Cross-border mergers and domestic-firm wages: Integrating "spillover effects" and "bargaining effects"

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Abstract
Two literatures exist concerning cross-border merger activity's impact on domestic wages: one focusing on positive spillover effects; the other focusing on negative bargaining effects. Motivated by scarce theoretical scholarship spanning these literatures, we nest both mechanisms in a single conceptual framework. Considering the separate phenomena of inward and outward cross-border merger activity, our theoretical model generates three formal propositions: cross-border mergers can lead to wage increases via positive spillover effects; and negative bargaining effects are relatively more dominant when union market power is high, and when merging firms exhibit relatedness. Employing US firm-level panel data on wages combined with industry-level data on unionization and merger activity (covering 1989–2001), we find support for our propositions as inward and outward cross-border merger activity generate positive spillovers to wages, but are more likely to generate firm-level wage decreases when unionization rates are high and when cross-border merger activity is characterized as horizontal. Accordingly, future research on how cross-border mergers affect domestic wages should be mindful that both spillover and bargaining effects are at play, and that the degree of union market power and the relatedness of cross-border merger activity are critical in determining which effect dominates.
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INTRODUCTION

Cross-border mergers and acquisitions (M&As) are an increasingly popular strategic move by firms as attested to by Shimizu, Hitt, Vaidyanath, and Pisano (2004) and as represented by two stylized facts: growth in cross-border M&A activity has outpaced growth in domestic M&A activity over the last two decades (Makaev, 2010); cross-border M&As now constitute the great majority – over 80% – of foreign direct investment (FDI) (McCann & Mudambi, 2004). While a number of different dimensions to cross-border M&As have been studied, one area of substantial recent interest has been the impact on domestic wages. In particular, two literatures on how cross-border M&As affect wages have developed: one focusing on the potential for positive spillover effects, the other focusing on the potential for negative bargaining effects.

The spillovers literature holds that FDI – where cross-border mergers are again the most popular form – involves a transfer of technology and ideas to a host nation (Liu, Siler, Wang, & Wei, 2000). This mechanism is based on the idea that multinational enterprises (MNEs) possess intangible assets such as technological know-how, management skills, export relationships, and brand awareness that purely domestic firms do not (Dunning, 1981; Caves, 1996). Moreover, MNEs are unable to fully prevent such advantages from spilling over to domestic firms – what McCann and Mudambi (2005) refer to as unintentional knowledge outflows – due to the presence of multiple "spillover" channels. While the adoption of technological advantages can clearly increase the productivity of domestic firms (Wei & Liu, 2006; Buckley, Clegg, & Wang, 2007; Haskel, Pereira, & Slaughter, 2007), it also increases wages due to increased worker productivity (Aitken, Harrison, & Lipsey, 1996).

While the above studies hold that inward cross-border M&A activity would involve substantial positive spillovers with regard to domestic-firm wages, it is important to highlight that reverse spillover effects can manifest via outward cross-border M&A activity. A number of scholars (e.g., Kogut & Chang, 1991; Fosfuri & Motta, 1999; Griffith, Harrison, & Van Reenen, 2006) have found outward FDI to be undertaken by firms in order to gain knowledge and technology from relatively productive foreign enterprises. Moreover, another set of scholars (e.g., Cantwell, 1995; Cantwell & Mudambi, 2005; Wei, Liu, & Wang, 2008) have even established that highly productive firms can learn from outward cross-border activity. The implication from this literature is that outward cross-border M&A activity may also yield significant spillovers to domestic firms. Wei et al. (2008) summarize the importance of both the traditional spillovers literature (based on inward cross-border M&A activity) and the reverse spillovers literature (based on outward cross-border M&A activity) well when they observe that knowledge flows are truly bidirectional in nature. Thus cross-border mergers – both inward and outward – enable intangible assets and knowledge to be transferred across borders within the MNE and spread to domestic-outsider firms, which in turn generates increased wages for workers in these firms.

The bargaining effects literature, instead, holds that cross-border mergers provide firms with fallback options that give them the upper hand in bargaining with unions over wages and working conditions. In this vein, Buckley and Ghauri (2004) observe that MNEs are perfectly placed to exploit differences between nationally based labor markets and globally integrated goods, services and financial markets. While cross-border M&As allow MNEs to more easily respond to wage differences by transferring production abroad (Fabbri, Haskel, & Slaughter, 2003), even more powerful – and pertinent to the "bargaining" effects hypothesis – is the creation of a "threat effect", as the presence of foreign production sites assists employers during labor strikes or work stoppages. Caves (1996: 125) notes that "if the MNE maintains capacity to produce the same goods in different national markets, output curtailed by a strike in one market can be replaced from another subsidiary's plant". In sum, the ability of unions to negotiate above-competitive wages is undermined by inward and outward cross-border mergers; that is, the outside options that M&As present for MNEs undercut the ability of unions to provide wage premiums.

When considering the above two literatures concerning how cross-border M&As might affect wages, three general observations become manifest. First, the bargaining effects literature consists almost entirely of theoretical studies and lacks empirical testing of the premise that cross-border M&As allow firms to play off one group of workers against another (Choi, 2001; Lommerud, Straume, & Sørgard, 2006; Braun, 2008). Second, the spillover effects literature indicates opposite tendencies, as it is dominated by empirical work and suffers from a lack of formal theoretical work.[1] Third, there has been a lack of dialog between these two discourses regarding how cross-border mergers might affect wages with only reviews by Driffield (1996), Gaston and Nelson (2002), and Conyon et al. (2002) appearing to acknowledge the presence of both mechanisms. While Harrison and McMillan (2011) set conditions which favor when foreign and domestic employment in MNEs are complements and substitutes, we have been unable to detect scholarship that specifically integrates "spillover" and "bargaining" effects. This lack of integration is partly due to different proclivities – theoretical (empirical) tendencies for work on bargaining (spillover) effects – yet the two effects clearly involve contending predictions that call for a comprehensive analysis setting conditions as to when bargaining and when spillover effects are most relevant.

Motivated by the above deficiencies in the literature on how cross-border mergers affect the wages of domestic firms, our aim is twofold. First, we present a theoretical treatment that involves integrating both the "spillover" and "bargaining" effects from cross-border merger activity in one conceptual framework.

Our model predicts that unionization in a sector favors the dominance of bargaining vs spillover effects; thus, cross-border mergers involve positive spillover effects, but such mergers are more likely to decrease wages under higher unionization rates. Our model also holds that the relatedness of the merging firms yields wage implications, as the substitutability of production between merging firms will enhance negative bargaining effects. Second, we link theory with empirics by testing these predictions on the separate phenomena of inward and outward cross-border M&A activity. Our empirical goal is to shed light on whether – and when – inward and outward cross-border merger activity involve positive or negative wage effects for domestic-outsider firms. To do so, we employ comprehensive firm-level panel data on wages (and other firm-level controls) and combine this data with measures of unionization and merger activity for US industrial sectors for the period 1989–2001. The empirical results suggest that both "spillover" and "bargaining" effects are at play, with cross-border merger activity. In particular, we find that cross-border M&As involve positive spillover effects, but are more likely to generate firm-level wage decreases when unionization rates are high, product relatedness (i.e., horizontal activity) is present, and mergers are outward in direction.

BACKGROUND LITERATURE

In order to ground our analysis and contribution, it behooves us to go beyond the above and engage in a detailed review of how cross-border M&A activity might affect domestic wages. Accordingly, we set out here to do the following: briefly review the bargaining effects and spillover effects mechanisms; provide more specificity on the presence of different spillover channels; and – in order to set up our effort to integrate "spillover" and "bargaining" effects – discuss the works which factor the two effects regarding how cross-border mergers (both inward and outward) might affect wages.

The bargaining effects literature almost entirely consists of theoretical studies (Choi, 2001; Braun, 2008); thus, a sizeable theoretical foundation exists – for example, Mezetti and Dinopoulos (1991) and Lommerud et al. (2003, 2005, 2006) – formalizing the idea that FDI allows firms to play off one group of workers against another. Yet to the best of our knowledge, only a handful of studies bring some evidence to bear concerning the empirical robustness of the bargaining effects mechanism. Choi (2001) takes advantage of between-industry variation and finds that union members in high FDI-level

industries are paid less than union members in low FDI-level industries. Fabbri et al. (2003) find some evidence – for example, plants owned by MNEs are more likely to shut down as compared with domestically owned plants – supporting the globalization of production leading to rising wage inequalities. Braun (2008) finds that the foreign ownership premium (i.e., subsidiaries of MNEs pay higher wages than purely domestic firms) goes to zero in highly unionized firms; thus, workers are unable to secure higher wages in highly unionized MNEs. In line with these ideas, Muendler and Becker (2010) find a substitutive relationship between home and foreign employment for German MNEs. Taken as a whole, these studies provide some evidence supporting the bargaining effects hypothesis; however, the limited nature of the work makes it difficult to definitively argue for the validity of this mechanism.

