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Clougherty, Joseph A.; Gugler, Klaus; Sørgard, Lars

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Joseph A. Clougherty
Klaus Gugler
Lars Sørgard

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Cross-Border Mergers and Domestic Wages: Integrating Positive 'Spillover' Effects and Negative 'Bargaining' Effects*

Joseph A. Clougherty
University of Illinois at Urbana-Champaign and CEPR-London
jaclough@illinois.edu

Klaus Gugler
Department of Economics, WU (Vienna University of Economics and Business)
klaus.gugler@wu.ac.at

Lars Sørgard**
Department of Economics, Norwegian School of Economics
lars.sorgard@nhh.no

Abstract

The existing literature concerning the impact of cross-border merger activity on domestic wages can be split into two camps: 1) those focusing on positive 'spillover' effects; 2) those focusing on negative 'bargaining' effects. Motivated in part by the lack of scholarship spanning these two literatures, we provide a theoretical model that nests these two mechanisms in one conceptual framework. From our theoretical model we are able to predict that 'spillover' effects tend to be more dominant under low unionization rates, while 'bargaining' effects tend to be more dominant under high unionization rates; furthermore, 'spillover' effects tend to be more dominant with inward cross-border mergers, while 'bargaining' effects tend to be more dominant with outward cross-border mergers. We employ comprehensive panel data on wages, unionization and merger activity for US industry sectors over the 1986-2001 period in order to test the impact of cross-border merger activity on domestic wages. We find support for our propositions in that higher unionization rates make it more likely that cross-border mergers generate wage decreases, while outward cross-border mergers more likely involve wage decreases than do inward cross-border mergers.

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**Corresponding author.

INTRODUCTION

Cross-border mergers and acquisitions (M&As) are an increasingly popular strategic move by firms as represented by two stylized facts: growth in cross-border merger activity has outpaced growth in domestic merger activity over the last two decades; cross-border M&As now constitute the great majority – over 80% – of foreign direct investment (FDI).[1] While a number of different dimensions to cross-border mergers – e.g., drivers of such activity (Fumagalli & Vasconcelos, 2009; Makaev, 2010), wavelike patterns (Evenett, 2003; Gugler et al., 2003; Makaev, 2010), corporate governance implications (Bris & Cabolis, 2002), impact on employment (Gugler & Yurtoglu, 2004), and antitrust considerations (Head & Ries, 1997; Baker, 2000) – have been studied, one area of substantial recent interest has been the impact of cross-border merger activity on wages. In particular, two literature camps on how cross-border M&As might affect wages have developed: one focusing on the potential for a positive 'spillover' effect, the other focusing on the potential for a negative 'bargaining' effect.

The positive spillovers literature holds that foreign direct investment – where cross-border M&As are again the most popular form of FDI – involves a transfer of technology and ideas to a host nation. This mechanism is based on the observation that multinational enterprises (MNEs) possess intangible assets such as technological know-how, marketing/management skills, export relationships, and brand awareness that purely domestic firms do not possess (Dunning, 1981; Markusen, 1995; Caves, 1996; Aitken et al., 1996). Moreover, foreign investors are unable to prevent these technological advantages from spilling over to domestic firms due to the presence of multiple 'spillover' channels. While the adoption of technological advantages clearly increases the productivity of domestic firms (Haskel, Perira & Slaughter, 2007), it also increases wages due to the increased productivity of workers (Aitken et al., 1996). Thus, cross-border mergers enable firm-specific assets to be transferred across borders within the multinational firm and then spread to domestic firms and workers in the host country environment.

[1] Over the last two decades, for instance, 26% of worldwide M&A activity was cross-border in nature; yet in recent years, some 33% of worldwide M&A activity appears to be cross-border (Makaev, 2010). See also UNCTAD (2000, 2004) and Kang & Johansson (2000).

The negative 'bargaining' effects literature instead holds that cross-border mergers provide firms with fall-back options that give them the upper hand in bargaining with unions over wages and working conditions. While cross-border mergers allow multinational firms 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'. Thus, the threat to simply move production abroad – and cross-border M&As that establish foreign production sites add credibility to this threat – can have a substantial impact in forcing trade unions in to lowering wages (Mezetti & Dinopoulos, 1991; Freeman, 1995).[2] 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 relatively moderate wage increases. The presence of foreign production sites can also assist employers during times of labor strikes or work stoppages. Caves (1996: p.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 this vein, Eckel and Egger (2009) report two different instances when the presence of foreign production helped a firm weather a strike.[3] In sum, the 'bargaining' effects literature argues that the ability of unions to negotiate higher-than-competitive wages has been undermined by the proliferation of cross-border mergers; i.e., the outside options that M&As present for multinational firms undercut the ability of unions to provide a wage premium for their members.

When considering the above two literatures concerning how cross-border M&As might affect wages, three general observations in particular become manifest. First, the negative bargaining effects literature consists almost entirely of theoretical studies. As lamented by a few scholars (e.g., Choi, 2001; Lommerud et al., 2006; Braun, 2008), the literature suffers from a lack of empirical testing concerning the idea that cross-border

[2] While Mezetti and Dinopoulos (1991) and Freeman (1995) were amongst the first to analyze this threat to domestic wages, a great deal of scholarship has followed in this tradition: e.g., Zhao (1995, 1998), Bughin and Vannini (1995), Choi (2001), Skaksen and Sørensen (2001), Straume (2003), Fabbri et al. (2003), Lommerud et al. (2003; 2005; 2006), Braun and Scheffel (2007), Braun (2008), Eckel and Egger (2009), and Farrell (2009).
[3] 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.

mergers allow firms to play off one group of workers against another. This deficiency in empirical work is all the more surprising when one recognizes that a number of anecdotal examples exist indicating the presence of negative 'bargaining' effects.[4] Second, the positive spillover effects literature indicates the exact opposite tendencies, as it is dominated by empirical work and suffers from a lack of formal theoretical scholarship. For instance, we were only able to identify two scholarly works – Fosfuri, Motta and Rønde (2001); Glass and Saggi (2002) – that formalize the positive spillovers mechanism in our review and reading of the literature. Third, there has been a lack of dialogue between these two discourses regarding how cross-border mergers might affect wages with only reviews by Gaston and Nelson (2002) and Conyon et al. (2002) appearing to acknowledge the presence of both mechanisms. This lack of dialogue and interaction is partly due to the different proclivities in the two camps: theoretical tendencies for work on 'bargaining' effects, and empirical tendencies for work on 'spillover' effects. Yet, this lack of integrative scholarship is a particular pity, as the two literatures clearly involve contending hypotheses that beg for a comprehensive analysis setting the conditions which explain when bargaining effects and when spillover effects are most relevant.

Motivated by the above deficiencies in the pre-existing literature on how cross-border mergers might affect wages, our aim here is twofold. First, we present a full theoretical treatment that involves integrating both the spillover and bargaining effects from cross-border merger activity in one conceptual framework. Our theoretical model predicts that unionization in a sector favors the dominance of bargaining-effects versus spillover-effects; thus, cross-border mergers more likely decrease wages under higher unionization

[4] Examples from various industries indicate that the negative 'bargaining' effects mechanism may be present in many cross-border mergers. For one, Lufthansa acquired some foreign-based small airlines in 2008-09; e.g., BMI (former British Midland) and Swiss (former Swissair). The pilot's trade union went on strike in February of 2010 and explained the strike as follows: *'The union is concerned that jobs at Lufthansa will be outsourced to cheaper pilots at some of Lufthansa's subsidiary airlines. In fact, the union accuses Lufthansa of deliberately acquiring the smaller airlines for this express purpose.'* The strike was ended after one day, when the union and Lufthansa resumed talks [see http://www.france24.com/en/20100222-lufthansa-pilots-strike-talks-german-airline-flights-suspended-unions-jobs accessed on 10/18/10]. Second, consider the Indian steel company Tata's acquisition of the Anglo-Dutch steel company Corus in February 2007. The UK union *'expressed fears that unfinished or 'slab' steel which is currently produced at the large integrated plant at Port Talbot in South Wales will be replaced by production at the parent company's domestic operations.'* [see http://www.eurofound.europa.eu/eiro/2007/03/articles/uk0703049i.htm accessed on 10/18/10]. Third, the European auto industry provides many examples of companies threatening to move production abroad due to the presence of plants in several different countries [for description of the trade union's challenges in this industry, see http://www.eurofound.europa.eu/eiro/2003/12/study/tn0312101s.htm accessed on 10/18/10].

rates than under low unionization rates (Makaev, 2010). Furthermore, given that acquiring firms are customarily more efficient than target firms, our model predicts that outward cross-border mergers are more likely than inward cross-border mergers to decrease wages. Second, we link theory with empirics by testing the above predictions, and eliciting the conditions which define when positive 'spillover' effects dominate and when negative 'bargaining' effects dominate. Thus, our empirical goal is to shed some light on whether – and when – cross-border merger activity involves positive or negative wage effects. In order to do so, we employ comprehensive panel data on wages, unionization and merger activity for US 2-digit industry sectors over the 1986-2001 period. The empirical results suggest that both the 'spillover' and 'bargaining' factors are at play, and that unionization is the key mediating construct. We find that the positive 'spillover' effects dominate under low unionization rates, while negative 'bargaining' effects dominate under high unionization rates. The results also suggest that outward cross-border mergers (where bargaining-effects are large) are more likely to decrease wages at home than are inward cross-border mergers (where spillover effects are large).

In order to follow through on the above aims, we organize the paper as follows. The second section sets the background by reviewing the relevant literature. The third section presents our theoretical model and derives empirical predictions. The fourth section outlines our estimation strategy. The fifth section describes the database. The sixth section presents our empirical results. The seventh section considers some robustness tests. The last section concludes.

