The Multinational Wage Premium and Wage Dynamics

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Abstract

A long recognized fact is that multinational enterprises (MNEs) pay higher wages than their domestic counterparts. However, the question remains how much of the higher wage is attributable to selection effects – as specific workers sort into firms that become MNEs – and how much is a wage premium is due the greater access to global markets that MNEs provide. Using detailed administrative data on French firms and workers over the years 2002-2007, we document a distinct U-shaped pattern in worker-level wages through time, with a dip in earnings observed for several years prior to a domestic firm being acquired by foreign firm, and thus switching to MNE status. This pre-acquisition decline in wages can partly explain why prior evidence found no causal impact of globalization on worker-level wages. Accounting for the pre-acquisition earnings dip we find that MNEs initially increase remuneration to workers by 4.8%, and by 6%-8% after several years. These estimates imply that more than 50% of the observed MNE wage premium is due to the impact of global market access.

JEL Classifications: F66, F14, F23

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1 Introduction

A long recognized fact is that multinational enterprises (MNEs) pay higher wages than their domestic counterparts. This multinational wage premium is a ubiquitous feature of the global economy, realized in developed and developing countries alike, is observed across many sectors, and is present regardless if MNEs originate abroad or domestically. Of course, the immediate question is whether the higher wages paid to workers are due to selection effects – as MNEs hire relatively talented workers that would earn high wages employed elsewhere – or if the MNEs pay an actual wage premium resulting from the greater access to global markets that they are able to provide. The answer to this question has important implications: if MNEs pay a premium to workers to otherwise identical workers, then globalization policies can have a direct effect on the distribution of income; whereas if selection effects dominate, then globalization will have no impact on worker outcomes.

Early evidence indicated that average firm-level wages are higher at MNEs, yet the recent availability of matched employee-employer datasets across several countries has cast doubt about the actual impact on worker-level wages. Much of the evidence suggests that the observed multinational wage premium may be almost entirely due to the sorting of different workers across firms, with no causal implications of globalization on average. Hijzen et al. (2013) incorporates administrative data from several countries (Brazil, Germany, Indonesia, Portugal, & UK) and finds little evidence that MNEs increase wages to otherwise identical workers. Similarly, Heyman et al. (2007) concludes that foreign ownership does not increase wages of Swedish workers, with some evidence that MNEs may even pay lower wages. Huttunen (2007) does find some evidence in Finland of a small wage premium (<2% - 3%) for high skill workers, but only several years after their employer becomes an MNE. Each of these studies combine a difference-in-difference (DID) estimator with propensity score matching techniques to control for the selection of firms that are selected into multinational status. One key result we document here is that worker-level wages exhibit a distinct U-shape pattern as domestic firms switch to MNE status – declining several years prior to foreign acquisition, and increasing for several years after – which confounds standard DID estimates.

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1Among many others, see Aitken, Harrison & Lipsey (1996), Lipsey & Sjöholm (2004), and Budd, Konings & Slaughter (2005) for firm-level evidence across several countries of higher wages paid by MNEs.
2As an alternative strategy, Martins (2011) examines changes in wages due to labor mobility and finds that they are similar for Portuguese workers that transition from employment at a domestic to a foreign firm, or from one foreign firm to another, suggesting there is a negligible MNE wage premium.
To understand the selection of firms into multinational status through time, it is first important to recognize that the overwhelming majority of MNE expansion into foreign countries proceeds through cross-border merger and acquisition (M&A) activity. The incidence of foreign acquisition is typically preceded by a series of negative productivity shocks within domestic target firms; with an active M&A market, negative internal productivity shocks raise the net benefit of selling valuable assets to external firms, and subsequently domestic firms will become an MNE whenever the acquiring firm originates abroad. Importantly, these productivity shocks may also be associated with renumeration to workers, such that workers employed at firms that become MNEs face different trends in wages than firms that remain domestic. As is now well-known (c.f., Ashenfelter (1978) and Heckman & Smith (1999)), persistent reductions in wages prior to joining a MNE (i.e., a pre-treatment earnings dip) can generate substantially biased DID estimates of the causal impact of multinational status on worker-level wages.

Consistent with our hypothesis, we show that worker-level wages paid in the first year as an MNE are significantly less than wages paid two years prior to acquisition by a foreign firm, and appear even smaller than wages paid three years prior to acquisition. The reduction in wages over the pre-acquisition years is substantial: on average, worker-level wages are 7.9% higher three years prior to acquisition. A key contribution of our analysis is to account for these confounding reductions in wages prior to acquisition by foreign firms when estimating the multinational wage premium. Using detailed administrative data about French workers and firms between 2002 and 2007, we estimate that MNEs increase wages for their workforce by 4.8% in the short-run (i.e., in the year after a firm becomes an MNE). Our estimate of a positive and significant MNE wage premium contrasts with prior evidence of no impact of foreign acquisition on worker-level wages.