By no means, however, does the spillover effects literature suffer from a lack of empirical scholarship. As Görg and Greenaway (2004) surmise in their literature review, early empirical scholarship was often unable to present robust empirical evidence in favor of spillover effects yielding wage benefits. For instance, Aitken and Harrison (1999), Girma, Greenaway, and Wakelin (2001), and Martins (2005) all find little support for the premise that positive spillovers to wages exist. Positive wage spillovers require a knowledge transfer to outsider firms that leads to enhanced labor productivity and then the enhanced labor productivity must translate into higher wages; hence, the presence of intermediary steps might make it difficult for knowledge spillovers to ultimately generate wage increases in domestic-outsider firms. However, researchers (e.g., Aitken et al., 1996) found that positive wage spillovers were more likely in developed nations where firms have the requisite "absorptive capacity" (Cantwell, 1993). And a number of recent studies have combined premise and employee-level data in order to support the existence of positive spillovers to employee wages in transition nations (e.g., Smarzynska-Javorcik, 2004), developing nations (e.g., Görg & Strobl, 2005; Poole, 2013), and developed nations (e.g., Andrews et al., 2009; Balsvik, 2011).

In order to fix ideas concerning the mechanisms behind spillover effects, we attempt to clarify here how FDI might lead to the diffusion of knowledge and technology to domestic-outsider firms. The most obvious beneficiary of FDI is the domestic-insider firm – the firm involved in the merger as either an acquirer or target – as its productivity (and wage structure) is potentially enhanced toward the

level of the foreign merging firm (e.g., Andrews et al., 2009; Braun, 2008). Girma et al. (2001) refer to this as a composition effect – a necessary step if positive spillovers are to occur. Yet outsider effects involving the ability of FDI to enhance domestic-outsider firms' productivity represent the heart of the spillovers literature; hence, our theoretical and empirical analysis will focus on these outsider effects. Accordingly, we outline here the four different spillover channels – as identified by Görg and Greenaway (2004) and Görg and Strobl (2005) – via which knowledge may spread to domestic-outsider firms. First, a demonstration channel exists, as firms learn by imitating MNEs. Second, a competition channel exists, as firms upgrade in order to compete successfully with the MNE. Third, a labor-market channel exists, as firms co-opt some MNE employees in order to secure know-how from job-movers. Fourth, a vertical channel exists, as MNEs promote improved performance in upstream suppliers and enhanced contacts with downstream foreign buyers – vertical efficiencies which can also be tapped into by domestic-outsider firms. The presence of these different channels allows for an externality-based spillover effect, as domestic-outsider firms potentially gain productivity (and consequently increase wages) due to inward and outward FDI.

Driffield (1996), Gaston and Nelson (2002), and Conyon et al. (2002) appear to represent the only scholarship that acknowledges the presence of both effects (bargaining and spillovers) when considering how cross-border mergers influence wages. Yet Gaston and Nelson (2002) simply review the microeconomics-based approaches to the issue of FDI and labor markets. Furthermore, Conyon et al. (2002) note that an MNE's ability to bargain better with labor represents an indirect effect of foreign-acquisition activity, but go on to concentrate on what they term to be the direct effect: higher productivity and wages (i.e., positive spillovers). While not nested within the bargaining and spillover effects literatures, Harrison and McMillan (2011) present empirical results that suggest the relationship between foreign and domestic employment can be both substitutive (à la Muendler & Becker, 2010) and complementary (à la Desai, Foley, & Hines, 2009). We would like to pick up from these studies that acknowledge the presence of competing effects, and approach the issue of cross-border M&A activity and domestic-outsider firm wages from an integrative perspective. We take the view that both research traditions capture an element of reality, and that the next step in scholarship is to identify – akin to Harrison and McMillan (2011) – the conditions explaining when inward and outward cross-border merger activity have a positive or a negative impact on domestic-firm wages. We turn now to our theoretical model which attempts to integrate both "spillover" and "bargaining" effects.

THEORETICAL MODEL

Our basic model considers an industry with four firms: where Firms 1 and 2 are domestic firms located in Country A, and Firms 3 and 4 are foreign firms located in Country B. All four firms compete in one downstream market and set quantities simultaneously; thus, Cournot competition is applicable here. We allow for product differentiation; that is, a varying degree of relatedness for the products of different firms. The inverse linear demand function for product i is as follows:

$$p_i = a - q_i - b \sum_j q_j, \quad where\ i, j = 1, \dots, 4, i \neq j \quad (1)$$

where q_i is the quantity sold of product i and $0 \leqslant b \leqslant 1$ is a measure of product differentiation. If products are identical (i.e., perfect substitutes) then $b = 1$; however, if products are simply unrelated (i.e., very poor substitutes) then $b = 0$.[2]

We assume a simple technology at the outset with one unit of labor needed to produce one unit of output; that is, $q_i = n_i$, where n_i is the labor employed in the production for firm i. For each labor unit, there exists both a wage and non-wage cost. We have w_i denote the wage per unit of employment for firm i (where $i = 1, \dots, 4$) and c denotes the non-wage cost per employee for all firms. To ensure a positive supply, we assume that $a > w_i + c$; that is, the demand intercept is greater than the sum of both the wage and non-wage costs. Workers in both Country A and B are unionized, and the union in each country is industry-wide in scope. Each union maximizes total rent for union members, though the union sets firm-specific wages for the different firms in their country. We also normalize the outside option for the workers to zero. Reflecting a concern for both wages and employment for union members, the utility function for the union in Country A (the domestic country) is then:

$$\underset{w_1, w_2}{Max}\ U_A = w_1 \cdot n_1 + w_2 \cdot n_2, \quad (2)$$

and the union in Country B (the foreign country) has a corresponding utility function. Furthermore, the profit function for firm i is:

$$\pi_i = (p_i - w_i - c)n_i, \quad where\ i = 1, \dots, 4. \quad (3)$$

We have a two-stage game where the unions set wages in Stage 1 and firms set quantities in Stage 2.

Although the union has the option to set different wages for different firms in Country A, we have pre-merger symmetry in order to present a clear benchmark in which to make comparisons. Accordingly, the pre-merger wages for both domestic firms (the insider and the outsider to the merger) are identical, and can be represented as follows:

$$w_i = \frac{(a-c)(2-b)}{4} \equiv w_0 \qquad (4)$$

with subscript *0 (I)* denoting the market structure without (with) cross-border merger activity.

We will consider the implications of cross-border merger activity on domestic-firm wages by contrasting the benchmark-situation without merger activity with the situation where cross-border merger activity takes place. In particular, we consider the implications of Firm 1 merging with Firm 4 (where no directionality is implied regarding the acquirer and target roles) in order to become an MNE.[3] Since our empirical analysis focuses on the impact of inward and outward cross-border merger activity (via both bargaining and spillover effects) on domestic-outsider firms as opposed to the domestic-insider within the merging firms, we focus here on how cross-border M&As affect the wages of domestic-outsider firms in the focal domestic industry. Accordingly, we concentrate below on externality-based spillover effects (which are outsider effects) and not on composition-based spillover effects (which are insider effects).

Spillover Effects
The premise behind spillover effects is that the least efficient of the merging firms experiences an upgrade in productivity: a composition-based spillover effect for one of the insider firms.[4] Moreover, some of this productivity gain diffuses to outsider firms (the externality-based spillover effect). It is natural to hold that externality-based spillovers are restricted to firms in the country where the composition-based spillover is present. For example, the labor-market channel is a primary channel for the diffusion of knowledge and technology to other firms; however, as Buckley and Ghauri (2004) point out, labor markets are national in scope. Thus the diffusion of knowledge from an insider to an outsider is substantially restricted due to the lack of a cross-national labor-market channel.

Given that inward and outward cross-border mergers upgrade the productivity of the least efficient merging firm, it is natural to model this productivity gain as increased productivity for each unit of labor.

Akin to Lommerud et al. (2006), we do so by assuming that a cross-border merger can lead to savings in non-wage costs. We denote these cost savings as spillovers; thus, μ_i represents the post-merger spillover to firm i. Firm i is either the domestic-insider firm $(i=1)$, the domestic-outsider firm $(i=2)$, the foreign-outsider firm $(i=3)$, or the foreign-insider firm $(i=4)$. Accordingly, $\mu_i=0$ implies a lack of positive spillover effects from the cross-border merger (tantamount to the pre-merger situation), while $0<\mu_i\leqslant 1$ represents the existence of some post-merger spillovers. We then have the following cost function for firm i:

$$C_i = w_i + c(1 - \mu_i) \qquad (5)$$

To consider the impact of spillover effects on the wages of domestic-outsider firms, we solve for the post-merger equilibrium wage for the different firms under a scenario with a cross-border M&A (which can be either inward or outward in nature) and potential spillovers to all firms. Since our empirics focus on domestic-outsider firms, we are concerned about how a spillover to that domestic-outsider will affect its wage. It can be shown that increased spillovers to the domestic-outsider have a positive effect on its post-merger wage (w_I):

$$\frac{\partial w_I}{\partial \mu_2} > 0 \qquad (6)$$

The appendix provides more details regarding the positive relationship between spillovers to domestic-outsider firms and the post-merger wage in these domestic-outsider firms; however, in essence, spillover effects allow domestic-outsider firms to become more productive, and the domestic union will, in turn, exploit this increased productivity by setting higher wages for employees in the outsider firm.