BACKGROUND

In order to ground our analysis and contribution, it behooves us to go beyond the above introduction to the spillover-effects and bargaining-effects literatures and engage in a more detailed review of how cross-border merger activity might affect wages. Accordingly, we set out here to do the following: briefly review the bargaining-effects literature; briefly review the spillover-effects literature; provide more specificity on the presence of different spillover channels; and – in order to setup our effort to integrate spillover and bargaining

effects – discuss the few works which are actually cognizant of the two competing literatures on how cross-border mergers affect wages.

The negative 'bargaining' effects literature – as pointed out by Choi (2001), Braun (2008) and others – almost entirely consists of theoretical studies. Thus, a sizeable theoretical literature exists – e.g., Mezetti and Dinopoulos (1991), Zhao (1995, 1998), Bughin and Vannini (1995), Skaksen and Sørensen (2001), Straume (2003), Lommerud et al. (2003; 2005; 2006), Eckel and Egger (2009), and Farrell (2009) – formalizing the idea that FDI in the mode of cross-border M&As or direct investments allows firms to play off one group of workers against another. Yet to the best of our knowledge, only three studies bring some evidence to bear on the empirical robustness of the negative 'bargaining' effects mechanism. First, 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. Second, Fabbri et al. (2003) find two pieces of evidence from the US and UK – 1) demand for low-skilled labor has become more elastic over the last two decades; 2) plants owned by multinationals are more likely to shut down as compared to domestically-owned plants – that support the globalization of production being a source of rising wage inequalities. Third, Braun (2008) uses Danish matched employer-employee data and finds support for a foreign ownership premium (i.e., subsidiaries of MNEs pay higher wages than do purely domestic firms); however, this foreign ownership premium goes to zero in highly unionized firms.[5] Thus, trade unions are unable to secure higher wages in highly unionized enterprises that have non-Danish owners. Taken as a whole, these studies provide some evidence in support of the 'bargaining' effects hypothesis; yet, the limited nature of this empirical work makes it difficult to definitively argue for the validity of this mechanism which negatively affects wages.

By no means, however, does the positive 'spillover' effects literature suffer from a lack of empirical scholarship. As Görg and Greenaway (2004) surmise in their review of the literature, the early empirical scholarship was often unable to present robust empirical evidence in favor of positive spillover effects. For instance, Aitken and Harrison (1999),

[5] In a related paper, Braun and Scheffel (2007) – using linked employer/employee data from Germany – find that the outsourcing of inputs from abroad decreases the union-wage premium for low-skilled workers.

Girma, Greenaway and Wakelin (2001), Barrios and Strobl (2002), and Martins (2005)—all find little support for the premise that positive spillovers to wages exist. Furthermore, researchers (e.g., Aitken et al., 1996) tended to find that positive spillovers were more likely to manifest in developed nations, as these nations had the requisite 'absorptive capacity' in order to learn from the presence of multinational firms. Yet of late, there have been an increasing amount of empirical studies at a very fine level of analysis (most often combining premise and employee level data) that have been able 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, 2009), and developed nations (e.g., Andrews et al., 2007; Pesola, 2007; Balsvik, 2010). Furthermore, some empirical scholarship has supported that higher skilled workers tend to reap the majority – if not all – of the wage benefits from the presence of MNEs in a sector (e.g., Driffield & Girma, 2003; Pesola, 2007). In sum, the positive spillover-effects literature may suffer from a lack of formal theoretical analysis, yet the empirical scholarship on this topic indicates both breadth and depth.

In order to fix ideas concerning the mechanisms behind positive spillover effects, we attempt to clarify here how foreign direct investments might lead to the diffusion of MNE knowledge and technology to domestic firms. The most obvious beneficiary of FDI is the domestic firm acquired by the MNE, as the acquired firms productivity (and wage structure) are enhanced toward MNE levels (e.g., Andrews et al., 2007; Braun, 2008; Martins & Esteves, 2008). Girma et al. (2001) refer to this direct takeover premium as a composition-effect, and while it is not a pure spillover effect, it certainly represents part of the benefit from cross-border M&A activity. Yet the heart of the spillovers literature resides beyond this composition-based spillover effect. In particular, how can FDI – potentially in the form of cross-border merger activity – enhance the productivity of non-merging domestic firms. 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 non-merging domestic firms. First, a demonstration channel exists, as domestic firms learn by imitating MNEs. Second, a competition channel exists, as domestic firms upgrade in order to compete successfully with the MNE (see related literature by Aghion et al., 2009). Third, a labor market channel exists, as domestic firms co-opt some MNE employees in order to secure know-how from these 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 purely domestic firms. Accordingly, the presence of these different channels allows for an externality-based spillover effect, as non-merging domestic firms gain productivity (and consequently increase wages) due to foreign direct investment in their nation.

As already noted in the Introduction, Gaston and Nelson (2002) and Conyon et al. (2002) appear to represent the only scholarship that acknowledges the presence of both research traditions concerning how cross-border mergers affect wages. It is important to underscore, however, that Gaston and Nelson's (2002) work is a review of 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 higher wages for labor (i.e., positive spillovers). We would like to pick-up from these two studies that acknowledge the presence of competing hypotheses, and approach the issue of cross-border mergers and 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 the conditions explaining when cross-border merger activity has a positive and when cross-border merger activity has a negative impact on employee wages. We turn now to our theoretical model which attempts to integrate the insights from both research traditions.

A THEORETICAL MODEL

Let us consider an industry with three firms, where firm 1 and 2 are purely domestic firms and firm 3 is a multinational firm.[6] The firms sell in one market—which can be considered to be either an international market or a domestic market. We apply the following inverse linear demand function for product *i*:

[6] Our model is closely related to Lommerud *et al.* (2005, 2006). It is a slightly modified version of their model, and we will later draw on the results from their model in discussing the robustness of our results. In our model, we allow post-merger cost savings – referred to as externality-based and composition-based spillover effects – for all firms in the industry. Lommerud *et al.* assume that cost savings can only be realized by the merging firms, and that the cost savings are identical for merging firms.

$$p_i = a - q_i - b\sum_j q_j, where \quad i, j = 1,..,3, \quad i \neq j \tag{1}$$

where q_j is the quantity sold of product *i* and $0 < b < 1$ is a measure of product differentiation. Thus, if $b = 1$ then the products are perfect substitutes, but if $b = 0$ then the products are unrelated.

We assume a very simple technology at the outset, where one unit of labor is needed to produce one unit of output: i.e., $q_i = n_i$, where n_i is the labor employed in the production of product i. For each unit of labor, there is a wage and non-wage cost. Let w_i denote the wage per unit of employment for firm *i*, and let *c* denote the non-wage cost per employee for all firms. To ensure a positive supply, we assume that $a > c$. Furthermore, following Lommerud *et al.* (2006) we assume that a merger can lead to savings in non-wage costs. These non-wage cost savings broadly capture the potential increase in productivity that derives from cross-border merger activity. Let μ_i denote the relative savings on non-wage costs after the merger for firm *i*. Further, $\mu_i = 0$ implies that there are no cost savings—i.e., the situation prior to the merger. After the merger, $0 \leq \mu_i \leq 1$. We then have the following cost function for firm *i*:

$$C_i = w_i + c(1 - \mu_i) \tag{2}$$

where μ_i captures the two different types of spillover effects. First, capturing the upgrade in productivity of the less efficient of the two merging firms (what is often referred to in the literature as a composition-based spillover effect – Girma et al., 2001). Second, capturing the possible diffusion of knowledge and technology to non-merging firms and the consequent upgrading in their productivity (what is considered in the literature to be an externality-based spillover effect). This externality-based spillover effect is of course the heart of the spillovers literature, though the composition-based effect is entwined with this pure spillover effect.[7]

We are concerned about the effects of a merger on the labor market in a developed country. To capture such a situation, we assume unionized workers in the domestic

[7] We have treated spillovers, measured by μ, as exogenous. In Fosfuri et al. (2001) and Glass and Saggi (2002), the spillover process is actually modeled. In particular, they model the interaction in the labor market between the workers and the firm after technology has been transferred due to a cross-border merger.

country—the country where two out of the three firms are located. In the foreign country, which can be regarded as less developed, we assume non-unionized workers.[8] To simplify further, we assume an industry-wide union in the domestic country that maximizes total rent for members (or those covered by union bargaining). The union is allowed to set different wages for different firms in the industry.

We assume that the outside option for the worker is w_o at the outset; i.e., the 'no merger' situation. If there is a cross-border merger, there can be spillovers ($\mu_i > 0$). Moreover, the externality-based and composition-based spillover effects can be partly appropriated by workers, thus implying that each worker has a more favorable outside option. We assume that the parameter *s* measures the share of externality-based and composition-based spillover effects appropriated by workers. Prior to the merger, $\mu_i = 0$ and the outside option is equal to w_o. Thus, the worker employed in firm *i* has an outside option equal to $w_o+sc\mu_i$ after the merger.

The utility function for the trade union in the domestic country is then the following:

$$\underset{w_i}{Max} \;\; U = \sum_i (w_i - w_0 - sc\mu_i), \quad where \quad i = 1,2\,, \tag{3}$$

and the profit function for firm *i* is the following:

$$\pi_i = (p_i - w_i - c[1-\mu_i])n_i \quad where \quad i = 1,..,3\,. \tag{4}$$

To simplify further, we assume that $w_3=w_o+sc\mu_3$; i.e., the wage in the foreign country is equal to the outside option. We assume a two stage game: where the union sets wages in stage 1, and firms set quantities in stage 2.

