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International trade and income distribution: The effect of corporate governance regimes

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Abstract

This paper introduces a model of corporate governance into the general oligopolistic equilibrium theory of international trade. Corporate governance defines the influence of workers and capital owners on manager contract and, through this contract, the scope of these two groups for subsequent rent extraction in the wage/employment negotiation between firms and unions. If capital owners have dictatorship over the manager contract, they can extract the full bargaining surplus and eliminate the union wage premium. If workers have dictatorship over the manager contract they can achieve a wage premium, driving the income of capital owners down to zero. In this setting, opening up to trade is to the detriment of the income group whose interests are decisive for the manager contract. This shows that distributional conflicts materializing from trade can be considerably different for countries with differing corporate governance regimes. Foreign investment allows capital owners in unionized industries to flee from disadvantageous corporate governance regimes at home, eliminating union wage premia and lowering manager remuneration in

countries with corporate governance regimes that give workers dictatorship over manager contracts.

KEYWORDS
corporate governance, foreign investment, international trade, labor unions, rent extraction

JEL CLASSIFICATION
F15, F16, F21, G30

1 | INTRODUCTION

In recent years the literature on international trade has drawn a nuanced picture of the winners and losers of globalization. Specifically, the focus has shifted from the consequences of a cross-sectoral reallocation of economic activity on functional income distribution, as put forward most prominently by Stolper and Samuelson (1941), to intra-sectoral divergence of factor returns due to heterogeneous exposure of firms to international trade shocks (see Egger & Kreickemeier, 2009, 2012; Helpman et al., 2010, 2017). Both strands of the literature ignore, however, that the economy-wide distribution of income may be the outcome of a distributional conflict inside the firm. This distributional conflict has been put forward by a sizable literature on *corporate governance* that focuses on the relationship between owners and managers and identifies contracts that are able to overcome problems associated with the information asymmetry in this relationship (see Shleifer & Vishny, 1997). However, so far corporate governance research has not paid attention to the link between the detailed microeconomic understanding about how the proceeds of production are distributed between different interest groups and the consequences of this distribution for the aggregate economy. Hence, existing models of corporate governance do not offer insights on the extent to which the separation of ownership and control determines winners and losers of globalization.[1]

Closing this gap and providing a theoretical model that puts the distributional conflict between owners, managers, and workers and its economy-wide implications at the center of corporate governance research is the main purpose of our analysis. With a focus on distributional conflict, we build on Zingales (1998, p. 497) who defines a corporate governance system "*as the complex set of constraints that shape the ex-post bargaining over the quasi-rents generated in the course of a relationship*." Based on this notion, we abstract from problems associated with asymmetric information when separating ownership and control and elaborate on how differences in the design of corporate governance systems affect the income distribution in closed and open economies. Building on research on *comparative* corporate governance (see Allen & Gale, 2000; La Porta et al., 1998, 2000; Morck, 2005), we distinguish two archetypal regimes of corporate governance, often referred to as the shareholder and stakeholder or, somewhat less common, the US and the German approach.[2] In this paper, we distinguish the shareholder and the stakeholder approach by noting that differences in corporate law make workers *outsiders* of the corporate system in the US and *insiders* of the corporate system in Germany. Governance in Germany has a dual structure and distinguishes the management board, which is concerned with the day-to-day business decisions, and the supervisory board, which appoints and oversees the management board and determines the details of manager contracts (Charkham, 2005, chapter 2). German

law specifies that workers must be represented on both the management and the supervisory board, whereas US law contains no such requirements for the board of directors, which unifies management and supervisory tasks.

Abstracting from details regarding the specific design of corporate governance regimes, we take a minimalist approach and assume that their purpose is to allocate decision power over the manager contract. The manager contract is chosen by the *governance board*,[3] and it determines manager remuneration as well as manager effort in the wage/employment negotiation of the firm and a firm-level union. This gives capital owners an *a priori* incentive to choose a manager contract with maximum bargaining effort, which is, however, limited by the fact that capital owners have to cover manager remuneration unilaterally. In contrast, workers have an incentive to implement a manager contract with minimum bargaining effort, which is limited by a participation constraint of capital owners covering the manager remuneration. Manager remuneration depends on the contracted bargaining effort, and we consider a positive link between these two contract elements by postulating a disutility of managers from providing higher bargaining effort. The two archetypes of corporate governance regimes can be captured in this setting by the polar cases of dictatorship of capital owners and dictatorship of workers over the manager contract.

We embed our corporate governance model into Neary's (2016) theory of generalized oligopolistic equilibrium, with a continuum of industries and a small number of firms competing in each of them. In line with Bastos and Kreickemeier (2009), we assume that a subset of industries is populated by firm-level unions and consider a model of efficient bargaining to capture the process of wage/employment negotiation between firms and unions. We choose a parametrization of our model, in which wage and employment bargaining establishes a vertical contract curve. This makes firm-level output independent of prevailing corporate governance regimes and allows us to isolate the impact of these regimes on income distribution. We begin our analysis by studying, for a closed economy, how the bargaining of capital owners and workers in the governance board solves distributional conflicts inside the firm and to what extent a common increase in the importance of workers for the governance board's decision affects the economy-wide distribution of income. Intuitively, a stronger representation of worker interests increases union wages and lowers the return to capital owners. Managers benefit from higher expected labor income, because their employment as production workers is an outside option for them.

We analyze in a second step how deunionization—due to a decline in the fraction of unionized industries—impacts income distribution under the two polar corporate governance systems representing the US and Germany. In the US, dictatorship of capital owners over manager contracts eliminates union wage premia, so that deunionization makes capital owners better off and lowers manager remuneration in the newly deunionized industries. However, there are no spillover effects on factor returns outside these industries. In Germany, dictatorship of workers over manager contracts implies for unionized industries that the return to capital owners (net of manager remuneration) falls to zero, whereas workers receive a premium over the competitive wage paid in nonunionized industries. In this case, deunionization lowers manager effort in all unionized industries, leading to an increase in the union wage premium, a higher return to capital owners, and lower manager remuneration. Thereby, the increase in the return to capital owners is confined to nonunionized industries and materializes in our model, because manager remuneration falls in all industries as a consequence of decreasing expected labor income.

Regarding the implications of trade, our model features a pro-competitive effect in line with the seminal work of Brander (1981). However, in a general equilibrium setting the

pro-competitive effect induces competitive wages to increase, leaving output unchanged in all industries. In such a featureless economy, international trade therefore only exerts distributional effects (see Neary, 2016), and we study these effects for the polar cases of US and German corporate governance regimes. If capital owners have dictatorship over the manager contract, opening up to trade redistributes income from capital owners to workers and managers. If workers have dictatorship over the manager contract, wages in nonunionized industries increase, whereas wages in unionized industries decline. The effects on managers and capital owners are *a priori* not clear. This points to the general insight that the income groups benefitting most strongly from the prevailing corporate governance regime in the closed economy are those that tend to lose from openness. Moreover, distributional conflicts in response to trade liberalization differ considerably for countries with US-type or German-type corporate governance regimes.

In an extension of our analysis, we show how the effects of openness change if we allow for foreign investment in addition to international trade. Abstracting from costs of trade and investment, German capital owners can flee in the open economy from the disadvantageous corporate governance regime of unionized industries at home and choose firm location in the US. The resulting decline in economy-wide labor demand induces competitive wages in Germany to decrease and thus attract US firms from nonunionized industries. Overall, the distributional effects of this reallocation are largely confined to Germany, where the union wage premium disappears, manager remuneration falls, and capital owners benefit.

Our analysis builds on a large literature studying problems of corporate governance. Based on the important insight by Berle and Means (1937) that separation of control and ownership should be a primary focus in research on the modern firm, this literature typically takes a microeconomic perspective and focuses on the implications of the contract/information structure of a single firm for efficiency of that firm and the distribution of the proceeds of production by that firm (e.g. Hart, 1995; Jensen & Meckling, 1976). Analyzing the distributional effects of corporate governance in general equilibrium, our interest is in the effect of rules of general applicability and not the internal microeconomic details of contracting. However, ours is of course far from the first paper to look inside the firm for ways to understand economy-wide responses to globalization. Over the last two decades a sizable literature has developed examining how globalization itself can separate ownership and control (for surveys see Helpman, 2006; Antràs & Rossi-Hansberg, 2009). This line of research, whether deriving from the transactions cost approach (e.g. Ethier, 1986; Grossman & Helpman, 2002; McLaren, 2000) or the property rights approach (e.g. Antràs, 2003, 2005; Antràs & Helpman, 2004), is primarily focused on the organization of production and its interaction with trade.[4] By contrast, our focus is on corporate governance and we analyze, in particular, how different governance regimes mediate the effects of international trade on the economy-wide distribution of income.

The rest of this paper is organized as follows. In Section 2, we develop a model of corporate governance and embed it into a framework of general oligopolistic equilibrium. There, we also show how a stronger representation of worker interests in the governance board impacts income distribution in a closed economy. In Section 3, we study the consequences of deunionization on income distribution for two polar cases reflecting in a stylized way the corporate governance regimes of the US and Germany. Sections 4 and 5 addresses the consequences of trade and foreign investment for income distribution under different corporate governance regimes. Section 6 concludes with a summary of the most important results and a brief outlook on promising directions for future research.

2 | A MODEL OF CORPORATE GOVERNANCE

In this section, we develop a model of corporate governance in general equilibrium. Emphasizing the role of corporate governance systems for solving distributional conflicts inside the firm and being, in particular, interested in how the achieved solution affects the economy-wide income distribution, we put our analysis into a general equilibrium framework with firm profits. The theory of generalized oligopolistic equilibrium (GOLE) put forward by Neary (2016) provides a natural environment for studying economy-wide corporate governance effects, and it is hence this framework we choose for our analysis.

2.1 | Endowments, technology, and preferences

We consider an economy that is populated by two groups of individuals, workers and capital owners. Capital owners are identical and hold an equal share of firms in either industry. Firms are equally distributed across sectors and the total, exogenous number of competitors equals the number of capital owners, $N \geq 1$. Firms do not differ in their technology. They hire one manager and have to employ one unit of labor for each unit of output they produce. There are no fixed costs. The economy is populated by E workers, each of them endowed with one unit of labor. Workers are *ex ante* identical but end up performing different tasks. N workers are employed as managers, while $L = E - N$ workers are used as variable labor input.