However, if the foreign-insider firm is the least-efficient of the merging firms, then the productivity of the foreign firms will increase post-merger (a composition-based spillover captured by $\mu_3>0$, and an externality-based spillover captured by $\mu_4>0$). In that case, there are no productivity gains for the domestic-insider firm ($\mu_1=0$), and therefore no spillovers to the non-merging domestic-outsider firm ($\mu_2=0$). Notice how the key criteria concerning the presence of spillover effects to domestic-outsider firms is whether the domestic-insider firm's productivity is upgraded via the cross-border merger; that is, the presence of the necessary composition-based spillover effect. The directionality of the merger – whether it is inward (where the foreign firm is the acquirer) or outward (where the domestic firm is the

acquirer) – is not material; instead, the relative productivity of the domestic-insider firm with respect to the foreign-insider firm determines the presence of spillovers.

In sum, solving for the post-merger equilibrium wage for the domestic-outsider firm under a scenario with a cross-border merger (either inward or outward) indicates that an increase in spillovers to the domestic-outsider firm yields a positive effect on a domestic-outsider's wage. The larger the spillover to domestic-outsider firms, the greater will be the post-merger wage in these domestic-outsider firms, as spillover effects allow domestic-outsider firms to become more productive which leads to higher wages. Accordingly, our first main result can be set out as follows:

> **Proposition 1:** Increased levels of inward and outward cross-border merger activity can generate wage increases in domestic-outsider firms via positive spillover effects.

Bargaining Effects

After completing a cross-border merger, the merged firms (an MNE) can maximize profits for the establishments in both countries; thus, the MNE jointly sets quantities in the domestic and foreign establishments in order to maximize profits. Since products are substitutes (albeit imperfect), MNEs have the option to reallocate post-merger production; for example, it can produce less in its domestic establishment and partly replace that production with more production in the foreign establishment. Accordingly, if the union in Country A sets a high wage, then the MNE can respond by producing less units in Country A and producing more units in Country B where wage costs are relatively low. This flexibility clearly can lead to downward pressure on employee wages in both the domestic and foreign establishment within the MNE (an insider bargaining effect), as the union realizes that unless wages are reduced, the MNE might move production to its foreign establishment. Moreover, the insider-firm wage reduction will, in turn, lead to changes in the wages for domestic-outsider firms, as both firms participate in the same labor market. The post-merger wage for the domestic-outsider firm, denoted w_2, is then the following:

$$w_2 = \frac{(a-c)(2-b)(4-3b)}{16-12b+b^2} \equiv w_I \qquad (7)$$

In order to derive the effect of cross-border M&A activity on domestic-outsider firm wages, we compare Eq. (7) with Eq. (4). It can be easily seen that the cross-border merger leads to lower wages for domestic-outsider firms (i.e., $w_0 > w_I$). Nevertheless, we should be clear in that the wage reduction for the domestic-outsider firm is less than the wage reduction involved with the merged establishments (e.g., the domestic-insider firm). This downward pressure on firm-level wages stems from increased competition between the unions in the two countries after the cross-border merger. When the union in Country A lowers domestic-insider firm wages, this leads to a shift in labor demand for the domestic-outsider firm – given such a negative shift, the union finds it optimal to also lower wages in the domestic-outsider firm. Essentially, the union gains from shifting some employment from the domestic-insider to the domestic-outsider firm, as the lower domestic-outsider wage is still higher than the domestic-insiders post-merger wage – an effect also present in Lommerud et al. (2006). In addition, the merged firm's domestic establishment and the domestic-outsider firm are under pressure from the foreign establishments due to the potential for a lower foreign wage. Hence the domestic union responds to these pressures by lowering wages in both domestic establishments (the insider and outsider), thereby dampening the loss of employment to foreign establishments.[5]

We now consider how a union's market power may influence these negative bargaining effects following a cross-border merger. For tractability of analysis and in line with our focus on the domestic country, we simplify our base model here by having a union only in Country A and one firm in Country B. Furthermore, θ captures the market power of the domestic union: where a union maximizes total rents for members under complete union market power ($\theta = 1$), and wages are set at the competitive level (i.e., the outside option) under the absence of union market power ($\theta = 0$). To focus on the bargaining effect concerning domestic wages, we rule out post-merger spillover effects (i.e., $\mu_i = 0$); and in order to allow a direct comparison between pre-merger and post-merger average wages, we have the union set one domestic wage ($w_1 = w_2 = w$). The union's utility function will then be as follows:

$$\underset{w}{Max}\ U = (w)^\theta (n_i)^{1-\theta}, \quad where\ i = 1, 2 \qquad (8)$$

Solving for equilibrium, the difference between the domestic wage before (w_0) and after the cross-border

merger (w_I) is as follows:

$$w_0 - w_I = \frac{\theta b(a-c)(4-2b+b^2)}{8-4b-b^2} \qquad (9)$$

Hence the domestic wage decreases (w_0–$w_I > 0$) after the cross-border merger as long as the domestic union has market power: that is, $\theta > 0$.[6] This confirms our main result above concerning negative bargaining effects, and illustrates that this result carries over to a situation of a domestic-industry wage. Second, we see – per expectation – that an increase in the union's market power (i.e., a higher θ) leads to an even larger spread in domestic wages when comparing the pre-merger with the post-merger scenarios. For instance, the competitive wage manifests both before and after the cross-border merger under the absence of union market power, but under strong union market power the potential for downward pressure on domestic wages after the cross-border merger is quite large. From our analysis, we can therefore conclude that the downward pressure on domestic-outsider firm wages following cross-border merger activity is increasing with the union's market power. Accordingly, our second main result can be set out as follows:

Proposition 2: The stronger the market power of unions, the more likely it is that inward and outward cross-border merger activity generate wage reductions in domestic-outsider firms via enhanced negative bargaining effects.

Merger Relatedness

We can also consider how the relatedness of merging firms' products (i.e., product differentiation) might affect the domestic wage change following a cross-border merger. From Eq. (9), we see that the cross-border M&A will have (almost) no effect on domestic wages when b approaches 0; that is, the products of merging firms are largely unrelated and very poor substitutes. This implies that the more related the products of the merging firms, the larger the wage reduction following a cross-border M&A (the appendix provides formal derivation). Put differently, related products (i.e., a large b) involve greater substitutability, hence there exists greater scope for a reallocation of production between the two establishments (domestic and foreign) of the merged firm. In this vein, Harrison and McMillan (2011: 870) observe that "for firms most likely to perform the same tasks in foreign affiliates and at home, foreign and domestic employees are substitutes". A union will anticipate this response by the merged entity

and set lower wages after the cross-border M&A in order to dampen the employment loss by members. In essence, both inward and outward cross-border M&As lead to lower wages – both for insider and outsider domestic firms – via the bargaining effect; and this negative bargaining effect is more pronounced when inward and outward cross-border M&A activity are best characterized as related in nature.[7] Accordingly, our third main result can be set out as follows:

Proposition 3: The more inward and outward cross-border merger activity can be characterized as related, the more likely it is that wage reductions for domestic-outsider firms will result via enhanced negative bargaining effects.

ESTIMATION STRATEGY

In order to apply our theoretical model and test our three propositions concerning cross-border merger activity and domestic-firm wages, we must formulate an estimation strategy. While domestic-outsider firm wages represent our focal construct of interest (i.e., our dependent variable), we face some challenges in capturing the relevant independent constructs. In particular, the identification of spillover effects and bargaining effects represents the key estimation challenge.

We draw from previous empirical work (e.g., Figlio & Blonigen, 2000; Conyon et al., 2002; Poole, 2013) that considers spillovers to be captured by the differential impact of cross-border activity with respect to domestic activity at the sector level in order to identify spillover effects. Accordingly, we first control for the sum of all merger activity – both domestic and cross-border – with respect to the number of employees in an industrial sector (hereafter, Total-Merger-Activity) to capture the general wage effects (due to demand and product competition changes as well as any other relevant labor market changes) involved with generic merger activity. Then we introduce the share of sectoral merger activity that is inward and the share that is outward in order to capture any additional benefits to wages due to merger activity being characterized as cross-border in nature (hereafter, Inward-Share and Outward-Share, respectively). Accordingly, we exploit the differential effect of merger tendencies within an industry, in particular the differential effect of engaging in cross-border merger activity as opposed to overall merger activity. As Poole (2013) argues, a larger share of cross-border activity increases the number of possible interactions between domestic

and foreign firms, and thereby creates greater potential for knowledge transfer. In sum, if positive spillovers exist due to inward and outward cross-border merger activity, then the coefficient estimate for inward-share and outward-share will be greater than 0; that is, cross-border merger activities will involve an additional wage premium beyond any generic positive effects due to total merger activity.[8]