First, let us consider the case when no merger takes place. Solving the game by backward induction, we find that wages in the domestic country are the following:

[8] Bughin and Vannini (1995) also investigate the interplay between a domestic, unionized market and a foreign market with no unionization. Note, though, that they do not consider cross-border mergers but rather the MNE's choice between exporting and investing abroad and how that affects the domestic labor market. The domestic firm's decision to invest abroad or not is also discussed in Skaksen and Sørensen (2001), Lommerud et al. (2003) and Eckel and Egger (2009). In Mezzetti and Dinopoulos (1991) there is also a unionized domestic firm. It competes in the domestic market with a foreign firm located in a country with no unionization, and they focus on how a credible threat to move production abroad may affect domestic wages.

$$w_i = \frac{(a-c)(2-b)+w_0(2+b)}{4} \equiv w_i^A, \quad where \quad i = 1,2 \tag{5}$$

and the superscript *A* denotes the market structure with no merger.

Now let us consider a cross-border merger between one of the domestic firms and the foreign firm. In this case, we let subscript *i* denote the merging domestic firm, subscript -*i* the non-merging domestic firm, and subscript 3 the foreign firm. Such a merger may lead to both externality-based and composition-based spillover effects. The least efficient of the two merging firms can upgrade its productivity—i.e., the composition-based spillover effect. If the foreign firm is the least efficient merging firm, then $\mu_3 > 0$ and $\mu_i = 0$; and if the domestic firm is the least efficient merging firm, then $\mu_3 = 0$ and $\mu_i > 0$. The externality-based spillover effect is captured by $\mu_{-i} > 0$; *i.e.*, a pure spillover to the non-merging domestic firm. Note also that we only have one foreign firm, and thus by assumption there is no spillover in the foreign market to any non-merging foreign firm.

We also distinguish between an outward and an inward cross-border merger: an outward merger involves a domestic acquirer and a foreign target, while an inward merger involves a foreign acquirer and a domestic target. In the existing literature, it is common to assume that the acquiring firm is the more efficient of the two merging firms; i.e., efficient acquiring firms buy less efficient target firms. Makaev (2010) finds robust empirical support for this assumption based on over 1 million observations of M&A activity covering the 1988 to 2008 period. In line with this, we assume that $\mu_3 > 0$ and $\mu_i = \mu_{-i} = 0$ under an outward cross-border merge; and that $\mu_3 = 0$, $\mu_i > 0$ and $\mu_{-i} > 0$ under an inward cross-border merger. Without imposing any restrictions on spillover effects, it can be shown that the wages in the two domestic firms are the following:

$$w_i = \frac{(a-c)(1-b)+w_0(1+b)+c([1+s]\mu_i - [1-s]b\mu_3)}{2} \equiv w_i^I \tag{7}$$

$$w_{-i} = \frac{(a-c)(2-b)+w_0(2+b)+c([1+s]2\mu_{-i} - [1-s]b\mu_3)}{4} \equiv w_{-i}^I \tag{8}$$

In order to illustrate bargaining effects, let us first consider a scenario with no spillover effects following a merger ($\mu_i = \mu_{-i} = \mu_3 = 0$). In this case, the merging firm's wages

on the domestic side are lower than prior to the merger ($w_i^I < w_i^A$), since the trade union anticipates that the merged entity is willing to produce more in the foreign country and less in the domestic country due to the merged firms' ability to partly replace high cost domestic production with low cost foreign production. To dampen the loss of employment in the domestic firm, the trade union sets a lower wage. In that respect, a cross-border merger triggers competition between the workers in the domestic firm and the (unorganized) workers in the foreign firm. The main driving force behind negative 'bargaining' effects is this competition between domestic and foreign workers—competition which leads to lower wages following a cross-border merger via a mechanism that seems to be present in other related models.[9]

Note, however, that the trade union does not change the wage for the non-merging domestic firm ($w_{-i}^I = w_i^A$). While dampened competition in the product market implies that the wage should increase post-merger, such an increase would lead to a loss of employment for the non-merging firm to the foreign firm. In our model these two effects cancel out.[10] If we consider the average wage in the industry, it is straight forward to see that if no cost-savings exist (i.e., the absence of spillover effects), then a cross-border merger leads to a reduction in the average domestic wage. As we will show later, the same result will be present if we assume that the union sets identical wages in the two firms (see the discussion concerning eq. 10).

Having established negative 'bargaining' effects, let us now consider positive 'spillover' effects in some detail. There are three possible effects in our model. First, there can be a composition-based spillover effect pertaining to the domestic firm involved in the

[9] To our knowledge, only the models by Lommerud et al. (2005, 2006) – where they find a negative bargaining effect – directly address the bargaining effects involved with cross-border merger activity. Nevertheless, models where firms undertake generic FDI (not via M&As per se) find analogous results to what we find here. Zhao (1995; 1998) investigates a two-country model with unionization and the possibility of FDI, and finds in both studies that FDI leads to lower wages. In Mezzetti and Dinopoulos (1991), only the domestic market is unionized, and they find that a credible threat to move production abroad lowers negotiated domestic wages. In Eckel and Egger (2009) and Farrell (2009), the negative bargaining effect is also present in a two-country model with the possibility of FDI, but general equilibrium mechanisms might counteract the direct bargaining effect. Finally, Skaksen and Sørensen (2001) also find a negative bargaining effect when products are substitutes (as in our model). These results indicate that our main result – a negative bargaining effect – is rather robust.

[10] Although Dhillon and Petrakes (2002) use a different model, they show that these two effects can cancel out and that this is a quite general result. It is not dependent on the demand function we have employed in this model.

cross-border merger—an effect captured by the parameter μ_i. Second, there can be a composition-based spillover effect pertaining to the foreign firm involved in the cross-border merger—an effect captured by the parameter μ_3. Third, there can be an externality-based spillover effect pertaining to the domestic firm which is not involved in the cross-border merger but nevertheless elicits productivity gains due to the merger—an effect captured by the parameter μ_{-i}. As indicated above, the presence of these effects depends crucially on whether an outward or inward cross-border merger is taking place.

Under an inward cross-border merger, the targeted domestic firm can experience higher post-merger productivity (a composition-based spillover effect captured by $\mu_i > 0$) and this can also benefit the non-merging domestic firm (an externality-based spillover effect captured by $\mu_{-I} > 0$). It can easily be seen from (7) and (8) that both effects would lead to higher wages in the domestic market. Since acquiring firms represent the more efficient of the two merging firms by assumption (and empirical reality), inward cross-border mergers do not involve a composition-based spillover effect for the foreign acquiring firm. Moreover, the main point here is that externality-based and composition-based spillover effects unambiguously lead to higher domestic wages.

Under an outward cross-border merger, the foreign firm – which is now the least efficient of the two merging firms – will by definition have higher productivity (a composition-based spillover effect captured by $\mu_3 > 0$). In that case, there are no productivity gains for the merged domestic firm ($\mu_i = 0$), and therefore no spillovers to the non-merging domestic firm ($\mu_{-I} = 0$). The composition-based spillover effect pertaining to the foreign firm (or better said, the foreign division of the merged firm) will make that part of the merged entity more productive, and implies that the merged firm behaves more aggressively concerning product sales. This is anticipated by the domestic trade union; thus, the trade union sets lower domestic wages in order to partly offset the potential loss of employment at both the merging and non-merging domestic firms due to the anticipated post-merger behavior by the merged entity.

Two things, however, may mitigate this negative effect on domestic wages induced by composition-based spillovers to foreign firms from outward cross-border merger activity. First, if foreign workers are able to fully appropriate the increased productivity (s=1), then

the foreign firm will not benefit from the productivity gain. In this case, the composition-based spillover effect pertaining to the foreign firm will not change the foreign firm's behavior, and by correspondence the domestic trade union will not have to drop wages in order to respond to increased foreign firm productivity. Second, relaxing our model by assuming that a trade union also exists in the foreign country can dampen and even reverse our results concerning the composition-based spillover effect associated with an outward cross-border merger.[11] The reason is that the trade union in the foreign country will respond to the increased productivity as such by setting higher wages. This, in turn, will dampen the domestic trade union's incentive to lower wages.

Moreover, we expect the externality-based and composition-based spillover effects to yield larger positive effects on domestic wages in the case of an inward cross-border merger as compared to the case of an outward cross-border merger. The reason behind this is two-fold. First, only an inward cross-border merger will have a positive spillover effect on the non-merging domestic firm, thus externality-based spillover effects are most manifest with inward mergers. Second, the composition-based spillover effect from an outward cross-border merger will only indirectly affect domestic wages—an indirect effect that actually leads to lower domestic wages if there is no trade union in the foreign country. In contrast, an inward cross-border merger will directly affect wages in the domestic firm taking part in the merger and have an unambiguously positive effect.

Finally, let us consider how the degree of unionization may influence the wage effect following a cross-border merger. Let Θ capture the degree of unionization. Under complete unionization (all workers unionized), we assume as above that the union maximizes total rents for members. Under no unionization, we assume that the wage is set at the competitive level (the outside option). To focus on the bargaining effect concerning wages, we rule out any post-merger spillover effects ($\mu_i = 0$) and normalize the outside option to zero ($w_0 = 0$). Moreover, to be able to directly compare pre- and post-merger average wages,

[11] See Lommerud *et al.* (2006), where they apply a model with trade unions in both countries. In contrast to us, they assume that cost savings are identical for the two merging firms. They show that what we denote as the composition-based spillover effect will in that case lead to higher wages.

we assume that the trade union sets one domestic wage ($w_1 = w_2 = w$). The trade union's utility function will then be as follows:

$$\underset{w}{Max} \;\; U = (w)^{\theta} (n_i)^{1-\theta}, \;\; where \;\; i = 1,2 \tag{9}$$

If $\Theta = 1$, then we have complete unionization; and if $\Theta = 0$, then there is no unionization and the wage is at its competitive level. It can be shown that the difference between the domestic wage before and after the cross-border merger is as follows:

$$w^I - w^A = \frac{\theta b(a-c)(4-2b+b^2)}{b^2+4b-8} \tag{10}$$

First, we see that the domestic wage decreases following the cross-border merger as long as $\Theta > 0$.[12] This confirms the result we have shown above concerning the bargaining effect, and illustrates that our main result carries over to a situation where the domestic wage is by assumption identical in the two firms. Second, we see – per expectation – that an increase in unionization (a higher Θ) will lead to a larger difference in domestic wages when comparing the pre with the post cross-border merger scenario. With no unionization, we observe the competitive wage both before and after the merger. Yet when unionization is strong, the domestic wage is high prior to the merger, but the potential for downward pressure on domestic wages after the cross-border merger is quite large.