It is also important to recognize that, upon acquisition, the parent company of an MNE makes investments in the innovative, productive, and export capabilities of the foreign affiliate (Guadalupe et al., 2012), so that wages may continue to increase for several years after acquisition. In order to distinguish short- and long-run effects of MNEs, we sequentially estimate the increase in wages from the year prior to acquisition \( (t - 1) \) to several individual years after acquisition by an MNE \( (t, t + 1, t + 2, \text{ etc.}) \). Besides the significant impact of MNEs on wages realized in the first year.

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3. UNCTAD (2000) reports that more than 80% of global capital flows occur via cross-border M&A activity.
4. Blonigen et al. (2013) provide direct evidence that negative productivity shocks promote takeover by MNEs.
after acquisition, our results indicate that the impact of MNE status on wages is approximately 7.8% over the long-run (i.e., after third year as an MNE), which approximately 60% larger than the estimated short-run effect. Finding a larger long-run effect is economically important, as it is arguably the more relevant effect of globalization policies that promote cross-border investment.

Finally, we highlight dynamics in MNE activity at more aggregate levels that may also confound DID estimates of the multinational wage premium. A prominent feature of aggregate M&A activity is the existence of merger waves, so that the propensity of firms to become MNEs ebbs and flows over time. The year to year oscillations in merger waves varies substantially across sectors. We highlight that the differences between sectors in the dynamics of M&A activity are correlated with inter-industry wage differentials, so that the omission of sector-by-time effects in prior analyses leads to substantial bias. Consistent with expectations, we show that omitting information about sector-specific dynamics in our sample – which covers an expansion period in M&A activity – leads to an upward biased estimate. Importantly, most prior studies of the wage premium examine periods of contraction in cross-border investment activity that would lead to downward biased estimates when sector-specific dynamics are omitted, which may partly explain why they have generally found no evidence of a significant multinational wage premium.

In summary, our analysis contributes to the literature on globalization and wages by (i) documenting a sharp earnings dip among workers employed at domestic firms that later become MNEs, (ii) estimating the multinational wage premium, explicitly accounting for persistent negative shocks to worker-level wages among domestic firms that switch to MNE status, and (iii) controlling for sector-specific dynamics in MNE activity that confound standard DID estimates of multinational wage premium. In the next section we illustrate systematic patterns in MNE activity over time in the raw data, highlighting both sector-level and firm-level dynamic characteristics. These patterns serve as motivation for our preferred empirical strategies for estimating the wage effects of MNEs developed in Section 3. The data sources for both worker and firm characteristics, as well as variable construction, are described in Section 4. The following section presents the results from our preferred empirical specifications, while Section 6 elucidates how failing to control for sector- and firm-specific dynamics generates biases that have plagued prior studies. The final section concludes.

5For recent analyses of merger waves see Harford (2005) and Forbes & Warnock (2012), among many others.
2 A First Look at MNE Characteristics Across Time

In order to motivate our empirical strategy for estimating the multinational wage premium, here we illustrate the systematic patterns MNE activity over time at the sector-level, as well as changes in firm-level characteristics prior to becoming a MNE. In Figure 1 we plot global cross-border M&A activity (the predominant mode of foreign investment) for the years 1990-2008. In Panel A we plot the number of cross-border M&As observed in each year aggregated across all manufacturing sectors and countries, while Panel B plots the number of M&As for each manufacturing sector defined at the 2-digit SIC level. In each panel the values correspond the volume of M&A activity relative to the sample mean for all manufacturing sectors.

Consistent with the large literature on merger activity, Panel A reveals a distinct wave pattern in the amount of cross-border acquisitions over time. The changes in activity are substantial; for example, the relatively low volume of activity at the beginning of the sample is less than half the volume of M&A activity in 2000, with another sharp decline in activity in 2001 and 2002. While time-period fixed effects may capture this aggregate oscillation, Panel B demonstrates that the fluctuations in multinational activity are quite different across sectors.