In order to identify bargaining effects, we must first capture the degree of unionization in an industrial sector (hereafter, Unionization), as a great deal of empirical work (e.g., Ashenfelter & Johnson, 1972; Lawrence & Lawrence, 1985) finds sector unionization to enhance wages. After controlling for the direct effect of unionization on firm-level wages, the interactions of unionization with inward-share and with outward-share broadly capture the respective bargaining effects involved with inward and outward cross-border M&A activity. Recall from Proposition 2 that bargaining effects involve cross-border mergers undercutting the ability of unions to set higher than competitive wages; thus, increased levels of cross-border activity make it difficult for unions to deliver high wages to their members. With the above in mind, we use OLS to estimate the following reduced-form wage equation in order to test for Propositions 1 and 2:

$$
\begin{aligned}
\text{Wages}_{i,t} = {} & b_0 + b_1(\text{Inward}-\text{Share})_{i,t} \\
& + b_2(\text{Outward}-\text{Share})_{i,t} \\
& + b_3(\text{Inward}-\text{Share*Unionization})_{i,t} \\
& + b_4(\text{Outward}-\text{Share*Unionization})_{i,t} \\
& + b_5(\text{Total}-\text{Merger}-\text{Activity})_{i,t} \\
& + b_6(\text{Unionization})_{i,t} \\
& + \beta(\text{X})_{i,t} + \alpha_i + \varepsilon_{it} \qquad (10)
\end{aligned}
$$

where i indexes firms, t indexes time, $X_{i,t}$ is a vector of firm-level control variables, α_i captures firm-level fixed effects, and ε_{it} is an error term that is clustered at the industry level. In line with Proposition 1, we expect larger degrees of inward cross-border merger activity (b_1) and larger degrees of outward cross-border merger activity (b_2) to lead to higher wages for domestic-outsider firms (the presence of positive spillover effects for both types of cross-border M&As). In line with Proposition 2, we expect higher combined levels of inward cross-border merger activity and unionization (b_3) to lead to lower wages for domestic-outsider firms (a negative bargaining effect for inward cross-border merger activity); and higher combined levels of outward cross-border merger activity and unionization (b_4) to lead to lower wages

for domestic-outsider firms (a negative bargaining effect for outward cross-border merger activity).

We also hypothesize that related cross-border M&As are particularly effective at limiting union wage-setting. Since horizontal cross-border M&As involve more relatedness than non-horizontal cross-border M&As (Harrison & McMillan, 2011), we interact the share of all merger activity in a sector which is both horizontal and inward with the unionization variable in order to elicit whether an incremental negative bargaining effect exists for inward activity of a horizontal nature. Similarly, we interact the share of all merger activity in a sector which is both horizontal and outward with the unionization variable in order to elicit whether an incremental negative bargaining effect exists for outward activity of a horizontal nature. Higher levels of horizontal cross-border activity should make it even more difficult for unions to deliver high wages to their members. Accordingly, the respective interactions of unionization with horizontal-outward-share and horizontal-inward-share broadly capture the potential for incremental negative bargaining effects when inward and outward activities are best characterized as horizontal. With the above in mind, we use OLS to estimate the following reduced-form wage equation in order to test for Proposition 3:

$$
\begin{aligned}
\text{Wages}_{i,t} = {} & b_0 + b_1(\text{Inward}-\text{Share})_{i,t} \\
& + b_2(\text{Outward}-\text{Share})_{i,t} \\
& + b_3(\text{Inward}-\text{Share*Unionization})_{i,t} \\
& + b_4(\text{Outward}-\text{Share*Unionization})_{i,t} \\
& + b_5(\text{Horiz}-\text{Inward}-\text{Share*Unionization})_{i,t} \\
& + b_6(\text{Horiz}-\text{Outward}-\text{Share*Unionization})_{i,t} \\
& + b_7(\text{Total}-\text{Merger}-\text{Activity})_{i,t} \\
& + b_8(\text{Unionization})_{i,t} + \beta(\text{X})_{i,t} + \alpha_i + \varepsilon_{it} \qquad (11)
\end{aligned}
$$

The empirical expectations here – in addition to the common constructs from Eq. (10) – are that both inward and outward cross-border merger activities of a horizontal nature involve additional wage-dampening effects. Specifically, higher combined levels of horizontal-inward cross-border merger activity and unionization (b_5) would lead to lower wages for domestic-outsider firms; and higher combined levels of horizontal-outward cross-border merger activity and unionization (b_6) would lead to lower wages for domestic-outsider firms. In other words, wage reductions for domestic-outsider firms emanating from cross-border merger activities will be particularly robust when those activities involve a higher degree

of substitutability between domestic and foreign production.

For both Eqs. (10) and (11), we draw from pre-existing empirical literature on what drives average wage rates – see Dickens and Katz (1987) for a review – in formulating the array of additional control constructs ($X_{i,t}$) beyond the requisite Total-Merger-Activity and Unionization variables. We expect that the levels of profitability and productivity per employee within a firm will positively affect the wages paid to employees; that is, wages reflect the marginal product of labor. Second, we expect that the total debt of a firm negatively affects wages; that is, employees in highly indebted firms are likely to receive lower wages. In terms of a firm's total assets per employee, some literature has found a positive correlation between capital intensity and average wages, but others note that a firm-level coefficient estimate may capture substitution effects between capital and labor (Lawrence & Lawrence, 1985). Accordingly, we have no clear-cut expectation with respect to the sign of total assets per employee. We also include the yearly changes in profitability and productivity in the regression equation: a positive and significant coefficient estimate for these variables would indicate that changes in firm profitability and productivity (in addition to the levels noted above) directly impact firm wages. Lastly, we control for the number of cross-border mergers undertaken by the focal firm at that point in time during the 1989–2001 period in order to capture any insider effects concerning wages for focal firms that have actually engaged in cross-border merger activity. The inclusion of this control variable further enhances our ability to interpret – that is, in addition to the nature of the data set-up – our identified spillover and bargaining effects as being outsider effects.

In sum, we include measures of the above firm-level control concepts in order to make better causal inferences with respect to our explanatory variables of principal interest. We also take advantage of the data's panel structure by controlling for firm-level fixed effects, which – following best methodological practice in the spillovers literature (e.g., Liu et al., 2000; Feinberg & Majumdar, 2001) – yield coefficient estimates that are strictly driven by within-firm variation. In addition, we cluster the standard errors at the industry level in order to account for dependence of observations within industries, and employ mean-centered independent variables in order to alleviate potential multicollinearity concerns which might arise due to the interaction terms. Lastly, we

will estimate both Eqs. (10) and (11) over three different samples in order to ensure that outliers do not drive findings. First, we use our full sample of available data to estimate both equations. Second, we control for outliers by removing observations from the top and bottom one percentiles for the firm-level wage and industry-level merger activity variables. Third, we use the interquartile ranges (IQR) for the distributions of the wage and merger activity variables in order to exclude potential outliers.

DATA

Our information on annual average wages for US-based firms derives from Thomson Reuter's Worldscope database. We retain all firms that (i) operate in an industry we have unionization data on (see below), and (ii) report some yearly data on wages in the sample period. In addition to firm-level wages, Worldscope also yields data on firm-level sales, profits, debt, assets, and employees. We thus construct unbalanced firm-level panels of US public firms where we can control for a number of firm-specific factors which will affect domestic-firm wages (i.e., our dependent variable of interest). While employing Thomson's data on publicly traded firms means that private firms are excluded from our sample, unreported empirical tests based on industry-level wages (where both private and public firms are included) provide similar empirical results.

Our information on merger activity in a sector derives from Thomson's "Worldwide Mergers & Acquisitions" series – an exhaustive data collection that uses a variety of sources including financial newspapers, Reuters Textline, *The Wall Street Journal*, Dow Jones, and others. The database covers the universe of corporate transactions (public and private) that represent a value transfer of at least US\$1 million. We define a merger as a transaction where more than 50% of the equity of a target firm is acquired. The Total-Merger-Activity variable is constructed by taking the sum of domestic and cross-border merger activity in a sector and normalizing that number by total number of employees in the same two-digit sector, while the other merger variables (Inward-Share, Outward-Share, Horizontal-Inward-Share, and Horizontal-Outward-Share) are constructed as a percentage of the sum of all merger activity in a particular sector.

Our information on sector-level unionization stems from the "Union Membership and Coverage Database" which provides private and public sector labor union membership estimates at the two-digit Standard Industry Classification (SIC) industry level.