Our analysis thus shows that the downward pressure on domestic wages after a cross-border merger is increasing with the degree of unionization in an industry, and this effect can outweigh the expected upward pressure on wages due to positive spillover effects. Put simply, unionization favors the relative strength of negative bargaining effects vis-à-vis positive spillover effects. Accordingly, our first main result can be set out as follows:

Proposition 1: *The more unionized the industry, the more likely is cross-border merger activity to generate domestic wage reductions.*

[12] This follows straight forward from our assumptions that $a > c$ and $0 < b < 1$.

Our second main result relates to the nature of the spillovers. We found that an inward cross-border merger is expected to yield a larger upward pressure on domestic wages than would an outward cross-border merger. The reason behind this is that inward cross-border mergers yield both composition-based and externality-based positive spillover effects in the domestic market. Yet on the other hand, the spillovers associated with outward cross-border merger activity (which in our model are only composition-based) only generate an indirect effect on domestic wages—an indirect effect that can even be negative. Put simply, outward cross-border merger activity favors the relative strength of negative bargaining effects, while inward cross-border merger activity favors the relative strength of positive spillover effects. Accordingly, our second main result can be set out as follows:

Proposition 2: *Outward cross-border mergers are more likely to generate domestic wage reductions than are inward cross-border mergers.*

EMPIRICAL ESTIMATION STRATEGY

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

We draw from previous empirical work (e.g., Figlio and Blonigen, 2000; Conyon et al., 2002; Poole, 2009) that considers spillover effects to be captured by the differential impact of cross-border activity with respect to domestic activity in order to identify positive spillover effects. Accordingly, we first control for total merger activity 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 in an industrial sector. Then we introduce the share of merger activity that is cross border in nature (hereafter, Cross-Border-Share) to capture any

additional benefits to wages due to merger activity being more cross-border in nature. 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 (2009) essentially argues, a larger share of cross-border mergers increases the number of possible interactions between domestic and foreign firms, and thereby creates greater potential for knowledge transfer. Thus if positive spillovers exist due to cross-border merger activity, then the coefficient estimate for cross-border-share will be greater than zero; i.e., cross-border mergers involve an additional wage premium beyond any generic positive effects due to total merger activity.

We should be clear here and point out that we elicit a relatively broad spillover effect, as the differential impact of cross-border merger activity with respect to generic merger activity will be composed of both composition-based and externality-based spillover effects. Recall how externality-based and composition-based spillover effects will both move in the same direction; i.e., productivity and wage gains for acquired firms spill over to non-merging firms. As already noted, recent empirical work (e.g., Smarzynska-Javorcik, 2004; Poole, 2009; Balsvik, 2010) has taken pains to combine premise and employee level data in order to accurately elicit true spillovers: i.e., externality-based spillover effects. Yet by lumping together both the composition-based and externality-based effects, we allow spillover effects to involve a generous empirical weighting. For instance, Martins and Esteves (2008) find composition effects to be rather substantial since foreign firms pay significantly higher wages than do domestic firms; thus, this 'takeover' wage premium for acquired firm employees will be a healthy part of this broad spillover effect. Accordingly, the ample empirical weight given to spillover effects makes it more difficult to elicit conditions where the positive spillover effects are outweighed by negative bargaining effects.

In order to identify negative bargaining effects, we must first capture the degree of unionization in an industrial sector (hereafter, Unionization). A great deal of empirical work (e.g., Ashenfelter & Johnson, 1972; Lawrence & Lawrence, 1985) finds unionization in a sector to enhance average wages. After controlling for the direct effect of unionization on sector wages, the interaction of unionization with cross-border-share can broadly capture the bargaining effect. Recall that negative bargaining effects involve cross-border mergers

undercutting the ability of unions to set higher than competitive wages. Thus, higher levels of cross-border merger activity make it difficult for unions to do their job of delivering higher wages to their members and covered employees. Accordingly, the interaction of unionization and cross-border merger activity broadly captures the negative bargaining effect.

With the above in mind, the following reduced-form wage equation can be employed in order to test proposition 1:

$$\text{Wages}_{i,t} = b_0 + b_1 (\text{Total-Merger-Activity})_{i,t-1} + b_2 (\text{Total-Merger-Activity} * \text{Unionization})_{i,t-1} + b_3 (\text{Cross-Border-Share})_{i,t-1} + b_4 (\text{Cross-Border-Share} * \text{Unionization})_{i,t-1} + b_5 (\text{Unionization})_{i,t-1} + \beta (X)_{i,t-1} + \varepsilon_{it} + \alpha_i + \gamma_t \quad (11)$$

where *i* indexes a US industrial 2-digit sector, *t* indexes time, $X_{i,t-1}$ is a vector of lagged control constructs, α_i represents the fixed panel-specific effect, and γ_t captures the fixed period-specific effect.[13] The main empirical expectations are as follows: larger degrees of cross-border merger activity (b_3) lead to higher wages (the positive spillover effect); larger degrees of unionization (b_5) lead to higher wages (the direct unionization effect); but higher combined levels of cross-border merger activity and unionization (b_4) lead to lower wages (the negative bargaining effect).

We are also interested, per proposition 2, in looking more carefully into which type of cross-border merger (outward versus inward) leads to lower domestic wages. We can accomplish this by breaking down the cross-border-share construct into the composite shares of outward cross-border mergers (hereafter, Outward-Share) and inward cross-border mergers (hereafter, Inward-Share). Recall that proposition 2 holds that outward cross-border mergers involve relatively more wage dampening effects than do inward cross-border mergers. Accordingly, we can expand the above reduced-form wage equation (eq. 11) in order to differentiate between outward and inward cross-border mergers and test for proposition 2 as follows:

[13] Notice that we also interact Total-Merger-Activity with Unionization in order to be consistent with subsequent interactions. The expectation is that there are no specific wage effects due to the combination of high Unionization and Total-Merger-Activity rates.

$$\text{Wages}_{i,t} = b_0 + b_1 (\text{Total-Merger-Activity})_{i,t-1} + b_2 (\text{Total-Merger-Activity} * \text{Unionization})_{i,t-1} + b_3 (\text{Outward-Share})_{i,t-1} + b_4 (\text{Outward-Share} * \text{Unionization})_{i,t-1} + b_5 (\text{Inward-Share})_{i,t-1} + b_6 (\text{Inward-Share} * \text{Unionization})_{i,t-1} + b_7 (\text{Unionization})_{i,t-1} + \beta (X)_{i,t-1} + \varepsilon_{it} + \alpha_i + \gamma_t \quad (12)$$

with notation analogous to equation 11. Thus, the empirical expectation here would be for the net effect of Outward-Share and its interaction (b_3 and b_4) to be consistently smaller at different unionization levels than the net effect of Inward-Share and its interaction (b_5 and b_6).

We also draw from pre-existing empirical literature on what drives average wage rates in an industrial sector – see Dickens and Katz (1987) for a review – in formulating the array of additional control constructs ($X_{i,t-1}$). For one, capital intensity has often been found to have a strong positive relationship with average wage rates (e.g., Lawrence & Lawrence, 1985), though the direction of causality has been questioned (Dickens & Katz, 1987). Second, the participation of females in an industry has traditionally been found to be associated with lower wages (e.g., Haworth & Rasmussen, 1971; Horrace & Oaxaca, 2001). Third, corporate profits have been found to be positively associated with average wage rates, as workers are able to earn higher wages in more profitable sectors (e.g., Pugel, 1980). Fourth, Dickens and Katz (1987) cite a number of studies that use a sectors' employment growth in order to control for changing demand conditions. Fifth, measures of labor quality – like a skill index, educational background, or value added – have been customarily sought, as employees earn higher wages when they can contribute larger amounts of value added (e.g., Ashenfelter & Johnson, 1972). Accordingly, we include measures of the above five control concepts in order to make better causal inferences on our explanatory variables of principal concern.

As indicated by the notation for both regression equations (eq. 11 & 12), we also take advantage of the data's panel structure by controlling for fixed panel (i.e., 2-digit industry) and period (i.e., year) specific effects. Conyon et al. (2002) note that fixed effects have not traditionally been employed in the spillovers literature: an omission that is particularly problematic in light of the potential for omitted variable bias. Using the data's panel structure to control for non-time-varying omitted variables – eliciting within-estimators – represents a distinct feature of our empirical analysis. We also take advantage of the data's

panel structure by lagging all of the right-hand-side constructs, thus we begin to address the endogeneity issue by mitigating simultaneity bias.[14]

Some additional words on endogeneity and selection biases may be in order here. One of the main problems concerning the analysis of merger-level effects (r.e., wages or other factors) has been the identification of a proper counterfactual: i.e., the proper level of that factor in the absence of a particular merger. A number of econometric means (e.g., difference-in-difference, matching methods, instrumental variables, and others) have been employed to tackle this concern. While some of these means are more appropriate than others depending on the problem at hand (Blundell and Costa Dias, 2001), these means have also been criticized as producing biased results—see for instance Bertrand et al. (2004). We circumvent the problem of identifying a proper counterfactual by analyzing the effects of industry-level merger activity, where industry-level activity – unlike merger-level activity – represents a non-singular event that can be continuously measured. Accordingly, we can infer from the co-movement of merger activity tendencies (and the unionization interaction) with wage rates as to whether our hypotheses find empirical support. Additionally, selection bias would be far more problematic with merger-level analysis than with industry-level analysis. Since at the industry-level we can include all of the relevant 2-digit sectors; and more importantly, we can essentially include the population of mergers occurring within that sector.[15] The use of fixed effects also partly controls for possible selection bias, as any time-invariant characteristics particular to an industry will be picked up by these terms. In light of the above points, it makes sense to turn now to a discussion of the actual data employed in operationalizing the proposed estimation strategy.