Workers, managers, and capital owners add up to the overall mass of consumers: $L + 2N$. Consumers have identical quasi-homothetic preferences that are represented by the quadratic utility function

$$u = \int_0^1 \left[a - \frac{1}{2}x(z)\right]x(z)dz - I\gamma, \tag{1}$$

where a is a common preference parameter, $x(z)$ is the consumption level of goods from industry z, I is an indicator function, which equals 1 if the individual is a manager and 0 otherwise, and γ is the disutility of managers from exerting bargaining effort in wage-employment negotiations with firm-level unions (see below). Consumers maximize utility (1), subject to their budget constraint

$$\int_0^1 p(z)x(z)dz \leq m, \tag{2}$$

where m is individual income and $p(z)$ is the price of good z. The solution to the utility maximization problem is represented by demand function $x(z) = a - \lambda p(z)$, where $\lambda = (a\mu_1 - m)/\mu_2$ denotes the consumer's marginal utility of income, which depends on the individual level of income, m, and the first as well as the second (uncentered) moment of the price distribution, $\mu_1 = \int_0^1 p(z)dz$ and $\mu_2 = \int_0^1 p(z)^2 dz$, respectively.

In the interest of notational simplicity, we have neglected consumer indices in our analysis. However, it is clear that in general agents can differ in income, m, their marginal utility of income, λ, and demand, $x(z)$. Adding up $x(z)$ over all individuals and solving for $p(z)$ gives inverse industry demand

$$p(z) = \frac{1}{\Lambda}[A - X(z)], \tag{3}$$

where $X(z)$ is aggregate demand for good z, A equals $a(L + 2N)$, and Λ denotes the representative consumer's marginal utility of income, which is given by

$$\Lambda = \frac{A\mu_1 - bM}{\mu_2}, \tag{4}$$

with M denoting aggregate income.[5] In the following, we choose indirect utility of the representative consumer as the numeraire and set $\Lambda = 1$.

2.2 | Labor market institutions

In our model, industries differ in their labor market institutions. To be more specific, we assume that in a fraction (subset) of industries $\bar{z} \in (0, 1)$ unions are organized at the firm-level, while in the residual industries the labor market is competitive. Similar to Bastos and Kreickemeier (2009), we rank industries such that unions are active in all $z \in [0, \bar{z}]$ industries. In these industries, firms and unions jointly determine employment and wages by maximizing the following Nash product

$$NP_i = \left[(w_i - w^c)q_i\right][\pi_i]^{\beta_i}, \tag{5}$$

where i is a firm index, w^c denotes the competitive wage paid by firms in the $1 - \bar{z}$ nonunionized industries, q_i is output (or employment) at the firm level, and π_i refers to *operating* firm-level profits.[6] Exponent $\beta_i \geq 0$ refers to the relative bargaining strength of the firm, which can be firm-specific. Substituting the goods market clearing condition $X = \sum_{j=1}^{N} q_j$ in (3), operating profits can be written as

$$\pi_i = \left(A - \sum_{j=1}^{N} q_j\right)q_i - w_i q_i. \tag{6}$$

Substituting the latter into (5) and maximizing the resulting expression for q_i and w_i, gives

$$q_i = \frac{A - w^c}{N + 1} \equiv q, \qquad w_i = w^c + \frac{1}{1 + \beta_i}\frac{A - w^c}{N + 1}. \tag{7}$$

From Equation (7) we see that a firm's output/employment level does not depend on bargaining strength β_i and hence it is the same in unionized and nonunionized industries. This is a consequence of two modeling ingredients. The first one is the assumption that unions are utilitarian and only interested in the total income gain of their members (see Carruth & Oswald, 1987; Oswald, 1982). The second one is the assumption of efficient bargaining, in which both employment (output) and wages are simultaneously determined in the negotiation between firms and unions (see Blanchard & Giavazzi, 2003; McDonald & Solow, 1981). The combination of these two assumptions gives us a framework in which bargaining leaves the size of surplus unaffected, while it influences the way this surplus is distributed between capital owners and workers. This establishes a parsimonious model of rent sharing. The degree of rent sharing is determined by the firm-specific value of β_i, with a larger (smaller) level of β_i indicating stronger (weaker) *rent extraction* by the capital owners, that is, $dw_i/d\beta_i < 0$.

Substitution of (7) in (3) and (6) further establishes

$$p = \frac{A + Nw^c}{N+1}, \qquad \pi_i = \frac{\beta_i}{1+\beta_i}\left(\frac{A - w^c}{N+1}\right)^2. \tag{8}$$

Summing up, we can conclude that the outcome of firm-union bargaining is (second-best) efficient, since it does not distort sectoral output or prices, while influencing how the bargaining surplus is distributed between the two bargaining parties. The larger the bargaining power of capital owners, β_i, the larger is this group's return from an agreement. Formally, we have $d\pi_i/d\beta_i > 0$, $\pi = 0$ if $\beta_i = 0$, and $\lim_{\beta_i \to \infty} \pi_i = \pi^c$, where π^c is the profit of firms in nonunionized industries with a competitive labor market.

2.3 | Manager contracts and rent extraction

Each firm needs to hire a manager prior to starting operation. In nonunionized industries, the manager simply runs the firm. In unionized industries, the manager additionally participates as the firm's representative in the wage-employment negotiations with the union. Crucially, the manager determines the relative bargaining power of the firm, β_i, by the effort provided in the wage-employment negotiation. We denote the manager's effort by $\gamma_i \in [0,1]$ and set $\beta_i \equiv \gamma_i/(1-\gamma_i)$.[7] Firms offer a contract to the manager that determines both the remuneration and the effort in the wage bargain. To be accepted, this contract must fulfill the manager's participation constraint. We abstract from problems associated with information asymmetry in a principal-agent context and assume that managerial effort is perfectly observable. In this case, the agent will accept the offer if the utility from acting as a manager, u_s, is at least as high as the expected utility from rejecting the contract, $\mathbb{E}[u_{\neg s}]$. Since neither capital owners nor workers have an incentive to *over-compensate* the manager, the offered contract will render the manager indifferent between accepting and rejecting it. The resulting utility level u_s is common to all managers and equal to the expected utility of production workers. The binding participation constraint of the manager in firm i can therefore be written as the indifference condition

$$\Gamma(s_i, \gamma_i) \equiv \frac{\mu_2}{2}\left\{\left(\overline{z}\,\mathbb{E}\left[\lambda_w^2\right] + (1-\overline{z})\lambda_{w^c}^2\right) - \lambda_{s_i}^2\right\} - \gamma_i = 0, \tag{9}$$

where λ_t, is the marginal utility of income of an agent receiving earning $t = w, w^c, s$ and it is inversely related to the indirect utility from this income: $u_t = (a^2 - \lambda_t^2\mu_2)/2$. In Equation (9) $\overline{z}$ and $1-\overline{z}$ capture the *ex ante* probabilities of finding employment in a unionized or a nonunionized industry, respectively. Moreover, the expectation operator acknowledges that unionized wages differ for firms with differing levels of γ_i. Equation (9) determines implicitly real manager remuneration $\sigma_i \equiv s_i/p$ as a function of manager effort γ_i, $\sigma_i = \hat{\sigma}(\gamma_i)$, taking as given the economy-wide variables $\mathbb{E}[\lambda_w^2]$, $\lambda_{w^c}^2$, and μ_2. Making use of $\lambda_{s_i} = [a - \hat{\sigma}(\gamma_i)]/p$, we can compute

$$\hat{\sigma}'(\gamma_i) = \frac{1}{a - \hat{\sigma}(\gamma_i)} > 0, \qquad \hat{\sigma}''(\gamma_i) = \left(\frac{1}{a - \hat{\sigma}(\gamma_i)}\right)^3 > 0. \tag{10}$$

Equation (10) establishes the intuitive results that capital owners must offer a higher remuneration, in order to elicit higher bargaining effort of the manager. Thereby, higher

bargaining effort improves rent extraction by capital owners, without changing production output. Hence, bargaining effort is a socially wasteful activity that produces disutility in our setting.

The content of a manager contract, $\{\sigma_i, \gamma_i\}$, is determined by a firm's *governance board*, which in general hosts delegates of the group of workers as well as the group of capital owners. More specifically, the contract determines γ_i and the corresponding level of $\sigma_i = \hat{\sigma}(\gamma_i)$ follows from Equation (9).

Unionized industries: In unionized industries, the delegate of capital owners has the objective to maximize real capital income ρ_i, which equals the real surplus accruing to capital owners in the negotiation with workers π_i/p—with $\pi_i = \gamma_i[(A - w^c)/(N + 1)]^2 \equiv \pi(\gamma_i)$, according to Equation (8)—minus the payment to the manager $\hat{\sigma}(\gamma_i)$. This establishes $\rho_i = \pi(\gamma_i)/p - \hat{\sigma}(\gamma_i) \equiv \hat{\rho}(\gamma_i)$. From the perspective of capital owners, higher manager effort therefore has the benefit of stronger rent extraction at the cost of higher manager remuneration. Below we introduce a parameter constraint ensuring that $\hat{\rho}(\gamma_i)$ is monotonically increasing in manager effort γ_i. The delegate of workers in the governance board maximizes the union objective $(w_i - w^c)q_i$. Making use of Equations (7) and (8), we compute $(w_i - w^c)q_i = [(1 - \gamma_i)/\gamma_i]\pi(\gamma_i) \equiv \zeta(\gamma_i)$, which is monotonically decreasing in γ_i.