Table 1 Variable definitions

Industry-level variables	
Total-Merger-Activity	Total number of mergers (i.e., both domestic and cross-border) in a sector divided by thousands employees in that two-digit sector
	Source: Thomson Financial Securities & Bureau of Economic Analysis
Inward-Share	Total number of inward cross-border mergers (non-US acquirer and US target) in a sector divided by the sum of all mergers in a given two-digit sector
	Source: Thomson Financial Securities
Outward-Share	Total number of outward cross-border mergers (US acquirer and non-US target) in a sector divided by the sum of all mergers in a given two-digit sector
	Source: Thomson Financial Securities
Horiz-Inward-Share	Total number of inward cross-border mergers (non-US acquirer and US target) in which the acquirer and target are active in the same four-digit sector divided by the sum of all mergers in a given two-digit sector
	Source: Thomson Financial Securities
Horiz-Outward-Share	Total number of outward cross-border mergers (US acquirer and non-US target) in which the acquirer and target are active in the same four-digit sector divided by the sum of all mergers in a given two-digit sector
	Source: Thomson Financial Securities
Unionization	Share of employees in a given two-digit sector that are actual members of a union
	Source: http://www.unionstats.com/
Firm-level variables	
Wage/Employee	Per capita wages and salaries in $1000 (the regressions use the natural logarithm)
	Source: Thomson Reuters Worldscope
Employees	Total employees of the firm *Source*: Thomson Reuters Worldscope
Profits/Employee	Corporate profits before tax per employee in millions dollars
	Source: Thomson Reuters Worldscope
Productivity	Total sales employee in millions dollars
	Source: Thomson Reuters Worldscope
Assets/Employee	Total assets per employee in millions dollars
	Source: Thomson Reuters Worldscope
Debt/Employee	Long-term debt per employee in millions dollars
	Source: Thomson Reuters Worldscope
Δ Profits/Employee	Yearly percentage change in Profits/Employee
Δ Productivity	Yearly percentage change in Productivity/Employee
Cross-Border-Merger-Count	Number of cross-border mergers engaged in by the focal firm till that point in time
	Source: Thomson Reuters SDC Platinum

Hirsch and Macpherson (2003) compiled these data from a monthly household survey (the Current Population Survey), have updated the data annually, and made it available to researchers. We measure unionization in terms of union membership; that is, the percentage of workers in an industry sector which are actual union members. In order to capture spillover and bargaining effects, the unionization and merger variables are defined annually for 36 two-digit SIC industries.[9] Table 1 presents exact definitions – and data sources – for all of the variables employed in our regression estimations.

After matching and compiling the above sources of data, we have unbalanced panel data consisting of 9491 firm-year observations for the 1989–2001 period for some 1864 individual US-based firms active

in 36 different two-digit SIC industries.[10] Table 2 presents summary statistics for the different variables employed in the regressions. Table 3 reports the pair-wise correlation coefficients for all of the employed variables.

EMPIRICAL RESULTS
Table 4 reports the empirical results for our regression specifications – where the first three estimations reflect Eq. (10) and the second three estimations reflect Eq. (11) – which tests our three formal propositions. We employ an OLS estimation method combined with fixed effects – and clustering of standard errors – in order to yield within-estimators for all of our estimations. Estimations (1) and (4) represent the respective full-sample base estimations

Table 2 Summary statistics: Means for variables

Year	Total-Merger-Activity	Inward-Share	Outward-Share	Horizontal-Inward-Share	Horizontal-Outward-Share	Unionization	Wage/Employee	Employees	Profits/Employee	Productivity	Assets/Employee	Debt/Employee	Δ Profits/Employee	Δ Productivity	Cross-Border-Merger-Count
1989	0.080	0.177	0.070	0.018	0.010	0.190	29.12	6552	0.010	0.209	1.564	0.113	−0.004	0.025	0.020
1990	0.076	0.177	0.064	0.016	0.006	0.189	30.16	6462	0.002	0.214	1.591	0.105	−0.009	0.005	0.026
1991	0.081	0.120	0.080	0.015	0.006	0.186	34.34	5326	0.006	0.221	1.812	0.078	0.003	−0.002	0.036
1992	0.087	0.093	0.098	0.011	0.011	0.188	36.11	5283	0.017	0.205	1.823	0.106	0.011	−0.016	0.045
1993	0.103	0.093	0.106	0.010	0.011	0.184	34.46	4160	0.006	0.183	1.839	0.129	−0.001	−0.017	0.059
1994	0.118	0.112	0.104	0.008	0.011	0.179	36.86	3914	0.022	0.190	1.938	0.132	0.019	0.005	0.074
1995	0.144	0.113	0.114	0.008	0.009	0.168	38.43	3666	0.018	0.214	2.123	0.137	−0.005	0.026	0.090
1996	0.140	0.087	0.112	0.008	0.010	0.168	40.99	3479	0.049	0.232	2.295	0.147	0.037	0.019	0.107
1997	0.146	0.107	0.112	0.010	0.012	0.164	39.95	3441	0.017	0.226	2.279	0.184	−0.032	−0.001	0.134
1998	0.157	0.093	0.125	0.010	0.012	0.153	42.52	3396	0.009	0.236	2.299	0.222	−0.002	0.019	0.164
1999	0.132	0.139	0.112	0.015	0.011	0.159	46.36	3403	0.246	0.235	2.426	0.230	0.269	0.006	0.189
2000	0.114	0.177	0.152	0.015	0.012	0.150	49.53	3230	−0.046	0.285	2.857	0.290	−0.052	0.041	0.224
2001	0.108	0.186	0.138	0.019	0.014	0.148	49.98	3483	−0.094	0.288	2.836	0.340	−0.051	0.011	0.247
Total	0.110	0.131	0.104	0.013	0.010	0.173	38.34	4453	0.020	0.223	2.087	0.167	0.013	0.006	0.102

Note: This table presents summary statistics on 36 two-digit industries and 1864 firms. For variable definitions see Table 1.

for Eqs. (10) and (11). Estimations (2) and (5) reflect the above properties, but drop the top and bottom one percentile for the firm-wage and merger-activity variables. Estimations (3) and (6) are, respectively, identical to the above with the exception of using the IQRs for the firm-wages and merger-activity variables in order to drop potential outliers. As a whole, the empirical results appear to be consistent, striking, and robust. All six estimations appear to indicate a well-specified model, as they yield total R^2s (including firm fixed effects) between 0.78 and 0.93 and within R^2s (excluding firm fixed effects) between 0.34 and 0.40. Furthermore, the coefficient estimates appear to be relatively consistent in terms of size and significance across the six estimations. In light of the relative consistency of the results, we take a variable by variable approach in reviewing the control constructs before discussing the results with the three formal propositions in mind.

First, the array of control variables derived from the literature concerning the drivers of employee wages seem to generally conform to prior empirical work. Labor productivity appears to be the most important determinant of firm-level wages, as it yields a large and significant coefficient estimate in all six estimations. Taking the coefficient estimate for employee productivity in Column (1) suggests that – evaluated at the sample mean – a 1% increase in labor productivity leads to a 0.4% increase in firm-level wages. Conversely, the coefficient estimates for profit per employee change significantly across the estimations although they are positive, per expectation, in four estimations and significant in two of those estimations. Furthermore, the change in firm-level profitability and productivity both yield positive and mostly significant coefficient estimates, thus suggesting that changes in profitability and productivity are, to a degree, passed on to employees in the form of higher wages. The coefficient estimates for firm debt per employee are negative and significant in estimations (2) and (5), but otherwise insignificant. The coefficient estimates for firm assets per employee are negative in all six estimations and significant in four of those estimations, thus indicating a substitution effect between capital and labor. It should be noted, however, that the impact of both debt and assets on firm-level wages are quite small economically. Further, the cross-border merger count variable yields positive and significant coefficients in all six estimations, thus domestic-outsider firms with extensive cross-border experiences tend to have higher wages. In addition, Total-Merger-Activity involves a positive and significant effect on

Table 3 Pair-wise correlation coefficients for variables

	Wage/ Employee	Total-Merger- Activity	Inward- Share	Inward-Share * Unionization	Horiz-Inward-Share * Unionization	Outward- Share	Outward-Share * Unionization	Horiz-Outward-Share * Unionization
Wage/Employee	1							
Total-Merger-Activity	0.13	1						
Inward-Share	−0.33	−0.24	1					
Inward-Share * Unionization	−0.24	−0.06	0.79	1				
Horizontal-Inward-Share * Unionization	−0.16	−0.01	0.67	0.85	1			
Outward-Share	−0.21	−0.17	0.47	0.34	0.28	1		
Outward-Share * Unionization	−0.27	0.02	0.44	0.59	0.47	0.68	1	
Horizontal-Outward-Share*Unionization	−0.25	0.11	0.40	0.55	0.50	0.60	0.89	1
Unionization	−0.22	−0.24	0.46	0.69	0.53	0.38	0.71	0.63
Profits/Employee	0.06	0.00	−0.02	−0.01	0.00	0.00	−0.01	−0.01
Productivity	0.19	0.02	−0.02	−0.02	−0.02	0.03	0.00	0.01
Assets/Employee	0.21	0.09	−0.10	−0.09	−0.07	−0.08	−0.09	−0.08
Debt/Employee	0.14	0.00	−0.02	−0.03	−0.02	0.04	−0.02	−0.02
Δ Productivity	0.09	0.00	0.01	0.00	0.00	0.02	0.01	0.01
Δ Profits/Employee	0.06	0.00	−0.01	0.00	0.00	0.01	0.00	0.00
Cross-Border-Merger-Count	−0.22	−0.06	0.18	0.15	0.12	0.23	0.18	0.15

	Unionization	Profits/ Employee	Productivity	Assets/ Employee	Debt/ Employee	Δ Productivity	Δ Profits/ Employee	Cross-Border-Merger- Count
Wage/Employee								
Total-Merger-Activity								
Inward-Share								
Inward-Share * Unionization								
Horizontal-Inward-Share * Unionization								
Outward-Share								
Outward-Share * Unionization								
Horizontal-Outward-Share * Unionization								
Unionization	1							
Profits/Employee	−0.01	1						
Productivity	−0.01	0.18	1					
Assets/Employee	−0.12	0.05	0.85	1				
Debt/Employee	−0.04	0.02	0.79	0.77	1			
Δ Productivity	0.01	0.36	0.40	0.25	0.11	1		
Δ Profits/Employee	0.00	0.99	0.21	0.05	0.00	0.39	1	
Cross-Border-Merger-Count	0.14	0.01	0.00	−0.06	−0.02	0.00	0.01	1