On average, sectors with higher levels of M&A activity are also those with relatively larger growth over the sample period, while low volume sectors experience a flat trend in M&A activity over time. Looking year to year, there are also substantial differences in the variation in activity across sectors. The growth in aggregate activity from 2002 to 2008 is primarily the result of increases in the M&A activity of only a few sectors. If these sectors with relatively higher waves of
cross-border investment activity during 2002–2008 are also those with relatively high wages, then one might spuriously attribute higher wages to the effects of MNE. Alternatively, if one were to examine a different sample period of, say, 1997–2004, it would appear that there is a downward trend in M&A activity among these high wage sectors, which would spuriously lead to smaller estimates of the effects of MNE status. At a minimum, the patterns in Figure 1 suggest that it is crucial to account for sector-specific dynamics to accurately identify the wage premium paid by MNEs. But it is also important to recognize that the direction of the bias generated by omitting sector-by-year effect depends on whether the sample period covers an expansion or contraction period within a merger wave.

In Figure 2 we take advantage of detailed administrative data from French firms to illustrate systematic changes in firm characteristics as they transition from domestic to multinational status. Specifically, we plot TFP for firms that are acquired by foreign owners relative to sector and year averages, from three years prior to the acquisition through four years after the firm is acquired. The middle line shows the relative detrended TFP for the average French firm acquired by a foreign owner, whereas the lines above and below show the relative detrended TFP for the 95th and 5th percentiles, respectively.

There are several important features of Figure 2. First, prior to acquisition, relative detrended TFP among target firms is falling significantly for any initial TFP level. Second, on average, target

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6The data sources used to estimate firm-level TFP and construct Figure 2 are described in section 4.
firms transition from being 1.5% above the mean productivity to being indistinguishable from the average firm in their sector at the time of acquisition. Third, the relative dip in productivity of domestic firms that become MNEs is realized for several years prior to acquisition.\footnote{We note that our results indicate that firm-level productivity and worker-level wages decline for several years prior to foreign acquisition, while Fich, Cai & Tran (2011) provides evidence from administrative filings by firms declaring their potential intent to merge that the length of M&A negotiations, from first contact, is approximately 120 days on average, and only 160 days at the upper quartile. Hence, it is highly unlikely that changes in wages two or three years prior to acquisition are related to the negotiation of a takeover by a foreign MNE. See Blonigen et al. (2013) for further discussion of how these productivity shocks promote foreign acquisition of domestic targets.}

The dynamics of firm-level productivity illustrated in Figure 2 are relevant here because these productivity shocks in the pre-acquisition period are also informative about the evolution of wages paid by firms that become MNEs. The relative reductions in productivity are also associated with relative reduction in wages at firms that switch to being MNEs upon acquisition by a foreign firm. Hence, over the entire pre-acquisition period, wages will appear on average higher then they are at the incidence of acquisition, which will likely confound DID estimates. Moreover, the tendency for firms that become MNEs to have nearly identical productivity to non-MNEs at the time of foreign acquisition, and the fact that the entire distribution of firms acquired by MNEs to experience declines in productivity for several years, each suggest that static TFP levels have only a tenuous relationship with the propensity of firms to become MNEs at any given point in time. In other words, simply controlling for firm productivity levels still omits important information about the propensity of firms to select into MNE status, and therefore may lead to biased estimates of the multinational wage premium.

In addition to wage dynamics, shocks to productivity within firms prior to becoming an MNE also informs about potential changes in workforce composition. The realization of negative firm-level shocks may induce some workers to exit. Since workers with better attributes are more likely to find improvements in employment with a new job search, it likely that any worker exits that occur in response to these productivity shocks will be not be random, and rather will be biased toward highly capable workers. Hence, over the entire pre-acquisition period, worker attributes may appear better on average higher then they actually are at the incidence of acquisition, which will likely bias DID estimates that treat pre-acquisition workforce characteristics as fixed. In the next section we develop an empirical strategy that explicit accounts for the confounding implications of these sector-specific and firm-specific dynamics in MNE activity.
3 Empirical Strategy

In this section we describe our empirical strategy to estimate the multinational wage premium. Consistent with much of the literature, we estimate a linear wage equation with the following form:

$$\ln \omega_{ijsy} = \alpha + \beta MNE_{ijsy} + X_{ijsy} \Gamma + \sigma_{sy} + \epsilon_{ijsy}$$ (1)

where $MNE_{ijsy}$ is an indicator variable that equals unity if firm $j$ in sector $s$, where worker $i$ is employed during year $y$, belongs to a multinational enterprise. The vector $X_{ijsy}$ contains several worker and firm control variables, and the term $\sigma_{sy}$ represent sector-by-year fixed effects. Our key parameter of interest is $\beta$, which indicates the wage premium paid by multinational firms. To identify $\beta$, we exploit variation in MNEs status as firms switch from domestic to multinational status when they are acquired by foreign firms. This variation in MNE status due to cross-border M&A activity is particularly relevant, as it is the predominant mode of foreign investment (UNCTAD, 2000), and also corresponds to a common strategy adopted in prior literature.