Our model points to an important conflict of interest between capital owners and workers regarding the contracted level of manager effort. This conflict of interest is solved by a negotiation between the two interest groups, who jointly maximize the asymmetric Nash product $B(\gamma_i) = \zeta(\gamma_i)^{\eta}\hat{\rho}(\gamma_i)^{1-\eta}$, $0 \leq \eta \leq 1$, with η and $1 - \eta$ referring to the bargaining strength of workers and capital owners, respectively. Of course, any admissible solution of the bargaining problem has to respect the two groups' participation constraints. The participation constraint of workers is given by $\zeta(\gamma_i) \geq 0$ and it is fulfilled for any possible $\gamma_i \in [0, 1]$. For capital owners, the participation constraint is given by $\hat{\rho}(\gamma_i) \geq 0$ and noting that $\hat{\rho}(0) = -\hat{\sigma}(0) < 0$, it determines a lower bound on manager effort γ_i. An interior solution for $\gamma_i \in (0, 1)$ is given by the first-order condition $B'(\gamma_i) = 0$, which can be reformulated to

$$-\eta\hat{\rho}(\gamma_i) + (1 - \eta)(1 - \gamma_i)\hat{\rho}'(\gamma_i) = 0. \tag{11}$$

For the moment, we consider an interior solution with $\hat{\rho}(\gamma_i) \geq 0$ and postpone a formal proof of its existence to the next section.[8] Since we assume a common level of η, we have $\gamma_i = \gamma$ in all unionized firms.

Nonunionized industries: In nonunionized industries, rent extraction does not depend on manager effort, and hence there is no conflict of interest between workers and capital owners regarding the content of manager contracts. Workers are indifferent between all possible contracts that respect the participation constraint of capital owners. In contrast, capital owners strictly prefer a contract that minimizes manager remuneration and therefore opt for $\gamma_i = 0$ and $\hat{\sigma}(0) = a - p\sqrt{\overline{z}\,\mathbb{E}[\lambda_w^2] + (1 - \overline{z})\lambda_{w^c}^2}$. This is the manager contract, we consider to be prevalent in nonunionized industries yielding a return to capital owners equal to $\pi^c/p - \hat{\sigma}(0)$.

2.4 | General equilibrium in the closed economy

With the insights from the partial equilibrium analysis at hand, we can now proceed with determining the general equilibrium outcome in the closed economy. For this purpose, we first

apply the labor market clearing condition. Acknowledging from Equation (7) that all firms have the same output level, irrespective of the prevailing labor market regime, labor market clearing requires $L = N(A - w^c)/(N + 1)$. Accounting for $A = a(L + 2N)$ and denoting firm-level employment by $\ell \equiv L/N$, we can solve for $w^c = N[a(\ell + 2) - \ell] - \ell$ and $p = N[a(2 + \ell) - \ell]$, according to Equation (8). We then compute real wages $\omega^c = w^c/p$ and $\hat{\omega}(\gamma) = w/p$ according to

$$\omega^c = 1 - \frac{\ell}{[(a-1)\ell + 2a]N}, \qquad \omega(\gamma_i) = 1 - \frac{\gamma_i \ell}{[(a-1)\ell + 2a]N}. \tag{12}$$

It is a notable feature of our model that the competitive wage does not depend on the design of corporate governance institutions, which is captured in our model by the value of parameter η. This is an immediate consequence of the efficient bargaining approach to union wage setting, which—as pointed out above—makes firm-level employment independent of the negotiated wage. The manager contract determines manager remuneration in unionized industries, which can be expressed in general equilibrium as

$$\sigma(\gamma_i, \gamma) \equiv a - \sqrt{\overline{z}\left(a - 1 + \frac{\gamma\ell}{[(a-1)\ell + 2a]N}\right)^2 + (1 - \overline{z})\left(a - 1 + \frac{\ell}{[(a-1)\ell + 2a]N}\right)^2 - 2\gamma_i}. \tag{13}$$

With manager effort in unionized industries equal to γ, manager remuneration in nonunionized industries is given by $\sigma(0, \gamma)$. Finally, the return to capital owners in unionized industries can be written

$$\rho(\gamma_i, \gamma) = \pi(\gamma_i)/p - \sigma(\gamma_i, \gamma), \tag{14}$$

whereas the return to capital owners in nonunionized industries equals $\rho^c = \pi^c/p - \sigma(0, \gamma)$.

In a symmetric general equilibrium, in which all firms including i offer manager contracts with the same level of γ, we have $\sigma(\gamma, \gamma)$. There is a notable difference in the interpretation of $\sigma(\gamma_i, \gamma)$ and $\sigma(\gamma, \gamma)$. Whereas $\sigma(\gamma_i, \gamma)$ captures how changes in contracted effort of firm i and changes in the contracted effort of all other unionized firms affect manager remuneration in firm i differentially, $\sigma(\gamma, \gamma)$ determines the response in manager remuneration of firm i to a pari passu change in the manager effort of all unionized firms, including i.

We can now follow an equivalent reasoning and set $\gamma_i = \gamma$ in Equation (14) to determine $\rho(\gamma, \gamma)$. This establishes

$$\rho = \frac{\gamma\ell^2}{[(a-1)\ell + 2a]N} - a + \sqrt{\overline{z}\left(a - 1 + \frac{\gamma\ell}{[(a-1)\ell + 2a]N}\right)^2 + (1 - \overline{z})\left(a - 1 + \frac{\ell}{[(a-1)\ell + 2a]N}\right)^2 - 2\gamma} \tag{15}$$

as a general equilibrium relationship between common manager effort γ and manager remuneration ρ. A second general equilibrium relationship between γ and ρ is established by the first-order condition in Equation (11). Substituting $\hat{\rho}(\gamma_i) = \pi(\gamma_i)/p - \hat{\sigma}(\gamma_i)$, $\hat{\rho}'(\gamma_i) = \pi^c/p - \hat{\sigma}'(\gamma_i)$ from the

partial equilibrium analysis and setting $\gamma_i = \gamma$, we compute

$$\rho = \frac{1-\eta}{\eta}(1-\gamma)\left[\frac{\ell^2}{[(a-1)\ell+2a]N} - \frac{1}{\sqrt{\bar{z}\left(a-1+\frac{\gamma\ell}{[(a-1)\ell+2a]N}\right)^2+(1-\bar{z})\left(a-1+\frac{\ell}{[(a-1)\ell+2a]N}\right)^2-2\gamma}}\right]. \tag{16}$$

The following lemma summarizes key properties of Equations (15) and (16).

Lemma 1. *Let us assume that* $a \geq 1+\sqrt{3}$ *and* $\ell \geq \underline{\ell}$, *with*

$$\underline{\ell} \equiv \frac{(a-1)^2N}{2} + \sqrt{\left(\frac{(a-1)^2N}{2}\right)^2 + 2a(a-1)N}. \tag{17}$$

Then, Equation (15) *establishes a positive link between* γ *and* ρ, *with* ρ *increasing from a minimum level of* $\rho = -\sigma(0,0)$ *at* $\gamma = 0$ *to a maximum level of* $\rho > 0$ *if* $\gamma = 1$. *Furthermore, Equation* (16) *establishes a negative link between* γ *and* ρ, *with* ρ *decreasing from* $\rho > 0$ *if* $\gamma = 0$ *to* $\rho = 0$ *if* $\gamma = 1$.

Proof. See the Appendix.

According to Lemma 1, the system of Equations (15) and (16) has a unique solution, which is denoted by (γ^*, ρ^*) and captured by the intersection point of the respective loci in Figure 1. For the solution in Figure 1 to be consistent with the optimal bargaining outcome in Equation (11), $\rho_1'(\gamma^*, \gamma^*) > 0$ must hold for all unionized firms. Otherwise both workers and capital owners would have an incentive to lower manager effort and deviate from $\gamma_i = \gamma^*$. In the Appendix, we show formally that $\rho(\gamma, \gamma^*) > 0$ is positively sloped in γ under the parameter constraints in Lemma 1. To facilitate our analysis, we add $\rho(\gamma, \gamma^*)$ from Equation (14) as an auxiliary locus in Figure 1, acknowledging that its intercept with the vertical axis pins down the manager remuneration in nonunionized industries $\rho(0, \gamma^*) = -\sigma(0, \gamma^*)$. Shifts of locus $\rho(\gamma, \gamma^*)$ therefore provide insights in how changes in unionized industries spill over to nonunionized industries through changes in expected labor income and the induced adjustments in manager remuneration.[9]

Using Figure 1, we can shed light on the role of worker participation in the governance board. For this purpose, we conduct the comparative static exercise of increasing η simultaneously in all unionized industries, thereby giving workers a stronger impact on the manager contract. A higher level of η rotates locus Equation (16) counter-clockwise in Figure 1 and therefore lowers manager effort, γ, for any given level of ρ. The decline in manager effort γ allows unions to extract a larger fraction of the bargaining surplus in their negotiations with firms. This induces the union wage $\omega(\gamma)$ to increase, according to Equation (12) with implications for the income distribution in unionized and nonunionized industries.

The increase in union wages increases outside income opportunities of managers, thereby tightening their participation constraint. This induces a downward shift of locus $\rho(\gamma, \gamma^*)$ in

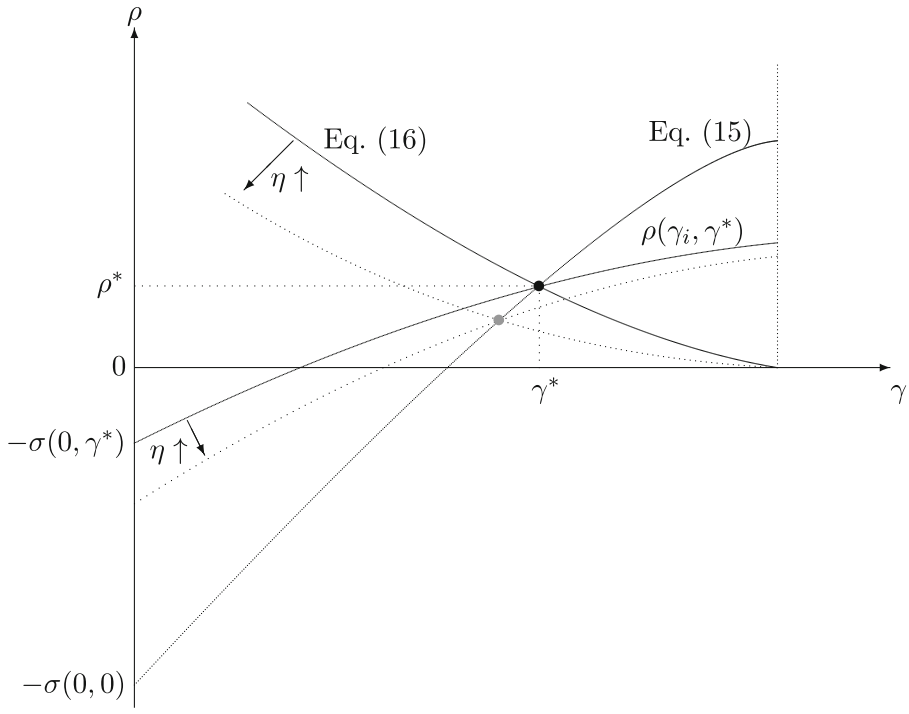

FIGURE 1 The return to capital owners and manager effort in general equilibrium.