DATA

Our information on merger activity derives from the 'Worldwide Mergers & Acquisitions' series which is produced by Thomson Financial Securities Data (TFSD). Thomson collects exhaustive data on mergers and spin-offs using a variety of sources such as financial

[14] We will also perform Granger causality tests in a later section of the manuscript; tests that suggest that wages – though Granger causing domestic mergers – do not Granger cause cross-border mergers

[15] Our only restriction is that we capture merger deals that have a minimum value of 1 million dollars.

newspapers, Reuters Textline, the Wall Street Journal, Dow Jones, and others. The database covers the universe of corporate transactions that represent at least 5 per cent of the ownership of a company with a transaction (i.e., a deal) value of at least 1 million US dollars. Public as well as private transactions are covered in the database. We define a merger – or an M&A deal – as a transaction when more than 50 percent of the equity of a target firm is acquired. The Total-Merger-Activity variable is normalized by total number of employees in the industrial sector, while all the other merger variables (Cross-Border-Share, Outward-Share, and Inward-Share) are defined as percentages of "all mergers" in a sector.

The unionization variables stem from the 'Union Membership and Coverage Database' which provides private and public sector labor union membership, coverage, and density estimates at the two-digit SIC industry level. 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 at www.unionstats.com. We will measure unionization in terms of both union membership and the number of employees covered by union bargaining.

Data on wages, employees, corporate profits, employment growth and value added—are all obtained from the U.S. Bureau of Economic Analysis. Data on the share of women in an industrial sector derive from the U.S. Bureau of Labor Statistics. Finally, a measure of capital intensity (the capital to labor ratio) is calculated and compiled to the industry level from Compustat's firm level database. Thus, all of the variables are defined annually for 41 2-digit SIC industries over the 1986-2001 time period; i.e., the unit of observation is always industry-year.[16] Table 1 presents exact definitions – and data sources – for all of the variables employed in our regression estimations.

[Table 1 approximately here]

Table 2 presents summary statistics for the different variables: Panel A for non-merger related variables; Panel B for the merger variables. Wages nearly doubled during our 16 year estimation period: almost 25,000 USD per employee in 1986 to more than 44,000 USD per employee in 2001. The average share of unionized workers in a sector also declined

[16] We are not able to extend the data beyond 2001 due to the switch over in the US from the SIC to the NAICS industry classification system.

from around 25% in 1986 to 15% in 2001, and the median declined from 20% to 10%. Furthermore, it does not appear to matter how we measure unionization: share of union membership indicates similar descriptive statistics when compared with share of union coverage. Furthermore, value-added per employee averages 89,000 USD; annual employment-growth averages nearly 11% over the sample (though median employment remains flat); corporate-profit per employee averages 13,400 USD; female-participation averages 36.5%; and finally, capital-intensity averages 220,000 USD per employee.

[Table 2 approximately here]

The descriptive statistics concerning Total-Merger-Activity suggest that there are on average .1 annual mergers per thousand employees at the two-digit SIC industry level, though overall merger activity exhibits substantial skewness as the median is only 0.05.[17] Furthermore, around 22% of all mergers are cross-border in nature; i.e., either the acquirer is from the US and the target from a foreign country, or the acquirer is from a foreign country and the target is from the US. Moreover, this percentage goes up considerably during the 16 years we observe in our data: from around 12% in 1986 to 33% in 2001. This increased tendency to engage in cross-border activity is even more pronounced than the worldwide trends detected by Makaev (2010) that we alluded to in the Introduction. Interestingly, means and medians are quite similar, thus cross-border merger activity seems to be distributed symmetrically across industries. Outward cross-border mergers (i.e., a US acquirer of a foreign target) as a share of all mergers almost quadrupled from an average of 3% in 1986 to nearly 14% in 2001. Inward cross-border mergers (i.e., a foreign acquirer of a US target) as a share of all mergers more than doubled from 9% in 1986 to 19% in 2001.

EMPIRICAL RESULTS

Table 3 reports the empirical results for four regression estimations based on equation 11 that test the first proposition: i.e., cross-border mergers more likely generate wage reductions in more highly unionized industries. We first estimate two regression specifications that employ a random-effects estimation method: one estimation using

[17] In absolute numbers, there are on average 76 (median 25) mergers annually at the 2-digit SIC industry level, thus, our database covers more than 3,000 mergers annually.

membership to define unionization and the second estimation using coverage to define unionization. Followed by two regression specifications that employ a fixed-effects estimation method: where again, one estimation uses membership and the other uses coverage to define unionization. The empirical results across the four different regression specifications are consistent, striking and robust.

[Table 3 approximately here]

The model appears well specified as the different measures of R-squared all appear to be relatively high: a 'Within R-squared' consistently higher than .96; a 'Between R-squared' averaging around the order of .35; and an 'Overall R-squared' averaging around .47. Furthermore, the coefficient estimates appear to be consistent in terms of size and significance across the four different regression specifications. We now take a variable by variable approach in reviewing the empirical results before discussing the results with the first theoretical proposition in mind.

First, Total-Merger-Activity involves a positive and significant effect on wages in an industrial sector, thus higher degrees of merger intensity in an industry generally lead to higher wage rates for workers in these same industries. Furthermore, the interaction of Total-Merger-Activity with Unionization does not involve a significant effect on wages in all four regression specifications. The insignificance of this interaction is comforting, as it suggests that unionization may eventually be an important modifier of cross-border merger activity but is not an important modifier of merger activity in general.

Second, we find in all of our specifications that cross-border merger activity (Cross-Border-Share) involves a positive and significant wage premium above and beyond the positive wage effect from overall merger activity. This result is in line with our expectations for a positive spillover effect emanating from cross-border merger activity. Beyond eliciting a positive spillover effect via the marginal effect of additional cross-border merger activity with respect to overall merger activity, the interaction of Cross-Border-Share with Unionization is intended to capture the negative bargaining effect involved with cross-border mergers. That interaction variable is indeed negative and significant in all four regression specifications, thus yielding support to the idea that cross-border merger activity undercuts the ability of unions to provide a wage premium for employees.

Third, we find a positive and mostly significant effect for the Unionization variable in all four regression specifications (in the fixed effects estimations, the variable is only significant at the 8.2% and 11.2% level, respectively). Accordingly, higher rates of unionization in a sector generally lead to higher wages in a sector. This result is in line with expectations, as clearly the 'raison d'être' for unions is the mission to increase the pay of their members – and those employees they represent – while holding other industry characteristics constant.

Fourth, the array of control variables that derive from the pre-existing literature concerning the drivers of industry level wages all appear to conform with prior empirical work. Capital-Intensity yields a positive – though not significant – coefficient estimate in all four regression specifications. Female-Participation appears to involve a statistically robust negative influence on average wages rates in all four regression specifications. Corporate-Profit yields positive – and mostly significant – coefficient estimates throughout the four specifications, thus labor does appear to share in the rents created within an industry. Employment-Growth appears to involve a very strong positive effect on wages, as growing industries seemingly pay higher wages. And finally, Value-Added is positive and significant in all four regression specifications, thus employees are indeed rewarded when greater value can be added to the production process. As an aside, Value-Added also partially controls for any changes in workforce composition: e.g., if mergers lead to the outsourcing of lower skilled workers, then the measured wages per employee at the remaining non-outsourced units will increase almost by definition.

We can now turn to analyzing the empirical results with our first proposition in mind. Recall that we propose that unionization makes it more likely that cross-border mergers generate domestic wage reductions. The idea behind this contention is that unionization favors the relative strength of negative bargaining effects, thus positive spillover effects are less manifest at higher rates of union membership and coverage. In order to get a feel for whether our results support this contention, it helps to move beyond a discussion of the individual coefficient estimates in our regression estimations and instead illustrate the net effect of the three variables of principal concern here: Cross-Border-Share, Unionization, and the interaction of these two variables. Accordingly, Figure 1 illustrates the relevance of Unionization by presenting the net effect on Wages of different Cross-Border-Share values

combined with different Unionization coverage rates (0%, 22%, & 50%). Evident from the figure is that higher levels of cross-border merger activity yield higher wage rates when the unionization rate is 0%—i.e., a 0% unionization rate reflects the situation where only positive spillovers are at play, thus the spillover effects clearly dominate the bargaining effects. Yet at a 22% unionization rate, higher levels of cross-border merger activity do not yield higher wages rates, thus this reflects the situation where the positive spillover effects and negative bargaining effects exactly offset each other. Furthermore, at a 50% unionization rate, higher levels of cross-border merger activity yield lower wage rates, thus in this situation the negative bargaining effects clearly dominate the positive spillover effects. Accordingly, higher levels of unionization appear to strengthen the relative impact of negative bargaining effects and soften the relative impact of positive spillover effects. In particular, unionization rates above 22% generally involve the dominance of negative bargaining effects. Accordingly, the illustration of the net effect appears to indicate strong support for the first proposition concerning the ability of unionization to dampen the relative impact of spillover effects and strengthen the relative impact of bargaining effects.

[Figure 1 approximately here]

Table 4 reports the empirical results for four regression estimations based on equation 12 that test the second proposition: i.e., outward cross-border mergers more likely generate wage reductions than do inward cross-border mergers. In line with our Table 3 estimations, we have regression specifications employing both a random-effects and fixed-effects estimation method, and we have regression specifications using both membership and coverage to define unionization. And as with the Table 3 results, the empirical results across the four different regression specifications are generally consistent, striking and robust. Table 4's similar qualities with Table 3 do not surprise in light of the fact that the only difference between the specifications in the two tables is that Cross-Border-Share is now broken down into the composite Outward-Share and Inward-Share constructs in order to differentiate between outward and inward cross-border merger activity.