Pertinent to our analysis here, Blonigen, Fontagne, Sly & Toubal (2013) show that firms are more likely to become multinational firms upon realizing negative shocks to their productivity, because these shocks raise their propensity to accept takeover bids and be acquired by multinational firms. Important for our purposes here, these firm-level productivity shocks also inform about the potential renumeration to workers; negative productive shocks lead to reductions in relative wages. This potential for workers employed at firms that are acquired by MNEs to experience reductions in wages prior to acquisition raises concerns about using the sample years prior to acquisition as the appropriate counterfactual. As Heckman & Smith (1999) explain, the key issue in constructing the appropriate counterfactual is whether pre-treatment (i.e., pre-acquisition) dips in earnings are transient or persistent. If the decline in earnings prior to acquisition is transient, then a pre/post comparison of wages will overstate the effect of MNE, whereas if they are persistent reductions in earnings, the pre/post comparison will understate the impact MNEs have on worker-level wages.

There are several facts that suggest that the observed worker-level dip in wages prior to acquisition is persistent, so that standard DID estimates would understate the true effects of MNEs on wages. Postel-Vinay & Turon (2010) show that even if firm-level productivity shocks are transitory,
the resulting worker-level wage shocks are persistent. They argue that even transitory productivity shocks can give firms a credible threat to terminate the workers’ employment, which allows the firm to renegotiate wages downward, thereby generating a persistent wage shock. Similarly, Lise et al. (2013) show how persistent firm-level productivity shocks induce renegotiation of long-term contracts, and thus generate persistent wage dynamics.

Note that when estimating (1), we take advantage of administrative data that links workers to their employer, which allows us to also control for a variety of workforce characteristics. Smeets et al. (2012) confirm that the attributes of workers do change substantially following acquisition. However, in addition to persistent reductions in wages prior to domestic firms becoming MNEs, negative productivity shocks among firms induce distinct changes in workforce composition during the pre-acquisition period. If workers with better employment prospects exit in response to these shocks, the workforce of a firm that becomes MNE will spuriously appear to have higher capability over the pre-acquisition period. Prior evidence suggests that these concerns are quantitatively important, as target firms exhibit significantly higher worker separation rates before foreign takeover than observed in the years prior to acquisition. (Hijzen et al., 2013). Alternatively, if one were to focus solely on workers that remain at the same firm as their employer switches to MNE status, the sample of workers will appear spuriously to have lower capabilities than is employed on average. In either case, failing to account for pre-acquisition changes in workforce characteristics will lead to biased estimates of the multinational wage premium.

Let $t$ denote the year of acquisition for each observation. To avoid understating the multinational wage premium due to the persistent earnings dip and changes in workforce composition prior to foreign acquisition, we compare post-acquisition wages to the year just prior to acquisition ($t - 1$). In this sense, our empirical strategy identifies the average treatment effect on the treated for workers employed at firms that switch to MNE status. However, we will also report estimates of the difference in wages in the year of acquisition, $t$, relative to several years prior ($t - 2$ and $t - 3$), and show how the worker-level wages systematically declines over the pre-acquisition period.

8Prior studies have taken several approaches to dealing with changes in workforce composition within MNEs. For example, Hijzen et al. (2013), Heyman et al. (2007) and, Huttunen (2007) focus exclusively on workers that remain employed at the same firm, even as they switch to MNE status. Alternatively, Martins (2011) and Andrews et al. (2010) focus exclusively on workers that switch between employment at MNEs and domestic firms. Our point here is that, regardless if one considers static or mobile workers employed at MNEs, at the time of acquisition the composition of the workforce is much different in the year prior to, and after, a firm becomes an MNE, and that these differences are likely to be non-random.
We are also interested in separating the short-run effect of MNEs on wages from the long-run effect, which may be the more policy relevant impact to consider. The long-run effect of MNE status may differ as acquirers make investments in the capabilities of target firms that subsequently increase worker marginal products. (Guadalupe et al., 2012) Indeed, even after accounting for heterogeneous worker and firm characteristics, Malchow-Moller, Markusen & Schjerning (2013) find that foreign firms exhibit faster wage growth. To separate the short- and long-run effects we estimate the change in wages from year $t - 1$ to each year following acquisition individually; i.e., we separately estimate the differences in wages paid between $(t)$ and $(t - 1)$, $(t + 1)$ and $(t - 1)$, and then $(t + 2)$ and $(t - 1)$. A U-shaped pattern in worker-level wages is evidenced by a reduction in worker-level wages prior to acquisition, and increasing wages at MNEs across the post-acquisition period, which we will see looking across each of the separate specifications of time periods.