Figure 1. The now lower intercept with the vertical axis at $\rho(0,\gamma^*) = -\sigma(0,\gamma^*)$ confirms an increase in manager remuneration in nonunionized industries and, despite a constant competitive wage ω^c, it implies a fall in the return to capital owners there. A higher union wage also induces manager remuneration to increase in unionized industries. However, this indirect income stimulus is counteracted and dominated by a direct negative effect on manager remuneration of a fall in manager effort γ (see the Appendix). Of course, a negative income effect of managers in unionized industries does not mean that they are worse off with a stronger representation of worker interests in the governance board. According to indifference condition (9), manager welfare in unionized and nonunionized industries is equalized, implying that the lower remuneration of managers in unionized industries is balanced by a lower disutility from higher bargaining effort, making on net managers in all industries better off after an increase in η. Finally, with union wages increasing, capital owners in unionized industries lose. This can be seen from Figure 1, where the new intersection point between Equations (15) and (16) is reached at a lower level of both γ and ρ.

The following proposition summarizes the results from this comparative static exercise.

Proposition 1. *A stronger representation of worker interests in the governance board (captured by a higher level of η) lowers contracted manager effort in the wage/employment negotiations with unions. This allows workers to extract a larger fraction of bargaining surplus in unionized industries and therefore renders workers better off after an increase in η. The wage increase improves the managers' expected income outside the contract, which makes this income group better off. Capital owners in unionized as well as nonunionized industries lose from a higher level of η.*

Proof. Analysis in the text.

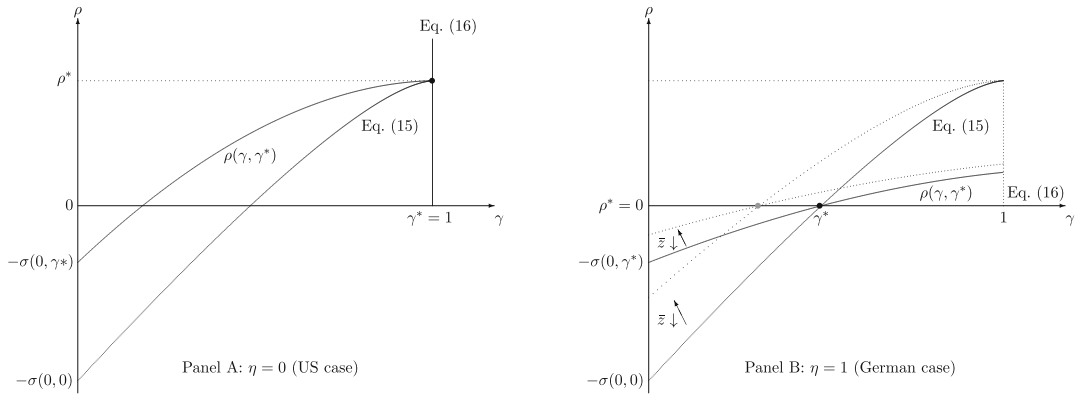

FIGURE 2 Deunionization, manager effort, and the return to capital owners.

3 | DEUNIONIZATION AND CORPORATE GOVERNANCE SYSTEMS

We now apply the model from the previous section to shed light on how local differences in corporate governance systems interact with labor market institutions in determining the economic well-being of different income groups. For this purpose, we look at the consequences of labor market reforms under two polar regimes of corporate governance, which we associate with the US and Germany, respectively. In the US, workers do not have a legal right to participate in the governance board, and hence we capture unionized firms in this country by the limiting case of $\eta = 0$. Things are different in Germany, where workers not only have a legal right to sit in the governance board but sometimes possess quasi-veto power in the board's decision process. We therefore associate Germany with the limiting case of $\eta = 1$.

We depict the two polar cases of the US and Germany in Figure 2. In Panel A, we see that in the limiting case of $\eta = 0$ the locus representing Equation (16) is given by a vertical line at $\gamma = 1$, yielding a unique intersection point with Equation (15) at $\gamma^* = 1$ and $\rho^* = \rho(1, 1)$. If capital owners can unilaterally choose the manager contract, they will set managerial effort to the maximum possible level, as the additional manager cost is more than compensated by the additional rents extracted in the wage/employment negotiation with the union. If $\gamma = 1$, the whole bargaining surplus goes to capital owners and the union wage falls to $\omega = \omega^c$, according to Equation (12). Moreover, with all firms paying the competitive wage, Equations (12) and (13) establish $\sigma(0, 1) = \omega^c$, implying that managers in nonunionized industries receive a remuneration equal to the competitive wage. In contrast, managers in unionized industries are compensated for their maximum level of bargaining effort and receive a remuneration equal to

$$\sigma(1,1) = a - \sqrt{\left(a - 1 + \frac{\ell}{[(a-1)\ell + 2a]N}\right)^2 - 2},$$

according to Equation (13). Finally, the income of capital owners in nonunionized and unionized industries is given by $\rho^c = \pi^c/p - \sigma(0, 1)$ and $\rho(1, 1) = \pi^c/p - \sigma(1, 1)$, respectively.

In the US, a decline in the fraction of unionized sectors $\bar{z}$, leads to a fall in the contracted manager effort of newly deunionized industries and therefore lowers manager remuneration and increases the return to capital owners in these industries. However, there is no effect on wages of

newly deunionized industries and hence no feedback effect on the income distribution in other industries. Moreover, the lower disutility of effort exactly compensates managers in newly deunionized industries for their income loss, leaving their welfare unchanged. Since lowering the fraction of unionized industries increases welfare of capital owners in newly unionized industries, it has Pareto improving effects by reducing wasteful managerial effort for rent extraction of capital owners. The important insight from our analysis that the effect of deunionization does not spill over to other industries is reflected in Figure 1 by noting that $\bar{z}$-changes leave the three loci in Panel A unchanged.

In Germany, $\eta = 1$ gives workers dictatorship over the content of the manager contract, leading them to set γ at the minimum level consistent with the participation constraint of capital owners, $\rho(\gamma, \gamma) = 0$. Panel B of Figure 2 depicts this case and shows that for $\eta = 1$ the locus representing Equation (16) coincides with the horizontal axis. The unique intersection point with Equation (15) determines the equilibrium $\gamma^* < 1$, which allows unions to extract part of the bargaining surplus and leads to a union wage premium $\omega(\gamma^*) > \omega^c$, according to Equation (12). As a consequence, managers in nonunionized as well as unionized industries receive a remuneration above the competitive wage. Due to higher manager costs, capital owners in nonunionized industries receive a positive income lower than in the case of $\eta = 1$, whereas capital owners in unionized industries receive an income equal to zero.

If Germany experiences a decline in the share of unionized industries, $\bar{z}$, bargaining effort and wages decrease with negative consequences for manager remuneration and positive consequences for the return to capital owners in newly deunionized industries. In addition, there are spillover effects to those industries in which labor market institutions do not change. To illustrate these spillover effects, we can make use of Panel B in Figure 2. There, we see that a lower wage rate in newly deunionized industries lowers expected labor income and thus the remuneration of managers in nonunionized industries, reflected by an upward shift in locus $\rho(\gamma, \gamma^*)$. Moreover, the lower outside income opportunities also reduce manager remuneration in unionized industries for any given level of $\gamma < 1$. This rotates locus Equation (15) clockwise in the figure. The lower manager remuneration implies an increase in the return to capital owners, which will be fully extracted by unionized workers through lowering manager effort γ. With lower manager effort, union wages increase, counteracting the reduction of expected labor income from deunionization. However, this second-round effect is dominated by the direct negative effect of workers in newly deunionized industries losing their wage premium, consistent with the upward shift of locus $\rho(\gamma, \gamma^*)$ and the clockwise rotation of Equation (15) in Panel B of Figure 2.

We complete our discussion of the closed economy with a brief summary of the distributional consequences of deunionization in our setting.

> **Proposition 2.** *Let the corporate governance systems in the US and Germany be associated with the limiting cases $\eta = 0$ and $\eta = 1$, respectively. Then, in the US the distributional effects of deunionization are confined to those industries in which unions disappear. There, the return to capital owners rises, whereas manager remuneration falls, with the income loss fully compensated by a lower disutility of effort. In Germany, deunionization decreases manager effort in all unionized industries and this changes economy-wide rent extraction, resulting in a higher union wage premium (outside newly deunionized industries), a higher return to capital owners, and lower manager remuneration.*

Proof. Analysis in the text and formal proof in the Appendix.

Whereas our discussion in this section is confined to the limiting cases of $\eta = 0$ and $\eta = 1$, we show in the Appendix that the analysis for Germany extends in a straightforward way to arbitrary levels of $\eta \geq 1/2$, with only one qualitative difference. If $\eta < 1$ capital owners have some impact on manager contracts and the reduction of contracted bargaining effort in response to deunionization will therefore be less pronounced in unionized industries, allowing capital owners to accrue part of additional bargaining surplus achieved by lowering manager remuneration. In all other respects the results from our analysis for Germany are unchanged if $\eta \in [1/2, 1)$.

4 | CORPORATE GOVERNANCE INSTITUTIONS AND INTERNATIONAL TRADE

In this section, we investigate how a movement from autarky to free trade with an integrated global goods market affects manager contracts. Thereby, we assume that the countries that are involved in international trade are identical in all respects, except for the prevailing corporate governance institutions. In this case, opening up to trade exerts a well-known pro-competitive effect, while it does not change output or prices in general equilibrium. This result may come at a surprise, because our model features sector-specific costs, which need not be the same across trading partners, and hence it captures important features of traditional trade models, in which goods trade arises due to comparative advantage. However, our model of rent sharing separates sectoral output levels from prevailing cost differences, depriving trade of its positive effect on production efficiency through adjustments in sectoral output. Compared to the *featureless* economy in Neary (2016) there are, however, richer distributional consequences of trade in our setting. These consequences and the question of how they depend on the prevailing corporate governance regimes are in the center of the subsequent analysis.