[Table 4 approximately here]

In light of the consistency in the estimations and results between Tables' 3 and 4, for brevity we will focus here simply on the illustrative interpretations of the Outward-Share

and Inward-Share variables. Recall that the second proposition is based on the idea that positive spillover effects should be relatively larger with inward cross-border mergers than with outward cross-border mergers, while negative bargaining effects should be relatively larger with outward cross-border mergers than with inward cross-border mergers.

Accordingly, Figure 2 illustrates the relevance of outward cross-border merger activity by presenting a similar illustration to that of Figure 1, except now the net effect involves the Outward-Share, Unionization and 'Outward-Share * Unionization' interaction variable. Manifest in this illustration of the coefficient estimates is that the critical unionization coverage level is now 20%. Thus, the positive spillover effects dominate the negative bargaining effects at unionization rates up till 20%; yet above 20% unionization, the negative bargaining effects dominate the positive spillover effects.

[Figure 2 approximately here]

Figure 3 presents a similar illustration to that of Figure 2, except it concentrates on the net effect involved with the Inward-Share, Unionization and 'Inward-Share * Unionization' interaction variable. What is most striking in this illustration of the coefficient estimates is that the critical unionization coverage level for inward cross-border merger activity is 25.5%. In other words, positive spillover effects tend to dominate negative bargaining effects at unionization rates up till 25.5%; yet above 25.5% unionization, the negative bargaining effects tend to dominate the positive spillover effects.

[Figure 3 approximately here]

Accordingly, Figures' 2 and 3 illustrate the empirical relevance of our second proposition, as outward cross-border mergers appear to be more likely to generate domestic wage reductions than do inward cross-border mergers. This result derives from the fact that positive spillover effects are relatively weaker with outward cross-border merger activity: the relative weakness can be detected in a comparison of Figures' 2 and 3, as it takes a unionization rate of 20% for the positive spillover effects to be swamped by negative bargaining effects for outward cross-border merger activity, while it takes a much higher unionization rate of 25.5% for the positive spillover effects to be swamped by negative bargaining effects for inward cross-border merger activity. Thus, the empirical evidence

tends to support outward cross-border mergers more likely involving wage decreases than inward cross-border mergers, as the bargaining effects become more dominant compared to spillover effects when merger activity becomes more outward in nature.

EMPIRICAL ROBUSTNESS

While we have attempted to effectively use the data's panel structure (by controlling for fixed panel and period specific effects and lagging our independent variables) in order to generate sound causal inferences, the reciprocal causation problem may still be evident in our econometric estimations. Namely, it could be that high wages in an industry induce firms to acquire foreign firms. Causality would then also run from wages to cross-border merger activity; i.e., the opposite of our principal contention. Accordingly, we test for causality amongst the wage and merger variables: with mergers further subdivided into domestic, cross-border, outward cross-border and inward cross-border mergers. Note that for consistency throughout the causality testing, we burrow down to the level of the different types of specific mergers. Thus, we do not consider Total-Merger-Activity or Cross-Border-Share variables here, but instead consider the frequency of these four different merger types – domestic, cross-border, outward cross-border and inward cross-border – with respect to the number of employees in an individual sector.

In testing for causality, we apply standard Granger causality tests (Granger, 1969). Namely, we use a standard joint test (e.g. χ^2-test) of exclusion restrictions to determine whether lagged X has significant linear predictive power regarding current Y. The null hypothesis that X does not strictly Granger cause Y is rejected if the coefficients on the lagged variables of X are jointly/significantly different from zero. Bidirectional causality (or, feedback) exists if Granger causality runs in both directions. In particular, we will consider two lags in order to test Granger causality. Since we must include lagged dependent variables in these Granger tests, estimation with OLS would be inconsistent in the presence of unobserved industry-specific effects. Therefore, we estimate our equations with the GMM estimator developed by Arellano and Bond (1991). This estimator eliminates industry effects by first-differencing and then controls for possible endogeneity in the lagged

explanatory variables (first and second lags per above) by employing further lagged values of these constructs.[18] Lagged values of potentially endogenous variables represent valid instruments provided there is no second-order autocorrelation in the first-differenced idiosyncratic error terms.

Table 5 presents our estimation results for these tests of strict Granger causality from X to Y. While there is evidence of first order serial correlation in the residuals, the AR(2) test statistics suggest the absence of second order serial correlation in the first differenced errors—thus indicating the validity of the instruments. The lower part of the table presents the p-values for the Granger-$\chi^2(2)$ tests. While domestic and cross-border mergers (and their subdivision into outward and inward cross-border mergers) significantly help predict wages in the subsequent two years (with p-values all below 1%), wages are significant predictors only for domestic merger activity (p=0.035), but not for cross-border mergers in the subsequent two years. Our Granger causality tests thus suggest that causality runs from cross-border mergers to wages, but not from wages to cross-border mergers. While we cannot exclude partial bi-directional causality between domestic mergers and wages, this domestic-mergers/wage relationship is not the focus of our paper. It is, of course, the positive spillover effects and negative bargaining effects on domestic wages due to cross-border merger activity that represents our area of causal interest.

[Table 5 approximately here]

CONCLUDING REMARKS

Motivated by the lack of scholarship which integrates the two contending perspectives on how cross-border merger activity might impact domestic wages, we consider the presence of positive spillover effects and negative bargaining effects in one

[18] To be specific, the first lagged dependent variable (t-1) – which is clearly endogenous – will use lagged values from t-4 and beyond in order to create a system of GMM instruments. Further, the second lagged dependent variable (t-2) – also clearly endogenous – will used lagged values from t-5 and beyond in order to create a system of GMM instruments. For those variables that are strictly exogenous in the regression estimation, all earlier values of that construct will be employed to create a system of GMM instruments. The above instrumentation strategy represents the best fit.

conceptual framework. From our theoretical model we are able to derive two testable propositions: (1) unionization enhances the likelihood that cross-border mergers lead to lower domestic wages; (2) outward cross-border mergers – as compared to inward cross-border mergers – more likely generate lower domestic wages. 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 41 US industries over the 1986-2001 period, and find support for our theoretical contentions. First, cross-border merger activity appears to be more likely to yield a negative impact on domestic wages under higher unionization rates; thus, cross-border mergers seem to increase the bargaining power of firms vis-à-vis unions and leads to lower domestic wages in highly unionized industries. Second, outward cross-border merger activity appears to be more likely to generate wage reductions than does inward cross-border merger activity; thus while positive spillover effects and negative bargaining effects both appear to be at play, the negative bargaining effects are more manifest/dominant in outward cross-border M&As.

Our analysis may shed some light on the mixed results found in the empirical literature concerning positive spillover effects. While the positive spillover effects literature consists of an abundance of empirical work (unlike the bargaining effects literature), much of that work has failed to identify positive 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 (e.g., Aitken & Harrison, 1999; Girma, Greenaway & Wakelin, 2001; Barrios & Strobl, 2002; Martins, 2005). According to our results, the failure to fully understand both the impact of negative bargaining effects and the critical role of unionization may partly explain the inability to elicit consistent evidence in support of positive spillover effects. 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 unionization is critical in determining which effect dominates.

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Figure 1: Net-Effect on Wages of Cross-Border-Share, Unionization, and their Interaction

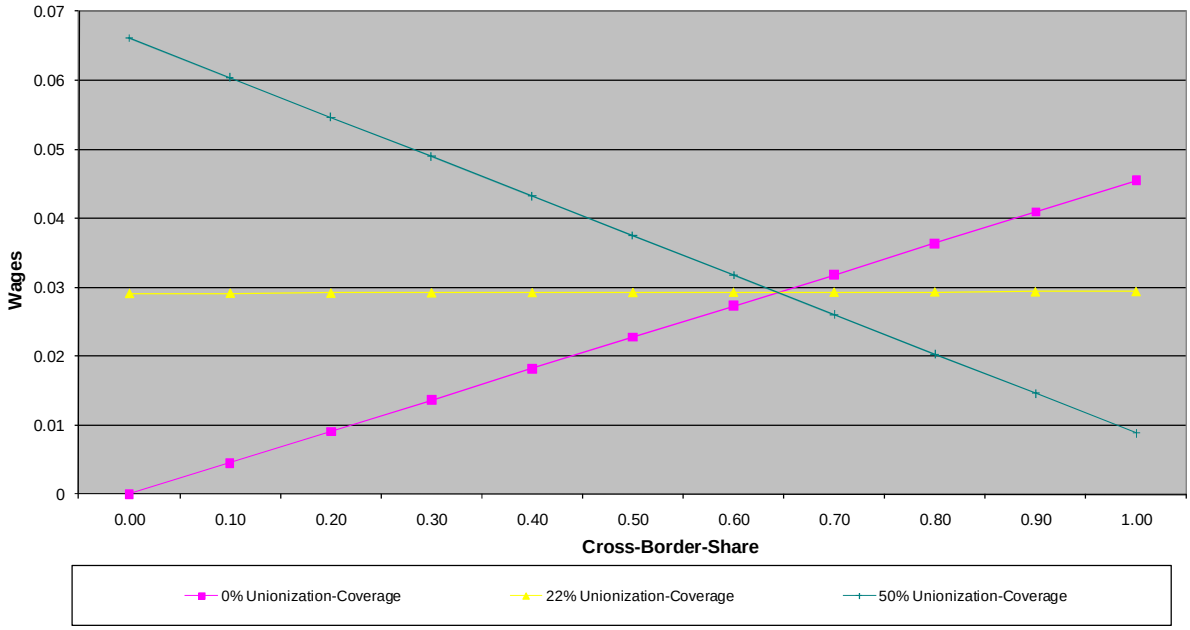

Figure 2: Net-Effect on Wages of Outward-Share, Unionization, and their Interaction