Table 4 The effects of cross-border mergers on firm wages

Independent variables	(1)	(2)	(3)	(4)	(5)	(6)
Inward-Share	1.452**	1.271**	1.058***	1.425**	1.258**	1.076***
	(0.255)	(0.214)	(0.143)	(0.270)	(0.236)	(0.146)
Outward-Share	3.251**	3.237***	3.307**	3.296**	3.295***	3.338***
	(0.590)	(0.501)	(0.586)	(0.554)	(0.451)	(0.553)
Inward-Share * Unionization	−3.082**	−1.765*	−3.584***	−1.937	−1.462	−4.467**
	(0.617)	(0.652)	(0.469)	(1.123)	(1.272)	(0.912)
Outward-Share * Unionization	−9.539**	−9.366***	−10.09**	−9.941***	−9.832***	−9.924***
	(1.773)	(1.416)	(1.709)	(1.524)	(1.066)	(1.365)
Horiz-Inward-Share * Unionization				−1.809†	−2.415	−0.596
				(0.864)	(1.346)	(1.090)
Horiz-Outward-Share * Unionization				−2.616**	−2.834*	−2.709**
				(0.655)	(0.804)	(0.476)
Total-Merger-Activity	0.785***	0.713***	0.674***	0.787***	0.715***	0.676***
	(0.0636)	(0.0593)	(0.0615)	(0.0612)	(0.0565)	(0.0584)
Unionization	0.777†	1.051*	0.251	0.696	1.125*	0.328
	(0.342)	(0.307)	(1.031)	(0.379)	(0.361)	(1.043)
Profits/Employee	−0.379***	0.0207*	0.168	−0.379***	0.0202†	0.169
	(0.0581)	(0.00791)	(0.225)	(0.0579)	(0.00979)	(0.222)
Productivity	1.726***	1.496***	1.094***	1.726***	1.494***	1.094***
	(0.158)	(0.132)	(0.129)	(0.157)	(0.133)	(0.129)
Debt/Employee	−0.0104	−0.0295†	0.000962	−0.0105	−0.0296†	0.000865
	(0.0412)	(0.0128)	(0.0138)	(0.0411)	(0.0127)	(0.0136)
Assets/Employee	−0.0694***	−0.0258*	−0.0171	−0.0694***	−0.0258*	−0.0172
	(0.00830)	(0.00808)	(0.00950)	(0.00826)	(0.00807)	(0.00939)
Δ Profits/Employee	0.0219	0.0887*	0.0971	0.0218	0.0888**	0.0969
	(0.0813)	(0.0250)	(0.0952)	(0.0814)	(0.0247)	(0.0943)
Δ Productivity	0.0787†	0.0874*	0.0483**	0.0783†	0.0875*	0.0483**
	(0.0355)	(0.0245)	(0.0126)	(0.0353)	(0.0244)	(0.0126)
Cross-Border-Merger-Count	0.0865***	0.0806***	0.0774*	0.0868***	0.0784***	0.0767*
	(0.0122)	(0.0107)	(0.0242)	(0.0121)	(0.0111)	(0.0248)
Constant	3.360***	3.316***	3.399***	3.365***	3.323***	3.401***
	(0.0121)	(0.0178)	(0.0404)	(0.0135)	(0.0183)	(0.0396)
Observations	9491	9378	8355	9491	9378	8355
R^2 total	0.925	0.930	0.780	0.925	0.930	0.781
R^2 within	0.342	0.351	0.396	0.343	0.352	0.396

Note: The dependent variable is the natural logarithm of per capita wages at the firm level. All estimations include a full set of firm dummies; standard errors are robust and allow for clustering on the industry level. † $p<0.1$, * $p<0.05$, ** $p<0.01$, *** $p<0.001$.

wages, such that higher degrees of merger intensity in a sector generally lead to higher wage rates for domestic firms. Finally, the coefficient estimate for Unionization is positive in all six estimations and significant in three; thus, the empirical results yield partial evidence in support of the prior that higher rates of unionization generally lead to higher wages.

We can now turn to analyzing the empirical results with our first and second propositions in mind (which estimations (1)–(3) directly test). With regard to the first proposition, we find that both inward and outward cross-border merger activities involve wage premiums above and beyond the positive wage

effect due to total merger activity; that is, Inward-Share and Outward-Share both yield positive and significant coefficient estimates in the first three estimations. This also indicates that cross-border M&A activities are superior to domestic M&A activity (since "domestic-share" is the omitted reference construct) in terms of spillovers. Interestingly, the spillover effects from outward cross-border M&As appear to be more robust than the spillovers involved with inward cross-border M&As, as the coefficient estimate for Outward-Share is larger than that of Inward-Share. In line with expectations, positive spillover effects to domestic-outsider firms

are present for both inward and outward cross-border merger activities.

With regard to the second proposition, recall that we proposed that unionization makes it more likely that cross-border M&A activity generates domestic wage reductions, as unionization favors the relative strength of negative bargaining effects. In essence, the contention is that positive spillover effects are relatively less manifest – as compared with negative bargaining effects – at higher rates of union membership. Estimations (1)–(3) indicate the presence of merger-induced bargaining effects for both inward and outward cross-border merger activity, as the coefficient estimates for the two interaction terms (both Inward-Share and Outward-Share with Unionization) are negative and significant in all estimations. In terms of the wage effects to domestic-outsider firms, it appears then that both forms of cross-border merger activity undercut the ability of unions to deliver high wages to their members. Accordingly, our empirical results yield support for Proposition 2.

In order to understand whether our empirical results "economically" support the first two contentions, it helps to move beyond a discussion of the significance of our individual coefficients and instead analyze the net effect of cross-border merger activity on domestic-outsider firm wages. Given the respective coefficients in estimation (1), we can calculate a critical level of unionization such that the net effect of increased cross-border merger activity with respect to wages is zero. Specifically, a relatively high unionization rate of 47% would be necessary for negative bargaining effects to actually dominate positive spillover effects when it comes to inward cross-border M&A activity. In light of a maximum unionization level of 41% in our sample, this means that inward cross-border mergers always exert a net positive influence on domestic-outsider firm wages; that is, positive spillover effects always dominate negative bargaining effects when it comes to inward merger activity. Outward cross-border merger activity, however, involves more substantial negative bargaining effects. The strength of these bargaining effects is indicated by the fact that a relatively low unionization rate of 34% would be sufficient for the net effect of outward cross-border merger activity on firm-level wages to be negative. Five out of the 36 industries contained in our sample exhibit a degree of unionization higher than 34% in at least one year; hence, these industries indicate years where the average effect of outward cross-border merger activity on domestic-outsider firm wages was actually negative.

The above said, positive spillover effects can be substantially attenuated by negative bargaining effects even in moderately unionized industries. For instance, a 1% increase in inward (outward) cross-border M&A activity would generate a 1.5% (3.3%) increase in domestic-outsider firm wages at unionization rates of 0%, yet at unionization rates of 10%, a 1% increase in inward (outward) cross-border M&A activity would generate wage increases of only 1.1% (2.3%). Thus in line with Proposition 2, the net effect of cross-border merger activity on domestic-outsider firm wages becomes increasingly negative under higher degrees of unionization, and this mitigation of positive spillover effects does not require absolutely high levels of unionization.

We now turn to analyzing the empirical results while mindful of our third proposition: cross-border merger activity of a horizontal nature entails – due to the enhanced substitutability of production between domestic and foreign establishments – an incremental negative bargaining effect that will further reduce the wages of domestic-outsider firms. Estimations (4)–(6) allow for both inward and outward horizontal cross-border M&A activity to manifest separate incremental bargaining effects. Accordingly, the two interactions – "Horizontal-Inward-Share * Unionization" and "Horizontal-Outward-Share * Unionization" – capture whether negative bargaining effects are more pronounced for these types of cross-border mergers. In line with our priors, both interaction terms carry negative coefficient estimates in all three estimations; however, only "Horizontal-Outward-Share * Unionization" yields statistically significant coefficient estimates in all three estimations. Accordingly, our empirical results suggest that it is outward cross-border mergers of a horizontal nature which mostly involve incremental negative bargaining effects, as the results concerning incremental negative bargaining effects for inward cross-border mergers are weaker. As an aside, this is in line with the intuition that foreign acquirers face substantial liabilities when attempting to engage in hardline bargaining with domestic labor – liabilities that domestic firms engaging in outward cross-border mergers do not face.[11] Thus outward cross-border merger activities of a horizontal nature – where the relatedness of domestic and foreign establishments will be greater – tend to entail incremental bargaining effects.