Since in the absence of shipment costs, trade effects in our model are monotonic in the number of trading partners, k, we can infer the implications of trade liberalization by looking at the comparative static effects of increasing k—with $k = 1$ referring to autarky and $k \geq 2$ referring to the open economy. Following the analysis of the closed economy step by step, the partial equilibrium outcome in the more general setting with $k \geq 1$ is given by

$$q = \frac{A - w^c}{kN + 1}, \qquad w_i = w^c + (1 - \gamma_i)\frac{A - w^c}{kN + 1}, \tag{7'}$$

and

$$p = \frac{A + kNw^c}{kN + 1}, \qquad \pi_i = \gamma_i\left(\frac{A - w^c}{kN + 1}\right)^2, \tag{8'}$$

where $A = akN(2 + \ell)$. Equations (7′) and (8′) reduce to the autarky expressions in Equations (7) and (8), if $k = 1$. Furthermore, the general equilibrium outcome in the open economy can be determined by setting $\gamma_i = \gamma$ and accounting for the modified labor market clearing condition

$$L = \frac{N(A - w^c)}{kN + 1}. \tag{15'}$$

Together, Equations (7′), (8′), (15′), the indifference condition in Equation (9), and the solution to the bargaining problem in Equation (11) characterize the open economy equilibrium in our model. For our results of the closed economy to extend to the open economy, we have to impose

the more restrictive parameter constraint $\ell > \ell_k$, with[10]

$$\ell_k \equiv \frac{(a-1)^2 kN}{2} + \sqrt{\left(\frac{(a-1)^2 kN}{2}\right)^2 + 2a(a-1)kN}. \tag{17'}$$

The impact of opening up to trade (captured by an increase in k) on rent extraction is channeled through adjustments in the competitive wage. A higher level of k triggers a pro-competitive effect in the goods markets, and this provides an incentive for firms and unions to expand production. As a consequence, aggregate labor demand increases, and hence the competitive wage must go up in order to restore labor market clearing. This can be confirmed by differentiating (15′) with respect to k. Since there is no pass through of higher labor costs on prices, the competitive wage also increases in real terms. Moreover, for a given level of γ, a higher competitive wage implies an increase in the union wage, according to Equation (7′), and this effect dominates the reduction in the operating profits of firms, $\pi(\gamma_i)$, as can be verified by the following equation:

$$\omega^c = 1 - \frac{\ell}{[(a-1)\ell + 2a]kN}, \qquad \omega(\gamma) = 1 - \frac{\gamma\ell}{[(a-1)\ell + 2a]kN}. \tag{12'}$$

The case of constant $\gamma < 1$ has been prominently discussed by Bastos and Kreickemeier (2009). Embedding the framework of a unionized oligopoly into general equilibrium, they note that opening up to trade, while lowering the union wage premium, makes all workers better off.

In our model things are different. Since manager effort in the wage/employment negotiation with unions is endogenous, distributional effects depend on the prevailing corporate governance regime. To highlight this, we contrast trade effects in the US and Germany, associating their corporate governance regimes with the polar cases of $\eta = 0$ and $\eta = 1$, respectively. We illustrate the impact of trade in Figure 3. Panel A depicts the case of the US, where a pro-competitive effect of trade ceteris paribus lowers firms' operating profits and thus the return to capital owners. This shifts the locus representing Equation (15) downwards in Figure 3. Because the contracted effort of managers remains unchanged at its maximum level of $\gamma = 1$, union wages increase pari passu with the competitive wage. This improves the outside income opportunities of managers in unionized and nonunionized industries and induces an increase in manager remuneration, captured by a downwards shift of locus $\rho(\gamma, \gamma^*)$ and a lower intercept of this curve with the vertical axis. With wages and manager remuneration both increasing in response to trade, the return to capital owners has to fall.

In Panel B, we show the impact of opening up to trade for Germany. Similar to the US, the pro-competitive effect of trade shifts the locus representing Equation (15) downwards. For the initial effort level of $\gamma = \gamma^*$, capital owners in unionized industries would receive a negative return, violating their participation constraint. As a consequence, contracted manager effort has to increase, thereby reducing the fraction of bargaining surplus that can be extracted by unions in the wage/employment negotiation with firms. This second-round effect through adjustments in γ counteracts the positive wage stimulus from stronger product market competition and, as formally shown in the Appendix, it dominates the wage stimulus from higher competitive wages, leading to a decline in $\omega(\gamma)$ and an increase in the remuneration of managers in unionized industries. Spillover effects on nonunionized industries are not clear in general. If the fraction of unionized industries is small, that is, if $\overline{z}$ is close to zero, expected labor income increases with the competitive wage and in this case manager remuneration in nonunionized sectors goes up, contributing to a decline in the return to capital owners there. In contrast, if the fraction of unionized

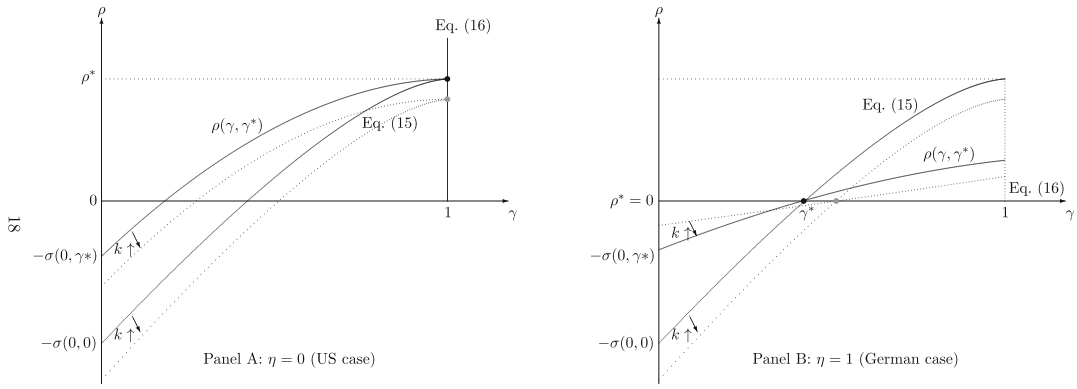

FIGURE 3 Opening up to trade, manager effort and the return to capital owners.

industries is large, that is, if $\bar{z}$ is close to one, expected labor income falls with the union wage and in this case manager remuneration in nonunionized industries decreases. This is the case we depict in Figure 3. Since the decline in manager remuneration counteracts the increase in the competitive wage, it is *a priori* not clear whether capital owners in nonunionized industries benefit or lose from Germany's opening up to trade.[11]

We summarize the main insights from the analysis above in the following proposition.

> **Proposition 3.** *If $\eta = 0$ gives the capital owners dictatorship over the manager contract, a country's opening up to trade redistributes income from capital owners to production workers and managers. If $\eta = 1$ gives workers dictatorship over the manager contract, the real competitive wage increases, while the real union wage decreases in response to trade liberalization. The effects on managers depends on the fraction of unionized industries. If this fraction is small, managers benefit and capital owners lose from trade. In contrast, managers lose if unionization is a common feature of most industries, and in this case the loss of capital owners from paying higher competitive wages is counteracted by the benefit of paying lower manager remuneration.*
>
> *Proof.* Analysis in the text and formal proof in the Appendix.

Proposition 3 highlights the distributional effects of trade under two polar corporate governance regimes. The results for these polar cases can be helpful in our view to provide a better understanding for increasing resistance to globalization observed for many developed countries over the last few decades (see Egger & Fischer, 2020; Harms & Schwab, 2019; Scheve & Slaughter, 2004). As a general insight from our analysis, we find that important distributional effects materialize in unionized industries and that it is the interest group dominating the governance board in these industries that loses from trade liberalization. This captures the intuitive idea that trade limits the scope for rent extraction. As a consequence, in the US it is the group of capital owners in unionized industries that is worse off in the open economy with negative spillover effects on the group of capital owners in nonunionized industries due to an increase in wages and manager remuneration. In contrast, in Germany it is the group of unionized workers that is worse off in the open economy, whereas workers in nonunionized industries benefit from an increase in competitive wages. This indicates that in Germany the distributional conflict due to trade liberalization is largely confined to the group of workers.

5 | TRADE AND FOREIGN INVESTMENT

In Section 4, we have associated openness of a country with the international trade of goods, excluding the possibility of foreign investment. Foreign investment can be attractive for capital owners to flee from disadvantageous corporate governance institutions in their home country. To elaborate on the role of foreign investment, we focus on two trading partners, the US and Germany, abstract from any trade and investment costs, and assume that capital owners choose firm location prior to the formation of the governance board. To rule out price differentiation across industries and to ensure that nonunionized firms continue to exist in either country if firms are footloose, we keep our assumption from previous sections that capital is immobile across sectors and in addition consider the same level of $\overline{z} < 1/2$ in both countries.

In this environment, German capital owners in unionized industries have an incentive to shift firm location to the US, because their income at home is brought down to zero by a dictatorship of workers over the manager contract. Since firms are small in the aggregate, they take the competitive wage as given. However, the incentive to shift firm location to the US exists in all unionized German industries, implying that economy-wide labor demand—and thus the prevailing competitive wage—will increase in the US and decrease in Germany. The emerging gap in competitive wages induces capital owners from nonunionized industries in the US to choose firm location in Germany, counteracting diverging movements of competitive wages in the US and Germany. The reallocation process will continue until competitive wages are equalized across countries and all German capital owners from unionized industries produce in the US.[12]

As a consequence, wages are equalized across industries in either country. In Germany, this is the case, because all locally producing firms are active in nonunionized industries. In the US, this is the case, because dictatorship of capital owners over manager contracts eliminates the union wage premium. Reallocation of firms therefore lowers wages and as a consequence also manager remuneration in Germany. In contrast, German capital owners benefit from foreign investment by achieving positive income in unionized industries and by paying lower manager remuneration in nonunionized industries. In the US, there are no distributional effects despite the access to foreign investment. Of course, managers in unionized industries earn more than managers in nonunionized industries. However, the income increase of managers newly employed in unionized firms compensates them for their higher effort provision, but it does not make them better off.