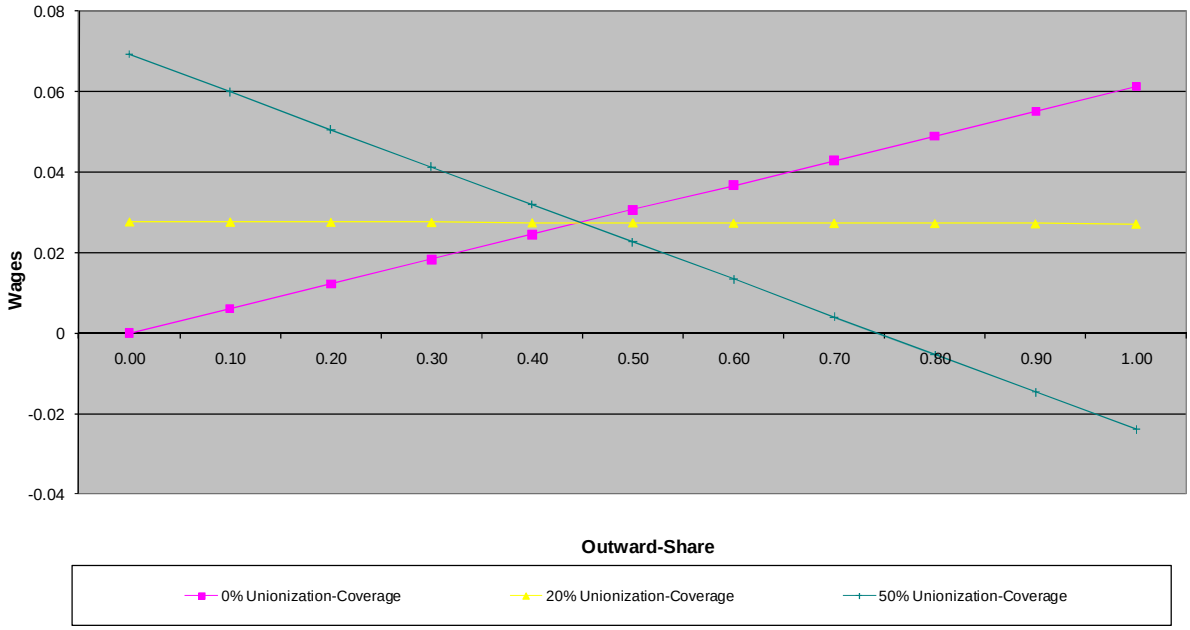

Figure 3: Net-Effect on Wages of Inward-Share, Unionization, and their Interaction

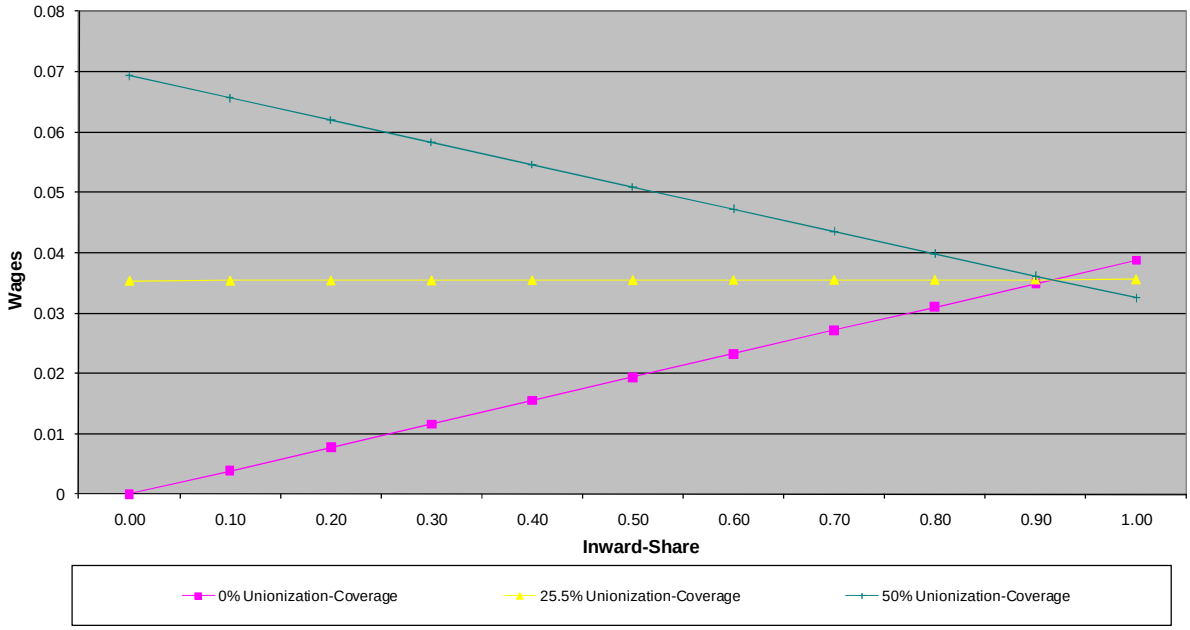

Table 1: Variable definitions

Merger variables	
Total-Merger-Activity	Total number of mergers (i.e., both domestic and cross-border) divided by thousand employees in a 2-digit industry; source: Thomson Financial Securities & Bureau of Economic Analysis.
Cross-Border-Share	Total number of cross-border mergers divided by total number of mergers in a given 2-digit industry; source: Thomson Financial Securities.
Outward-Share	Total number of outward cross-border mergers (US acquirer & non-US target) divided by total number of mergers in a given 2-digit industry; source: Thomson Financial Securities.
Inward-Share	Total number of inward cross-border mergers (non-US acquirer & US target) divided by total number of mergers in a given 2-digit industry; source: Thomson Financial Securities.
Other variables	
Wage (w)	Wage and salary accruals in USD (the regressions use the natural logarithm); source: Bureau of Economic Analysis.
Employees	Full time equivalent employees in thousands; source: Bureau of Economic Analysis.
Value-Added	Value added per employee in mlns. of USD; source: Bureau of Economic Analysis.
Employment-Growth	Annual percentage change in the total number of employees; source: Bureau of Economic Analysis.
Unionization	Share of total employees unionized according to membership, or union coverage; source: http://www.unionstats.com/
Corporate-Profit	Corporate profits before tax per employee in mlns. of USD; source: Bureau of Economic Analysis.
Female-Participation	Share of women out of all employees; source: Bureau of Labor Statistics, http://www.bls.gov/data/archived.htm
Capital-Intensity	Capital per employee in mlns. of USD; source: Compustat.

Table 2: Summary statistics

Panel A: Non-merger variables

	Wage		Employees		Unionization			
					Membership		Coverage	
Year	Mean	Median	Mean	Median	Mean	Median	Mean	Median
1986	24653	24563	882	690	0.235	0.201	0.253	0.214
1987	25549	25418	902	732	0.228	0.195	0.246	0.215
1988	26777	26599	1033	802	0.202	0.170	0.220	0.186
1989	27697	27262	1057	851	0.190	0.164	0.208	0.175
1990	28929	28342	1073	872	0.185	0.155	0.205	0.169
1991	30025	29365	1060	852	0.185	0.149	0.202	0.162
1992	31686	30834	1071	867	0.191	0.156	0.206	0.171
1993	32430	31197	1099	872	0.187	0.131	0.200	0.142
1994	33437	32440	1134	846	0.182	0.140	0.198	0.154
1995	34734	33891	1165	827	0.168	0.139	0.180	0.146
1996	35909	34880	1194	842	0.166	0.130	0.180	0.139
1997	37543	35719	1230	804	0.163	0.117	0.174	0.124
1998	39274	36923	1266	817	0.153	0.118	0.167	0.125
1999	41051	38616	1291	836	0.158	0.110	0.168	0.121
2000	43137	40718	1319	827	0.149	0.105	0.159	0.117
2001	44230	41022	1307	783	0.149	0.102	0.159	0.112
Total	33778	32275	1136	803	0.179	0.150	0.194	0.158

Panel A continued: Non-merger variables

	Value-Added		Employment-Growth		Corporate-Profit		Female-Participation		Capital-Intensity	
Year	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
1986	0.065	0.044			0.0046	0.0024	0.337	0.280	0.138	0.052
1987	0.071	0.045	0.062	0.002	0.0108	0.0031	0.338	0.287	0.132	0.059
1988	0.070	0.050	0.041	0.005	0.0122	0.0052	0.367	0.322	0.157	0.065
1989	0.072	0.051	0.093	0.004	0.0118	0.0053	0.368	0.327	0.165	0.066
1990	0.075	0.053	0.081	0.000	0.0133	0.0033	0.369	0.325	0.177	0.067
1991	0.077	0.055	0.018	-0.009	0.0117	0.0025	0.370	0.333	0.154	0.061
1992	0.080	0.057	0.093	0.000	0.0125	0.0028	0.370	0.333	0.161	0.059
1993	0.082	0.057	0.111	0.005	0.0117	0.0034	0.369	0.330	0.171	0.064
1994	0.086	0.061	0.132	0.009	0.0145	0.0036	0.368	0.326	0.197	0.070
1995	0.093	0.061	0.143	0.004	0.0185	0.0054	0.367	0.330	0.236	0.067
1996	0.097	0.065	0.151	0.003	0.0198	0.0049	0.367	0.328	0.226	0.075
1997	0.100	0.067	0.176	0.006	0.0199	0.0060	0.367	0.329	0.230	0.074
1998	0.104	0.069	0.173	0.007	0.0155	0.0053	0.366	0.329	0.279	0.081
1999	0.110	0.072	0.166	0.001	0.0143	0.0043	0.368	0.331	0.312	0.088
2000	0.119	0.076	0.182	0.001	0.0110	0.0032	0.368	0.332	0.377	0.085
2001	0.121	0.074	-0.027	-0.002	0.0107	0.0026	0.368	0.334	0.340	0.088
Total	0.089	0.061	0.108	0.001	0.0134	0.0037	0.365	0.326	0.218	0.067