While the empirical results for estimations (4)–(6) largely conform to estimations (1)–(3) in terms of common variables, an important exception exists regarding generic bargaining effects. Once we hold constant the incremental bargaining effects involved

with horizontal cross-border merger activity ("Horizontal-Inward-Share * Unionization" and "Horizontal-Outward-Share * Unionization"), the interaction terms of "Inward-Share * Unionization" and "Outward-Share * Unionization" capture the potential for generic bargaining effects when cross-border M&As are best characterized as non-horizontal. Thus it is interesting to note that the generic bargaining effects involved with inward merger activity become insignificant in estimations (4) and (5). While mindful that the number of interaction terms raises the potential for multicollinearity and the consequent insignificance of coefficients, estimations (4)–(6) appear to indicate that negative bargaining effects principally pertain to outward cross-border merger activity. In other words, both non-horizontal and horizontal-outward cross-border merger activity appear to involve robust negative bargaining effects, while the negative bargaining effects pertaining to inward cross-border merger activity (both horizontal and non-horizontal) are far less robust in these estimations.

The empirical results concerning incremental negative bargaining effects merit further consideration and analysis. In particular, the coefficient estimate of negative 1.81 for "Horizontal-Inward-Share * Unionization" in estimation (4) suggests that shifting 1% of inward cross-border merger activity from non-horizontal to horizontal (while keeping Total-Merger-Activity and Unionization constant) would decrease wages in domestic-outsider firms by some 1.81%. In addition, the coefficient estimate for "Horizontal-Outward-Share * Unionization" in estimation (4) suggests that shifting 1% of outward cross-border mergers to horizontal activity would decrease wages in domestic-outsider firms by some 2.62%. Thus we do find support for the prior that both inward and, in particular, outward cross-border M&A activity of a horizontal nature (i.e., related activity) tend to involve an enhanced negative bargaining effect that further reduces domestic-outsider firm wages.

In sum, our empirical results generally support our theoretical propositions. First, the coefficient estimates for the Inward-Share and Outward-Share variables are positive and significant; hence, both forms of cross-border merger activity appear to involve positive spillover effects with respect to domestic-outsider firm wages. Second, the coefficient estimates for the respective interactions of Inward-Share and Outward-Share with Unionization are negative and significant; hence, both forms of cross-border merger activity appear to involve negative bargaining

effects with respect to domestic-outsider firm wages, as cross-border activity appears to improve the bargaining position of firms *vis-à-vis* unions. Third, the interaction of Horizontal-Inward-Share and Unionization indicates weak empirical support, but the interaction term for Horizontal-Outward-Share with Unionization is both negative and significant in all estimations; hence, there appears to be evidence that incremental negative bargaining effects are particularly involved when outward cross-border M&As are best characterized as related.

CONCLUSION AND DISCUSSION

Motivated by the lack of scholarship integrating the two contending perspectives on how cross-border merger activity affects domestic wages, we consider the presence of positive spillover effects and negative bargaining effects in one conceptual framework. From our theoretical model we are able to derive three testable propositions: (i) inward and outward cross-border M&As involve positive spillover effects that enhance domestic-outsider firm wages; (ii) unionization enhances the likelihood that cross-border merger activity leads to lower domestic-outsider firm wages via negative bargaining effects; (iii) related cross-border merger activity involves enhanced negative bargaining effects which generates lower wages for domestic-outsider firms. We test these theoretical contentions using a comprehensive panel data set composed of measures on M&A activity, unionization, and wages that are based on 1864 US firms in 36 industry sectors during the 1989–2001 period, and find support for our theoretical contentions. First, cross-border M&A activity (both inward and outward) generates positive spillover effects with respect to the wages of domestic-outsider firms. Second, cross-border merger activity (both inward and outward) is more likely to yield a negative impact on domestic-outsider firm wages under higher unionization rates; therefore, cross-border mergers seem to increase the bargaining power of firms *vis-à-vis* unions. Third, cross-border merger activity of a horizontal nature – particularly outward mergers – is likely to involve enhanced negative bargaining effects; therefore, cross-border mergers that are more related seem to involve additional bargaining power for firms *vis-à-vis* unions, thus leading to even lower domestic-outsider firm wages.

While our theoretical and empirical analysis sheds light on how cross-border merger activity affects domestic-outsider firm wages, it also involves some limitations which lead to future research opportunities. While insider and outsider firm effects will move in

consort according to our theory, empirical work that moves beyond a focus on domestic-outsider effects to consider domestic-insider effects will also be of merit. Another interesting future research task would be to consider additional firm heterogeneity beyond insider and outsider status: for example, Cantwell and Mudambi's (2011) distinction between laggards and leaders.[12] Furthermore, cross-border mergers are certainly the prevailing FDI mode (McCann & Mudambi, 2004), yet an obvious future endeavor would be to gather whether cross-border investment via joint-ventures and greenfields would similarly affect domestic wages. In addition to this task, empirical work based on European data would certainly be of merit, as negative bargaining effects are likely to have greater scope in the European context where unionization rates are higher. That said, focusing on the United States does represent a hard case in which to establish validity, as union market power is relatively low in the United States compared with other nations. Lastly, further research on the strategies employed by firms interested in cross-border acquisitions when facing unionization in a sector and in a target is also warranted. While Klier, Ma, and McMillan's (2004) findings suggest that foreign firms are insensitive to the standing of unions in a particular location, acquiring firms might favor non-unionized targets over unionized targets and might engage in long-run strategies to de-unionize an acquired firm.

Our analysis also yields clear normative prescriptions for firms facing relatively high wage costs in their industry environment. Namely, cross-border M&A activity can enhance the bargaining strength of firms *vis-à-vis* labor, as it provides firms with fallback options that give them the upper hand in bargaining with unions over wages and working conditions. Far from being *de novo*, a number of examples suggest that many firms have employed this implicit strategy in their relationships with labor unions. For instance, Braun and Scheffel (2007) report that the President of the employer association for the German metal and electrical industry – Gesamtmetall – indirectly threatened that production would be moved abroad if the unions did not agree to moderate wage increases. In a similar vein, Eckel and Egger (2009) report two different instances where the presence of foreign production helped a firm weather a strike. First, Goodyear Tire and Rubber Co. announced during a major steelworkers strike in North America that it could fall back on the production of foreign subsidiaries to soften the strike's impact. Second, Ford Automobile of Russia imported cars from Germany

in order to make up for losses from a 2007 strike at its St. Petersburg plant. Thus while it is relatively well known that cross-border mergers allow multinational firms to more easily respond to national wage differences by transferring production abroad (e.g., Fabbri, Haskel, & Slaughter, 2003), our analysis highlights an additional benefit to cross-national production flexibility – such flexibility can ultimately lower the relevant wage costs faced by multinational firms.

In terms of normative implications for labor, our analysis leads to some important long-run dynamic implications for workers in a world where negative bargaining effects are present. In particular, unions begin to lose their "reason for being" under high levels of cross-border M&A activity, as they become levers that allow MNEs to play off workers in one nation against another. In other words, unions can be used to reduce wages in domestic firms and sectors. De-unionization might then be an optimal "long-run" response by workers to a situation where an MNE can increasingly use unions to negotiate relatively low wages. Thus the de-unionization dynamic – in line with current trends – will increasingly become the preference of workers due to the presence of negative bargaining effects.

By setting the conditions (i.e., low unionization, inward cross-border M&As, and non-horizontal cross-border M&As) when positive spillover effects are more likely to dominate, we follow through on the call by a number of scholars (e.g., Buckley & Ghauri, 2004; Shimizu et al., 2004) to further investigate the spillover effects phenomenon. For instance, McCann and Mudambi (2004) point out that MNEs are generally viewed as sources of employment and catalysts for local industry revitalization through technology transfer, yet the processes via which cross-border M&As – the largest component of FDI change – generate positive spillovers are not well understood. Current trends toward de-unionization would suggest then that positive wage effects would more likely derive from cross-border merger activity. Accordingly, our efforts here increase understanding of spillover processes and the contexts in which positive spillover effects are most relevant.

Our finding global merger activity to generate wage reductions under certain conditions (i.e., high unionization, outward cross-border M&As, and horizontal cross-border activities) also leads to some implications for the IB literature. For one, Eden and Lenway expressed concern that globalization of economic activity might exhibit "dark-side" effects: for

example, "for those who are not fleet of foot, bringing down the barriers protecting national borders has been a frightening and intimidating experience" (Eden & Lenway, 2001: 388). In line with these ideas, workers in highly unionized industries experiencing horizontal cross-border merger activity and significant outflows of M&A activity face negative wage effects. Thus Buckley and Ghauri's (2004) observation appears to be borne out here in that the lack of global integration in labor markets – in contrast to the integration of goods, service, and financial markets – can yield significant advantages for MNEs *vis-à-vis* labor with the proliferation of cross-border activity.

Finally, our analysis may shed some light on the mixed results found in the empirical literature concerning spillover effects (Buckley et al., 2007). While the spillover effects literature consists of an abundance of empirical work (unlike the bargaining effects literature), much of that work has failed to identify spillover effects. Görg and Greenaway (2004) surmise that the early empirical scholarship, in particular, was often unable to support the premise that positive spillovers to wages exist. According to our results, the failure to fully understand both the impact of bargaining effects and the critical role of unionization may partly explain the inability to elicit consistent evidence in support of positive wage spillovers. In sum, our message here is simple but important: further work on the impact of cross-border merger activity (and foreign direct investment in general) on domestic wages should be mindful that both positive spillover effects and negative bargaining effects are at play, and that the degree of union market power as well as the direction and relatedness of cross-border merger activity are critical in determining which effect dominates.