6 | CONCLUSION AND FURTHER DISCUSSION

This paper presents a model of corporate governance in which the manager contract is the outcome of a negotiation between workers and capital owners in the governance board of the firm. The contract specifies both manager remuneration and manager effort in the subsequent wage/employment negotiation between firms and unions. Manager remuneration and manager effort are positively linked in our model due to a disutility of effort and a participation constraint of managers. Worker and capital owners have opposing interests regarding the contracted manager effort, with the former preferring the minimum feasible level and the latter preferring the maximum feasible level of bargaining effort. The contracted manager effort therefore depends on the relative strength of workers and capital owners in the firm's governance board, with dictatorship of workers and dictatorship of capital owners reflecting the two polar cases of corporate regimes in the US and Germany, respectively.

We embed our model of corporate governance into the theory of oligopolistic equilibrium with a continuum of industries, a small number of firms active in each industry, and a fraction of

industries populated by firm-level unions. In this setting, we show that trade liberalization hurts the interest group with the stronger representation in the governance board and hence leads to different distributional conflicts under corporate governance systems prevailing in the US and Germany. We also show that access to foreign investment makes firms footloose and allows German capital owners to flee the disadvantageous corporate governance regime in the unionized industries of their home country by reallocating production to the US. Although there is a counteracting reallocation of production from the US to Germany in nonunionized industries, German workers and managers will unambiguously lose, whereas German capital owners will benefit from foreign investment.

Providing a first attempt to study the consequences of differing corporate governance regimes for the distributional effects of trade, we impose several simplifying assumptions, which, on the one hand, facilitate our analysis but, on the other hand, also reduce the general validity of our results. One restrictive feature of our analysis is the assumption of perfect information and the abstraction from contractual problems. Another restrictive feature is the vertical contract curve resulting from the efficient bargaining between firms and unions over wages and employment. Together, the two assumptions establish production efficiency and make corporate governance regimes purely redistributive in our model. This implies that our theoretical framework lacks important features justifying a meaningful welfare analysis. Therefore, giving up either restrictive assumption provides a promising direction for future research on the role of corporate governance in the context of international trade.

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DATA AVAILABILITY STATEMENT

Data sharing not applicable to this article as no new data were generated or analyzed during the current study.

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ENDNOTES

[1] Recent years have seen various attempts to shed light on how separation of ownership and control influences the performance of firms in international markets. Prominent examples include Marin and Verdier (2008, 2012, 2014) and Schymik (2018). However, existing work does not focus on economy-wide distributional consequences of different corporate governance regimes. The distribution of the proceeds of production between firms and workers is in the center of interest of a sizable literature dealing with individual and collective bargaining. Prominent examples in the context of international trade include Mezzetti and Dinopoulos (1991), Lommerud et al. (2003), Helpman et al. (2010), and Felbermayr et al. (2011). However, this literature ignores the role of managers, and hence it does not speak directly to corporate governance.

[2] The literature comparing corporate governance in the US and Germany is sizable (see, for instance, O'Sullivan, 2000).

[3] We use the term governance board to refer to the council of delegates supervising manager activities, without distinguishing explicitly between one-tier and two-tier systems.

[4] Firm organization also plays a prominent role in the analysis of firm hierarchies and the consequences of openness for hierarchical firm organization has been addressed in work by Caliendo and Rossi-Hansberg (2012), Caliendo et al. (2015), and Gumpert (2018). Moreover, firm organization also features prominently in the literature studying the consequences of offshoring for wages and welfare (see, for instance, Davidson et al., 2008; Egger, Kreickemeier, & Wrona, 2015; Egger et al., 2022).

[5] For characterizing the representative consumer, we have implicitly assumed that participation and nonsatiation are fulfilled for all consumers (see Egger & Etzel, 2012; Egger, Kreickemeier, & Wrona, 2015, for a discussion). The former requires price differences across industries to be sufficiently small, whereas the latter requires the marginal utility of income, λ, to be positive for all income groups. We will discuss formal conditions guaranteeing these outcomes below.

[6] In the interest of notational simplicity, we suppress the sector index from now on.

[7] As extensively discussed in Binmore et al. (1986), the solution to the Nash bargaining problem in (5) can be approximated by Rubinstein's (1982) noncooperative bargaining model with alternating taking and leaving offers in which the bargaining parties differ in the time interval that elapses between one party's reaction to the other party's offer and the own counter-offer. In such a setting, the party that needs more time to formulate the own offer ends up with a lower bargaining surplus, which, in the labor economics literature, is associated with a lower bargaining power of this party. Our approach can be interpreted as extension to this reasoning, which captures the idea that the manager's time for formulating a counter-offer depends on the manager's effort level.

[8] If the solution of Equation (11) supports $\hat{\rho}(\gamma_i) > (=)0$, then $\hat{\rho}'(\gamma_i) > (=)0$ is immediate. Moreover, differentiating Equation (11) gives $-\hat{\rho}'(\gamma_i) + (1-\eta)(1-\gamma_i)\hat{\rho}''(\gamma_i)$, which is negative, due to $\hat{\rho}'(\gamma_i) > (=)0$ and $\hat{\rho}''(\gamma_i) = -\hat{\sigma}''(\gamma_i) < 0$. We can thus safely conclude that if Equation (11) has an admissible solution, it refers to a unique maximum of Nash product $B(\gamma_i)$.

[9] Since prices are equalized across industries any positive level of real income guarantees consumption of all goods. This implies that the participation constraint is fulfilled for all income groups. The parameter constraints in Lemma 1 are, however, not sufficient for nonsatiation of these groups. According to the definition of λ_t, a positive marginal utility of income (and thus nonsatiation) is established in our model for workers and managers, according to Equations (12) and (15). Moreover, noting that $\pi^c > \pi(\gamma^*)$, condition $a > \pi^c/p - \sigma(0,\gamma^*)$ would guarantee a positive marginal utility of income for capital owners. Since $\sigma(0,\gamma^*) < a-1$, we can formulate $\ell < \overline{\ell}$, with

$$\overline{\ell} = \frac{(2a-1)(a-1)N}{2} + \sqrt{\left(\frac{2a-1)(a-1)N}{2}\right)^2 + 2a(2a-1)N},$$

as a sufficient condition for nonsatiation of this income group. Since $\ell < \overline{\ell}$, we conclude that an outcome with participation and nonsatiation of all income groups is consistent with the general equilibrium outcome depicted in Figure 1.

[10] Similarly, the parameter constraint guaranteeing nonsatiation of capital owners in Footnote 9 has to be modified to $\ell < \overline{\ell}_k$, with

$$\overline{\ell}_k \equiv \frac{(2a-1)(a-1)kN}{2} + \sqrt{\left(\frac{2a-1)(a-1)kN}{2}\right)^2 - 2a(2a-1)kN}.$$

[11] We have not been able to show increasing returns for capital owners under the parameter constraints $a > 1+\sqrt{3}$ and $\ell > \ell_k$. However, we can show that a movement from autarky to trade with one other economy—associated with an increase of k from 1 to 2—is to the benefit of of capital owners in nonunionized industries if $a = 4$, $N = 2$ and $\ell = \ell_k - 1/2$, which in turn is sufficient for Equation (15) to reach a value larger than zero if $\gamma = 1$ and thus is consistent with a unique solution of $\rho(\gamma,\gamma) = 0$ in $\gamma \in (0,1)$.

[12] With zero investment costs, the allocation of firms across nonunionized industries is *a priori* not clear. However, it is clear that each sector hosts $2N$ firms and that the EU hosts on average $N/(1-\overline{z})$ firms in each of their nonunionized industries.

[13] Note that the numerator in (A3) decreases in ℓ, reaching a minimum at $1-\overline{z}\{1/N + \gamma/[(a-1)N]^2\} > 0$.

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APPENDIX

A.1 Proof of Lemma 1

We first look at the properties of Equation (15) and note that $d\sigma(1,1)/d\ell < 0$ and that $\lim_{\ell\to 0}\sigma(1,1) = a - \sqrt{(a-1)^2-2}$, $\lim_{\ell\to 1}\sigma(1,1) = a - \sqrt{(a-1+1/[(a-1)N])^2-2}$ hold

according to Equation (13). Then, parameter constraint $a > 1 + \sqrt{3}$ ensures $0 < \sigma(1,1) < a - 1$. This is sufficient to establish $\rho(1,1) > \pi(1) - a + 1$, according to Equation (14). Moreover, the parameter constraint $\ell > \ell$, with ℓ given by Equation (17), establishes $\pi(1) - a + 1 > 0$. Putting together, the two parameter constraints in Lemma 1 therefore ensure $\rho(1,1) > 0$ and thus the right-hand side of Equation (15) is strictly positive at a common $\gamma = 1$. Differentiation of Equation (15) further implies

$$\frac{d\rho}{d\gamma} = \pi(1) - \frac{1 - \bar{z}\left(a - 1 + \frac{\gamma\ell}{[(a-1)\ell+2a]N}\right)\frac{\ell}{[(a-1)\ell+2a]N}}{a - \sigma(\gamma,\gamma)}. \tag{A1}$$

From above we know that the parameter constraints in Lemma 1 establish $\pi(1) > a - 1$ and $a - 1 > \sigma(1,1)$. Making use of $a - 1 > \sqrt{3}$, it is then immediate that Equation (15) establishes a monotonically positive link between γ and ρ, reaching a minimum level of $\rho(0,0) = -\sigma(0,0) < 0$ if $\gamma = 0$ and a maximum level of $\rho(1,1) = \pi(1) - \sigma(1,1) > 0$ if $\gamma = 1$.