Panel B: Merger variables

Year	Total-Merger-Activity		Cross-Border-Share		Outward-Share		Inward-Share	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
1986	0.041	0.028	0.125	0.095	0.034	0.000	0.091	0.035
1987	0.043	0.026	0.129	0.125	0.037	0.012	0.092	0.042
1988	0.055	0.034	0.219	0.220	0.065	0.043	0.153	0.137
1989	0.075	0.044	0.229	0.202	0.065	0.049	0.164	0.114
1990	0.074	0.044	0.252	0.231	0.069	0.043	0.182	0.152
1991	0.077	0.038	0.208	0.183	0.096	0.071	0.112	0.082
1992	0.086	0.039	0.211	0.211	0.115	0.089	0.096	0.083
1993	0.099	0.045	0.207	0.169	0.114	0.101	0.093	0.067
1994	0.115	0.055	0.211	0.181	0.100	0.083	0.111	0.060
1995	0.139	0.060	0.219	0.202	0.112	0.100	0.107	0.091
1996	0.138	0.065	0.198	0.167	0.116	0.117	0.082	0.061
1997	0.140	0.073	0.214	0.219	0.112	0.102	0.103	0.086
1998	0.157	0.082	0.210	0.191	0.118	0.125	0.092	0.070
1999	0.133	0.074	0.249	0.222	0.109	0.105	0.141	0.111
2000	0.111	0.066	0.327	0.343	0.147	0.140	0.180	0.143
2001	0.105	0.043	0.325	0.333	0.136	0.117	0.189	0.148
Total	0.101	0.053	0.223	0.202	0.098	0.077	0.125	0.091

Note: This table presents summary statistics on 41 2-digit SIC industries.
For variable definitions see Table 1.

Table 3: The Effects of Cross-Border Mergers on Wages

Dependent variable: Natural logarithm of Wage								
Estimation method:	Random Effects				Fixed Effects			
Unionization Definition:	Membership		Coverage		Membership		Coverage	
	Coeff	z-val	Coeff	z-val	Coeff	t-val	Coeff	t-val
Independent Variables (1st lag of)								
Total-Merger-Activity	0.1303	4.70	0.1297	4.69	0.1239	3.00	0.1234	3.04
Total-Merger-Activity * Unionization	0.0037	0.04	0.0157	0.17	0.0111	0.12	0.0241	0.30
Cross-Border-Share	0.0407	2.40	0.0451	2.70	0.0412	2.28	0.0455	2.28
Cross-Border-Share * Unionization	-0.2056	-2.92	-0.2119	-3.30	-0.1989	-2.68	-0.2056	-2.76
Unionization	0.1382	2.84	0.1319	2.62	0.1395	1.78	0.1323	1.62
Capital-Intensity	0.0121	1.30	0.0121	1.30	0.0123	1.01	0.0124	1.01
Female-Participation	-0.7904	-7.76	-0.7934	-7.79	-0.9284	-2.84	-0.9313	-2.85
Corporate-Profit	0.3100	2.59	0.3060	2.59	0.2900	1.57	0.2860	1.56
Employment-Growth	0.0356	7.58	0.0355	7.58	0.0355	18.33	0.0354	18.01
Value-Added	0.4299	5.34	0.4341	5.50	0.3971	3.44	0.4020	3.52
Constant	10.372	212.5	10.372	211.8	10.423	85.38	10.423	84.85
Observations	540		540		540		540	
Clusters (# of 2-digit industries)	41		41		41		41	
R-squared								
Within	0.963		0.963		0.9637		0.963	
Between	0.377		0.379		0.3488		0.350	
Overall	0.483		0.484		0.4600		0.461	

Note: The dependent variable is the natural logarithm of wages at the 2-digit SIC industry level.
A full set of year dummies is included. For variable definitions see Table 1.

Table 4: The Effects of Cross-Border Mergers on Wages: Outward versus Inward M&As

Dependent variable: Natural logarithm of Wage								
Estimation method:	Random Effects				Fixed Effects			
Unionization Definition:	Membership		Coverage		Membership		Coverage	
	Coeff	z-val	Coeff	z-val	Coeff	t-val	Coeff	t-val
Independent variables (1st lag of)								
Total-Merger-Activity	0.1304	4.71	0.1296	4.69	0.1244	3.01	0.1235	3.04
Total-Merger-Activity * Unionization	0.0198	0.21	0.0307	0.33	0.0278	0.32	0.0397	0.50
Outward-Share	0.0579	1.67	0.0614	1.78	0.0579	1.55	0.0613	1.57
Outward-Share * Unionization	-0.3207	-2.26	-0.3126	-2.43	-0.3171	-2.15	-0.3092	-2.18
Inward-Share	0.0340	1.94	0.0383	2.21	0.0346	2.37	0.0388	2.30
Inward-Share * Unionization	-0.1483	-1.92	-0.1592	-2.22	-0.1401	-2.04	-0.1513	-2.18
Unionization	0.1456	2.97	0.1381	2.72	0.1470	1.81	0.1387	1.65
Capital-Intensity	0.0123	1.34	0.0123	1.34	0.0127	1.05	0.0127	1.04
Femaie-Participation	-0.7886	-7.68	-0.7922	-7.72	-0.9173	-2.82	-0.9224	-2.84
Corporate-Profit	0.3100	2.62	0.3060	2.62	0.2910	1.62	0.2880	1.60
Employment-Growth	0.0355	7.60	0.0355	7.60	0.0354	18.44	0.0354	18.12
Value-Added	0.4150	5.22	0.4212	5.37	0.3824	3.19	0.3891	3.27
Constant	10.370	208.5	10.371	207.9	10.417	85.71	10.418	85.14
Observations	540		540		540		540	
Clusters (# of 2-digit industries)	41		41		41		41	
R-squared								
Within	0.965		0.965		0.965		0.965	
Between	0.376		0.378		0.350		0.351	
Overall	0.483		0.484		0.462		0.463	

Note: The dependent variable is the natural logarithm of wages at the 2-digit SIC industry level.
A full set of year dummies is included. For variable definitions see Table 1.

Table 5: Granger Causality Testing with GMM

Dependent variable:	Natural log of Wage		Natural log of Wage		Domestic Mergers/ Employees		Cross-Border Mergers/ Employees		Outward Mergers/ Employees		Inward Mergers/ Employees	
Independent variables:	Coeff	z-val	Coeff	z-val	Coeff	z-val	Coeff	z-val	Coeff	z-val	Coeff	z-val
Lag 1: Natural log of wage	0.8530	12.08	0.8332	11.89	0.0813	0.63	-0.0798	-0.55	-0.0974	-1.15	-0.0252	-0.37
Lag 2: Natural log of wage	0.0348	0.43	0.0436	0.57	-0.3445	-2.49	-0.0691	-0.83	-0.0313	-0.63	-0.0040	-0.08
Lag1: Domestic mergers/employees	-0.0022	-0.05	0.0031	0.07	0.5257	5.12	-0.1628	-2.25	-0.1083	-1.84	-0.0229	-1.28
Lag2: Domestic mergers/employees	0.1166	3.84	0.1106	3.72	0.2922	1.39	0.4645	1.44	0.3184	1.31	0.1056	1.62
Lag 1: Cross-border mergers/employees	0.0018	0.07			-0.0826	-1.24	0.4452	11.17				
Lag 2: Cross-border mergers/employees	-0.1137	-4.24			-0.0878	-0.83	-0.1406	-1.56				
Lag 1: Outward mergers/employees			-0.0513	-0.84					0.3305	5.74	-0.0786	-2.55
Lag 2: Outward mergers/employees			-0.0664	-3.04					-0.0391	-1.22	0.0930	3.15
Lag 1: Inward mergers/employees			0.1781	1.91					0.7843	2.17	0.2984	1.64
Lag 2: Inward mergers/employees			-0.1634	-2.57					-0.3696	-1.31	-0.1260	-1.04
Constant	1.1801	2.09	1.2904	2.19	2.6587	1.98	1.5009	1.17	1.2963	1.30	0.2983	0.93
Observations	510		510		510		510		510		510	
Clusters (# of 2-digit industries)	41		41		41		41		41		41	
Arellano-Bond test for zero autocorrelation in first-differenced errors (p-values):												
AR(1)	0.0008		0.0005		0.0028		0.1793		0.1407		0.0479	
AR(2)	0.5997		0.9539		0.2386		0.2456		0.1450		0.1564	
Granger causality tests (p-values of Wald tests of joint significance of respective coefficients):												
Do domestic mergers cause wages?	0.0003		0.0003									
Do cross-border mergers cause wages?	0.0000											
Do outward mergers cause wages?			0.0084									
Do inward mergers cause wages?			0.0002									
Do wages cause domestic mergers?					0.0346							
Do wages cause cross-border mergers?							0.3952					
Do wages cause outward mergers?									0.4316			
Do wages cause inward merger?											0.6196	

Note: The table reports Arellano-Bond (1991) dynamic panel-data estimation (GMM). This method eliminates industry fixed effects by first differencing. AR(k) is the p-value of a test that the average autocovariance in residuals of order k is zero. Instruments include lagged levels of the dependent and the predetermined variables dated t-2 or earlier. Granger causality tests are Wald tests of joint significance of the respective coefficients, which are χ^2-squared distributed, reported are the p-values. Standard Errors are adjusted for clustering on SIC industries. Included are a full set of year dummies.