NOTES

[1]Works formalizing the spillover mechanism include: Wang and Blomström (1992), Fosfuri, Motta, and Rønde (2001), Glass and Saggi (2002), Grünfeld (2006), Lin and Saggi (2007), and Markusen and Trofimenko (2009).

[2]The model is largely influenced by Lommerud et al. (2006), although in contrast to that model we focus on how spillover and bargaining effects impact domestic-outsider firm wages.

[3]Other cross-border combinations of firms exist that lead to similar results. Lommerud et al. (2006) allow for two cross-border M&As and find results consistent with ours, as a second cross-border M&A in the absence of spillovers leads to even greater downward pressures on wages, but they do not model externality-based spillovers.

[4]We treat spillovers – measured by μ – as exogenous, but the externality-based spillover effects process is modeled in Fosfuri et al. (2001) and Glass and Saggi (2002). In particular, they model the interaction in the labor market between the workers and the firm after technology has been transferred via a cross-border merger.

[5]While the mechanism we focus on for negative bargaining effects to domestic-outsider firms is valid, it is not necessarily the only mechanism behind our empirical findings. In particular, a "threat effect" may also be present, as the establishment of production sites in foreign countries by domestic-insider firms may provide enhanced bargaining power for domestic-outsider firms, as they can more credibly threaten to move production abroad after these concrete actions have been taken by industry competitors (Mezetti & Dinopoulos, 1991). Yet we should underscore that such a mechanism resides outside our modeling approach.

[6]This follows straightforward from our assumptions that $a > c$ and $0 < b < 1$.

[7]Such a downward pressure on wages will not be present in a corresponding model with a competitive labor market with a horizontal supply curve (a constant reservation wage). Furthermore, Lommerud et al. (2005) model bargaining effects via a monopoly union setting wages (like we do here) and also via a situation where domestic-industry wages are set through bargaining. Most importantly, they find identical qualitative results when considering the impact of cross-border mergers on wages under both approaches.

[8]Any uncontrolled-for demand effects from cross-border merger activity that reside outside the error term will be captured by the inward-share and outward-share variables, thus reducing the size of the coefficient estimates for these variables meant to capture positive spillover effects.

[9]The average unionization rates for each of our 36 two-digit SIC industries are: Metal Mining 31%; Coal Mining 30%; Oil & Gas Extraction 3%; Food & Kindred Products 20%; Textile Mill Products 5%; Lumber & Wood Products 7%; Furniture & Fixtures 8%; Paper & Allied Products 31%; Printing/Publishing 8%; Chemicals 10%; Petroleum Refining 24%; Rubber Products 16%; Stone, Clay, Glass & Concrete 19%; Primary Metal 32%; Fabricated Metal 15%; Industrial & Commercial Machinery 11%; Electronic & Electrical Equipment 9%; Measuring & Analyzing Instruments 5%; Misc. Manufacturing 7%; Local & Highway Transit 35%; Motor Freight & Warehouse 20%; Water Transport 24%; Air Transport 38%; Pipelines 19%; Transport Services 7%; Communications 23%; Electric Gas & Sanitary Services 31%; Depository Institutions 1%; Non-depository Credit Institutions 1%; Hotels 10%; Personal Services 3%; Business Services 3%; Auto Repair & Parking 3%; Health Services 10%; Educational Services 35%; Social Services 7%. Accordingly, the average unionization rate for the 36 industries ranges from 1 to 38% (and the annual measures range from 0.34 to 41.0%), thus indicating plenty of variation in this measure.

[10]Data do not extend beyond 2001 due to the switch from SIC to North American Industry Classification System classification. An attempt to bridge these industry classifications found the correspondence tables to be quite imperfect at this level of analysis.

[11]Unreported empirical tests suggest that the lack of robustness for inward-based bargaining effects may be due to low value-added firms where inward-based bargaining effects (and spillover effects) appear to be minimal.

[12]In results available upon request, we engage in a theoretical exercise akin to that of Pagel and Wey (2013) where we show our theoretical propositions concerning negative bargaining effects to be robust when we layer-on additional firm heterogeneity in the form of low-cost and high-cost firms.

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APPENDIX

Equations (1)–(3) in the main text, respectively, show the inverse-linear demand, unions' utility and firms' profit functions. Since unions set wages in Stage 1 and firms set quantities in Stage 2, we start by solving the last stage of the game (i.e., via backwards induction). Given that one unit of labor is needed to produce one unit of output ($q_i = n_i$), we can find the chosen amount of labor (and thus output) at Stage 2. Given the labor demand, we can derive the optimal wages chosen at Stage 1. In the absence of a cross-border M&A, the firms' first order condition from the profit function can be used to find labor quantities. We set $\partial \pi_i / \partial n_i = 0$ for $i = 1.4$, and solve simultaneously with respect to demand for all four firms, for example, Firm 1 – which is located in Country A – has the following labor demand:

$$n_1 = \frac{(a-c)(2-b) - w_1(2b+2) + b(w_2 + w_3 + w_4)}{(2-b)(3b+2)}.$$

(A1)

Given the optimal value of n_i (where $i = 1.4$) at Stage 2, we can solve the union's maximization problem by setting $\partial U_A / \partial w_A = \partial U_B / \partial w_B = 0$, and solving with respect to w_A and w_B. Then we find the domestic wage.

We compare this scenario with a situation where cross-border M&A activity takes place. In particular, we have Firm 1 merge with Firm 4; hence, the domestic-outsider is denoted with Subscript 2. As explained in the text, we allow for spillovers to all firms following a cross-border merger. While the union's maximization problem remains the same, the merged entity faces the following maximization:

$$\pi_{14} = (p_1 - w_1 - c(1 - \mu_1) \cdot n_1) + (p_4 - w_4 - c(1 - \mu_4) \cdot n_4). \tag{A2}$$

The post-merger profit functions for the domestic-outsider and foreign-outsider firms are as follows:

$$\pi_2 = (p_2 - w_2 - c[1 - \mu_2]n_2) \tag{A3}$$

$$\pi_4 = (p_4 - w_4 - c[1 - \mu_4]n_4) \tag{A4}$$

At Stage 2 we solve four first-order conditions simultaneously, $\partial \pi_{14}/\partial n_1 = \partial \pi_{14}/\partial n_4 = \partial \pi_2/\partial n_2 = \partial \pi_3/\partial n_3 = 0$, with respect to n_1, n_2, n_3, and n_4.

Given labor demand at Stage 2, the unions in Country A and B set firm wages simultaneously. Setting $\partial U_A/\partial w_1 = \partial U_A/\partial w_2 = \partial U_B/\partial w_3 = \partial U_B/\partial w_4 = 0$, we can solve with respect to w_1, w_2, w_3, and w_4. If we negate spillover effects (i.e., set $\mu_i = 0$), we can find post-merger wages in the absence of spillovers. The wage in the domestic-insider firm is the following:

$$w_1 = \frac{(a-c)(1-b)(2-b)4}{(16 - 12b + b^2)} \tag{A5}$$

Equation (7) in the main text reports the wage in the domestic-outsider firm. It can be verified that wages in both the insider and outsider firms drop post-merger; furthermore, the post-merger wage is lower in the domestic-insider than in the domestic-outsider firm. Since our principal interest involves the domestic-outsider firm's wage, we report the wage in Country A for Firm 2 in the presence of spillovers ($\mu_i > 0$):

where

$$V = b \cdot c(8b^5 - 28b^4 - 36b^3 + 174b^2 - 48b - 128)$$

$$Y = 256 \cdot c + b \cdot c(-3b^5 - 35b^4 + 258b^3 - 320b^2 - 336b + 384)$$

$$Z = b \cdot c(3b^5 - 15b^4 + 18b^3 + 56b^2 - 32b - 64)$$

$$X = b \cdot c(3b^5 - 7b^4 - 20b^3 + 60b^2 - 64)$$

The impact of spillovers on domestic-outsider wages (which is always positive per Eq. (6)) follows:

$$\frac{\partial w_2}{\partial \mu_2} = \frac{256 \cdot c + b \cdot c(-3b^5 - 35b^4 + 258b^3 - 320b^2 - 336b + 384)}{512 + 768b - 608b^2 - 624b^3 + 386b^4 + 3b^5 - 17b^6} \tag{A7}$$

Finally, we consider how merger relatedness affects the wage reduction following a cross-border M&A. From Eq. (9) we have the following:

$$\frac{\partial(w_0 - w_I)}{\partial b} = \frac{\theta(a-c)(32 \cdot (1-b) + 36b^2 - 8b^3 - b^4)}{(b^2 + 4b - 8)^2} \tag{A8}$$

This is always positive and implies that an increase in b leads to a larger post-merger wage reduction.

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$$w_2 = \frac{(2-b)(a-c)(9b^5 - 67b^4 + 86b^3 + 144b^2 - 128b - 128) - V \cdot \mu_1 - Y \cdot \mu_2 - Z \cdot \mu_3 - X \cdot \mu_4}{17b^6 - 3b^5 - 386b^4 + 624b^3 + 608b^2 - 768b - 512} \tag{A6}$$

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