Let us now turn to the properties of Equation (16). For this purpose, we first rewrite the equation as $\rho = [(1-\eta)/\eta](1-\gamma)R(\gamma)$, with $R(\gamma) \equiv \pi(1) - [a - \sigma(\gamma,\gamma)]^{-1}$. Noting that $a - \sigma(\gamma,\gamma) = \sqrt{\kappa(\gamma,\bar{z}) - 2\gamma}$, with

$$\kappa(\gamma,\bar{z}) \equiv \bar{z}\left(a - 1 + \frac{\gamma\ell}{[(a-1)\ell + 2a]N}\right)^2 + (1-\bar{z})\left(a - 1 + \frac{\ell}{[(a-1)\ell + 2a]N}\right)^2 > (a-1)^2, \tag{A2}$$

it follows that $a - \sigma(\gamma,\gamma) > 1$. Acknowledging $\pi(1) > a - 1$ and $a > 1 + \sqrt{3} > 2$, we can safely conclude that $R(\gamma) > 0$ holds under the parameter constraints in Lemma 1. Hence, provided that $\eta \in (0,1)$, Equation (16) establishes $\rho > 0$ for any $\gamma < 1$ and $\rho = 0$ if $\gamma = 1$. Furthermore, differentiation of $R(\gamma)$ gives[13]

$$R'(\gamma) = -\frac{1 - \bar{z}\left(a - 1 + \frac{\gamma\ell}{[(a-1)\ell+2a]N}\right)\frac{\ell}{[(a-1)\ell+2a]N}}{[a - \sigma(\gamma,\gamma)]^3} < 0, \tag{A3}$$

implying that Equation (16) establishes a monotonic negative link between γ and ρ. Finally, making use of the definition $\bar{\sigma}(\gamma) \equiv \sigma(\gamma,\gamma)$, it follows from Equation (13) that $R'(\gamma) = -\bar{\sigma}'(\gamma)/[a - \bar{\sigma}(\gamma)]$, establishing $d\sigma(\gamma,\gamma)/d\gamma = \bar{\sigma}'(\gamma) > 0$. This completes the proof.

A.2 The properties of $\rho(\gamma_i, \gamma)$

Partially differentiating Equation (14) with respect to γ_i gives

$$\rho_1'(\gamma_i,\gamma) = \pi(1) - \frac{1}{\sqrt{\kappa(\gamma,\bar{z}) - 2\gamma_i}}, \qquad \rho_{11}''(\gamma_i,\gamma) = -\frac{1}{\sqrt[3]{\kappa(\gamma,\bar{z}) - 2\gamma_i}} < 0. \tag{A4}$$

Noting from above that the parameter constraints in Lemma 1 establish $\pi(1) > a - 1$ and accounting for Equation (A2), it follows that $\rho_1'(\gamma_i,\gamma) > 0$ holds for any possible (γ_i,γ)-combination. This completes the proof.

A.3 Proof of Proposition 2

Subtracting Equation (16) from Equation (15) allows us to formulate the following implicit relationship between γ and $\bar{z}$:

$$\hat{\Gamma}(\gamma,\bar{z}) \equiv \left[\frac{[\gamma\eta-(1-\eta)(1-\gamma)]\ell^2}{[(a-1)\ell+2a]N}-\eta a\right]\sqrt{\kappa(\gamma,\bar{z})-2\gamma} + \big[\kappa(\gamma,\bar{z})-2\gamma\big]\eta+(1-\eta)(1-\gamma)=0, \tag{A5}$$

with $\kappa(\gamma,\bar{z})$ given by Equation (A2). In the limiting case of $\eta=0$, we have $\hat{\Gamma}(\cdot)=(1-\gamma)[1-\pi(1)]$. With the the bracket term being negative under the parameter constraints from Lemma 1, $\hat{\Gamma}(\gamma,\bar{z})=0$ requires $\gamma=1$ if $\eta=0$. This case is illustrated in Panel A of Figure 2. In contrast, $\hat{\Gamma}(\gamma,\bar{z})=0$ has an interior solution in $\gamma\in(0,1)$ if $\eta>0$. This is the case we focus on in the subsequent steps of this proof. Then, partially differentiating $\hat{\Gamma}$ with respect to γ gives

$$\hat{\Gamma}'_1(\cdot)=\frac{\ell^2\sqrt{\kappa(\gamma,\bar{z})-2\gamma}}{[(a-1)\ell+2a]N}-2\eta\left[1-\frac{\kappa'_1(\gamma,\bar{z})}{2}\right]-(1-\eta) - \left[\frac{[\gamma\eta-(1-\eta)(1-\gamma)]\ell^2}{[(a-1)\ell+2a]N}-\eta a\right]\frac{1-\kappa'_1(\gamma,\bar{z})/2}{\sqrt{\kappa(\gamma,\bar{z})-2\gamma}}. \tag{A6}$$

Evaluated at $\hat{\Gamma}(\cdot)=0$, this derivative reduces to

$$\hat{\Gamma}'_1(\cdot)=\frac{\ell^2\sqrt{\kappa(\gamma,\bar{z})-2\gamma}}{[(a-1)\ell+2a]N}-\eta\left[1-\frac{\kappa'_1(\gamma,\bar{z})}{2}\right]-(1-\eta)\left[1-(1-\gamma)\frac{1-\kappa'_1(\gamma,\bar{z})/2}{\kappa(\gamma,\bar{z})-2\gamma}\right]. \tag{A7}$$

Considering $1>\kappa'_1(\gamma,\bar{z})/2>0$ and accounting for $\sqrt{\kappa(\gamma,\bar{z})-2\gamma}=a-\sigma(\gamma,\gamma)>1$, $\pi(1)>a-1$, and $a>1+\sqrt{3}>2$, it is immediate that $\hat{\Gamma}'_1(\cdot)>0$. Furthermore, partially differentiating $\hat{\Gamma}$ with respect to $\bar{z}$ gives

$$\hat{\Gamma}'_2(\cdot)=\left\{\left[\frac{[\gamma\eta-(1-\eta)(1-\gamma)]\ell^2}{[(a-1)\ell+2a]N}-\eta a\right]\sqrt{\kappa(\gamma,\bar{z})-2\gamma}+2\big[\kappa(\gamma,\bar{z})-2\gamma\big]\eta\right\}\frac{\kappa'_2(\gamma,\bar{z})}{2[\kappa(\gamma,\bar{z})-2\gamma]}. \tag{A8}$$

Making use of $\hat{\Gamma}(\gamma,\bar{z})=0$, it follows that $\hat{\Gamma}'_2(\cdot)>,=,<0$ if $(1-\gamma)(1-\eta)>,=,<\eta[\kappa(\gamma,\bar{z})-2\gamma]$. Recollecting $\kappa(\gamma,\bar{z})-2\gamma>1$, we can safely conclude that the curly bracket expression in Equation (A8) is positive under the sufficient condition that $\eta\geq 1/2$. Noting further that $\kappa'_2(\gamma,\bar{z})<0$ holds for any $\gamma<1$, this establishes $\hat{\Gamma}'_2(\cdot)<0$. Therefore, Equation (A5) establishes a positive link between γ and $\bar{z}$, which implies that deunionization reduces manager effort in the remaining unionized industries if $\eta\geq 1/2$. Since a negative link between γ and $\omega(\gamma)$ follows from Equation (12), it is then immediate that deunionization in the form of a lower level of $\bar{z}$ increases the union wage $\omega(\gamma)$.

To show the impact of a decline in $\bar{z}$ on manager remuneration in unionized industries we define $\alpha\equiv\kappa(\gamma,\bar{z})-2\gamma>1$ and reformulate the implicit function in Equation (A5) as follows

$$\overline{\Gamma}(\gamma,\alpha)\equiv\left[\frac{[\gamma\eta-(1-\eta)(1-\gamma)]\ell^2}{[(a-1)\ell+2a]N}-\eta a\right]\sqrt{\alpha}+\alpha\eta+(1-\eta)(1-\gamma)=0. \tag{A9}$$

Differentiating the latter with respect to γ (holding α constant) gives

$$\overline{\Gamma}'_1(\cdot) = \frac{\ell^2}{[(a-1)\ell + 2a]N}\sqrt{\alpha} - (1-\eta) > 0. \tag{A10}$$

Differentiation of $\overline{\Gamma}(\cdot)$ with respect to α establishes

$$\overline{\Gamma}'_2(\cdot) = \left\{\left[\frac{[\gamma\eta - (1-\eta)(1-\gamma)]\ell^2}{[(a-1)\ell + 2a]N} - \eta a\right]\sqrt{\alpha} + 2\alpha\eta\right\}\frac{1}{2\alpha}. \tag{A11}$$

Evaluating this derivative at $\overline{\Gamma}(\cdot) = 0$, we find that $\eta \geq 1/2$ is sufficient for $\overline{\Gamma}'_2(\cdot) > 0$—see the discussion on Equation (A8). Equation (A9) therefore establishes a negative link between α and γ if workers have a sufficiently strong impact on the content of the manager contract. Noting that $\hat{\sigma}(\gamma) = a - \sqrt{\alpha}$, it follows that a decrease of γ due to deunionization lowers manager remuneration in unionized industries. To show the impact of a decline in $\overline{z}$ on manager remuneration in nonunionized industries, we can rewrite the implicit function in Equation (A5) as follows

$$\tilde{\Gamma}(\gamma, \kappa) \equiv \left[\frac{[\gamma\eta - (1-\eta)(1-\gamma)]\ell^2}{[(a-1)\ell + 2a]N} - \eta a\right]\sqrt{\kappa - 2\gamma} + [\kappa - 2\gamma]\eta + (1-\eta)(1-\gamma) = 0. \tag{A12}$$

Partially differentiating $\tilde{\Gamma}(\cdot)$ with respect to γ (holding κ constant) yields

$$\tilde{\Gamma}'_1(\cdot) = \frac{\ell^2}{[(a-1)\ell + 2a]N}\sqrt{\kappa - 2\gamma} - \frac{1}{\sqrt{\kappa - 2\gamma}}\left[\frac{[\gamma\eta - (1-\eta)(1-\gamma)]\ell^2}{[(a-1)\ell + 2a]N} - \eta a\right] - 1 - \eta. \tag{A13}$$

Evaluating this derivative at $\tilde{\Gamma}(\cdot) = 0$, we obtain

$$\tilde{\Gamma}'_1(\cdot) = \frac{\ell^2}{[(a-1)\ell + 2a]N}\sqrt{\kappa - 2\gamma} - 1 + \frac{(1-\eta)(1-\gamma)}{\kappa - 2\gamma} > 0. \tag{A14}$$

Furthermore, differentiating $\tilde{\Gamma}(\cdot)$ with respect to κ yields

$$\tilde{\Gamma}'_2(\cdot) = \left\{\left[\frac{[\gamma\eta - (1-\eta)(1-\gamma)]\ell^2}{[(a-1)\ell + 2a]N} - \eta a\right]\sqrt{\kappa - 2\gamma} + 2(\kappa - 2\gamma)\eta\right\}\frac{1}{2\kappa - 2\gamma}. \tag{A15}$$

Following a similar reasoning as in Equation (A8), it follows that $\tilde{\Gamma}'_2(\kappa) > 0$ holds for all $\eta \geq 1/2$, when evaluated at $\tilde{\Gamma}(\cdot) = 0$. Putting together, this establishes a negative link between κ and γ. Since a decline in $\overline{z}$ leads to a reduction in γ (see above), we can thus conclude that $\sigma(0, \gamma^*) = a - \sqrt{\kappa}$ decreases in response to deunionization.

Finally, for $\eta \geq 1/2$ a decline in $\overline{z}$ increases the return to capital owners in nonunionized industries, because manager remuneration falls there. In unionized industries, wages increase and manager remuneration falls, generating counteracting effects on the return to capital owners. To get a definite result for the impact of deunionization on the return to capital owners, we can reformulate Equation (16) as follows

$$\rho = \frac{1-\eta}{\eta}(1-\gamma)\left[\pi(1) - \frac{1}{\sqrt{\alpha}}\right] \tag{A16}$$

From above we know that α increases whereas γ decreases if $\overline{z}$ declines and $\eta \geq 1/2$, implying that deunionization unambiguously increases the return to capital owners in unionized industries if $\eta < 1$, whereas it leaves the return to capital owners in unionized industries unchanged at a value of zero in the limiting case of $\eta = 1$. This completes the proof.

A.4 Proof of Proposition 3

Since the effects of trade for $\eta = 0$ can be directly inferred from our analysis in the text, we restrict the formal discussion in this appendix to the limiting case of $\eta = 1$. We begin our analysis with studying the impact of an increase in k on manager effort γ, which is pinned down in our model by $\rho(\gamma, \gamma) = \pi(\gamma) - \sigma(\gamma, \gamma) = 0$. This establishes an implicit link between γ and k of the following form

$$\Psi(\gamma, k) \equiv \frac{\gamma \ell^2}{[(a-1)\ell + 2a]kN} - a + \sqrt{\overline{z}\left(a - 1 + \frac{\gamma \ell}{[(a-1)\ell + 2a]kN}\right)^2 + (1-\overline{z})\left(a - 1 + \frac{\ell}{[(a-1)\ell + 2a]kN}\right)^2 - 2\gamma} = 0. \tag{A17}$$

Applying the implicit function theorem establishes

$$\left.\frac{d\gamma}{dk}\right|_{\Psi(\cdot)=0} = -\frac{\partial \Psi / \partial k}{\partial \Psi / \partial \gamma} = \frac{\gamma}{k}\frac{\tilde{\pi}(\gamma, k) + \psi_2(\gamma, k)}{\tilde{\pi}(\gamma, k) - \psi_1(\gamma, k)}, \tag{A18}$$

with $\tilde{\pi}(\gamma, k) \equiv \gamma \ell^2 / \{[(a-1)\ell + 2a]kN\}$ as the operating profit in the open economy and

$$\psi_1(\gamma, k) \equiv \frac{\gamma - \overline{z}\left(a - 1 + \frac{\gamma \ell}{[(a-1)\ell + 2a]kN}\right)\frac{\gamma \ell}{[(a-1)\ell + 2a]kN}}{\sqrt{\overline{z}\left(a - 1 + \frac{\gamma \ell}{[(a-1)\ell + 2a]kN}\right)^2 + (1-\overline{z})\left(a - 1 + \frac{\ell}{[(a-1)\ell + 2a]kN}\right)^2 - 2\gamma}},$$

$$\psi_2(\gamma, k) \equiv \frac{\overline{z}\left(a - 1 + \frac{\gamma \ell}{[(a-1)\ell + 2a]kN}\right)\frac{\gamma \ell}{[(a-1)\ell + 2a]kN} + (1-\overline{z})\left(a - 1 + \frac{\ell}{[(a-1)\ell + 2a]kN}\right)\frac{\ell}{[(a-1)\ell + 2a]kN}}{\sqrt{\overline{z}\left(a - 1 + \frac{\gamma \ell}{[(a-1)\ell + 2a]kN}\right)^2 + (1-\overline{z})\left(a - 1 + \frac{\ell}{[(a-1)\ell + 2a]kN}\right)^2 - 2\gamma}}.$$

Noting that $\ell > \ell_k$ ensures $\tilde{\pi}(\gamma, k) > \gamma$, whereas $a > 1 + \sqrt{3}$ establishes $0 < \psi_1(\gamma, k) < \gamma$, it follows that $\tilde{\pi}(\gamma, k) > \psi_1(\gamma, k)$ and thus $d\gamma/dk\big|_{\Psi(\cdot)=0} > 0$. We denote the manager contract determined by the implicit function $\Psi(\gamma, k) = 0$ by $\gamma = \tilde{\gamma}(k)$, with $\tilde{\gamma}'(k) > 0$.

With this insight at hand, we now turn to the impact of an increase in k on manager remuneration in unionized industries. Defining the auxiliary function

$$\tilde{\kappa}(k) \equiv \overline{z}\left(a - 1 + \frac{\tilde{\gamma}(k)\ell}{[(a-1)\ell + 2a]kN}\right)^2 + (1-\overline{z})\left(a - 1 + \frac{\ell}{[(a-1)\ell + 2a]kN}\right)^2 > (a-1)^2, \tag{A19}$$

we can express manager remuneration in unionized industries as $\tilde{\sigma}(k) \equiv a - \sqrt{\tilde{\kappa}(k) - 2\tilde{\gamma}(k)}$. Making use of Equations (A17) and (A19), we obtain

$$\tilde{\sigma}(k) \equiv \frac{\tilde{\gamma}(k)\ell^2}{[(a-1)\ell + 2a]kN}, \tag{A20}$$

with

$$\tilde{\sigma}'(k) = \left[\frac{\tilde{\gamma}'(k)k}{\tilde{\gamma}(k)} - 1\right]\frac{\tilde{\sigma}(k)}{k} > 0, \tag{A21}$$

according to Equation (A18). This shows that manager remuneration in unionized industries increases in k. To determine the impact of increasing k on manager remuneration in nonunionized industries, we can express the latter as $\tilde{\sigma}_c(k) \equiv a - \sqrt{\tilde{\kappa}(k)}$. Differentiation gives

$$\begin{aligned}\tilde{\sigma}_c'(k) = -\frac{1}{\sqrt{\tilde{\kappa}(k)}}\Bigg\{&\bar{z}\left(a - 1 + \frac{\tilde{\gamma}(k)\ell}{[(a-1)\ell + 2a]kN}\right)\frac{\tilde{\gamma}(k)\ell}{[(a-1)\ell + 2a]k^2N}\left[\frac{\tilde{\gamma}'(k)k}{\tilde{\gamma}(k)} - 1\right]\\ &-(1-\bar{z})\left(a - 1 + \frac{\ell}{[(a-1)\ell + 2a]kN}\right)\frac{\ell}{[(a-1)\ell + 2a]k^2N}\Bigg\},\end{aligned} \tag{A22}$$

showing that $\tilde{\sigma}_c'(k) >, =, < 0$ is possible. In particular, we have $\tilde{\sigma}_c'(k) < 0$ if the fraction of unionized industries is large. This can be easily confirmed for the limiting case $\bar{z} \to 1$ and explained by the observation that a higher number of trading partners k reduces the union wage $\omega(\gamma)$. To see this, we can evaluate $\omega(\gamma)$ at $\gamma = \tilde{\gamma}(k)$ and denote the resulting expression by $\tilde{\omega}(k)$. Differentiation with respect to k then gives $\tilde{\omega}'(k) = -\tilde{\sigma}'(k)/\ell < 0$, according to (12′), (A18), (A20), and (A21). If $\bar{z}$ is high the wage decrease in unionized industries induces an overall decline in the expected labor income with negative consequences on manager remuneration in nonunionized industries. In contrast if $\bar{z}$ is small, the increase in the competitive wage is decisive for an overall increase in expected labor income, with positive consequences for manager remuneration in nonunionized industries. This can be easily confirmed for the limiting case of $\bar{z} \to 0$.

In a final step, we analyze the impact of increasing k on the return to capital owners. In unionized industries, the return to capital owners equals zero if $\eta = 1$ and this outcome is independent of the level of k. In nonunionized industries the return to capital owners can be expressed as function of k according to $\tilde{\rho}_c(k) \equiv \ell^2/\{[(a-1)\ell + 2a]kN\} - \tilde{\sigma}_c(k)$. Differentiation gives

$$\begin{aligned}\tilde{\rho}_c'(k) = &-\frac{\ell^2}{[(a-1)\ell + 2a]k^2N}\\ &+\frac{\bar{z}\left(a - 1 + \frac{\tilde{\gamma}(k)\ell}{[(a-1)\ell+2a]kN}\right)\frac{\tilde{\gamma}(k)\ell}{[(a-1)\ell+2a]k^2N}}{\sqrt{\bar{z}\left(a - 1 + \frac{\tilde{\gamma}(k)\ell}{[(a-1)\ell+2a]kN}\right)^2 + (1-\bar{z})\left(a - 1 + \frac{\ell}{[(a-1)\ell+2a]kN}\right)^2}}\left[\frac{\tilde{\gamma}'(k)k}{\tilde{\gamma}(k)} - 1\right]\\ &-\frac{(1-\bar{z})\left(a - 1 + \frac{\ell}{[(a-1)\ell+2a]kN}\right)\frac{\ell}{[(a-1)\ell+2a]k^2N}}{\sqrt{\bar{z}\left(a - 1 + \frac{\tilde{\gamma}(k)\ell}{[(a-1)\ell+2a]kN}\right)^2 + (1-\bar{z})\left(a - 1 + \frac{\ell}{[(a-1)\ell+2a]kN}\right)^2}}.\end{aligned} \tag{A23}$$

It is immediate that $\tilde{\sigma}_c'(k) > 0$ is sufficient for the return of capital owners to decrease in k, and hence we conclude that capital owners lose from opening up to trade if only a small fraction of industries are unionized. In contrast, the decrease in manager remuneration counteracts the increase in the competitive wage if $\overline{z} \to 1$. This completes the proof.