Our preferred strategy includes sector-by-time fixed effects, $\sigma_{sy}$. While time period specific effects capture aggregate fluctuations in wages and multinational activity, the patterns in Figure 1 demonstrate that there is substantial heterogeneity, and often divergence, in year-to-year changes in multinational activity across sectors. Importantly, these sector-specific fluctuations in MNE activity may be correlated with inter-industry wage differentials, so that the omission of $\sigma_{sy}$ would bias estimate of our key parameter of interest.

The remaining set of control variables in $X_{ijsy}$ includes a rich set of characteristics for both workers and firms suggested by previous literature. These include worker gender, job tenure (and its squared value) and a skill dummy being one if the worker is employed in a high skilled occupation. The detailed information about the location of workers’ employment allows us to also control for the spatial distribution of wages across regions within a country using regional fixed effects. On the firm side, it is well-known that high productivity firms pay higher wages. In addition, there is evidence from inbound foreign investment flows that high productivity firms are more likely to be acquired by MNEs; see evidence from Chile in Ramondo (2009), from Indonesia in Arnold & Javorcik (2009), from the U.S. in Criscuolo & Martin (2009), and from Spain in Guadalupe et al. (2012). Thus, we include a measure of firm-level TFP in $X_{ijsy}$. Besides firm-level productivity we include observed capital intensity, skill intensity and an export status dummy for each firm.
4 Data

Data regarding workers and occupations come from the “DADS Postes”–Declaration Annuelle de Données Sociales, an employer-employee dataset collected by the INSEE (Institut National de la Statistique et des Etudes Economiques). These data are taken from a yearly notification filed by any firm with employees, and contain information on age, gender, experience, occupation, sector, region, firm identifier, plant size, compensation. The DADS report mandatory information on all declared employees including the number of yearly hours worked, wages (including bonus payments) and occupation. The French classification of occupations identifies skilled and unskilled workers. Skill groups correspond to the 2-digit French Classification of Occupations and Social Categories.

We identify firms involved in a merger or acquisition using the ‘extended’ LIFI (LIaison FINancière) data, a dataset that has information on the ownership and nationality of the parent company of firms located in France. A firm classified as French independent is a resident in France that is not owned by a group. A French affiliate is resident in France and owned by a French parent and a foreign affiliate is a firm that is located in France but owned by a foreign group. We indicate an affiliate as being in foreign owned if the foreign firm controls more than 50% of its shares or voting rights; the results are insensitive to the specified cutoff for an acquisition to take place, as the median share of voting shares owned by a group is 99%. We use LIFI to identify the year of a takeover and the foreign status of the acquiring firm. We define a firm as having undergone a foreign M&A if the owner in year \( t \) is foreign, while the owner in year \( t - 1 \) is French.

To calculate firm-level TFP, we first merge the LIFI data to the EAE (Enquete Annuelle d’Entreprise) annual business survey dataset, which contains information from firms’ income statements and balance sheets. It also reports the location of firms in France and their 4-digit sector of principal activity. The survey has information on firms with more than 25 employees. Importantly, the EAE dataset is exhaustive above this reporting threshold. In order to compute total factor productivity (TFP), we restrict the data to the manufacturing sectors. We compute firm-level TFP using the procedure described by Olley & Pakes (1996), controlling for the simultaneity bias that arises from the endogeneity of a firm’s input selection. We then calculate a firm’s detrended TFP relative to its sectoral average. Our sample covers the years 2002-2007. Table 1 contains summary statistics for each of the key variables in our analysis.
5 Results on the MNE Wage Premium

Figure 3 plots the unconditional distribution of wages observed among domestic firms, MNEs, and those that switch from domestic firms to being MNEs as they are acquired by foreign multinationals during the sample period. The well-known fact that MNEs pay relatively higher wages is apparent, as the distribution of observed MNE wages lies above the observed distribution for domestic firms. Interestingly, we find that firms that switch from being domestic to MNEs within our sample appear to have a relatively higher wages over the whole distribution than those firms that remain domestic, but a distribution of wages that is relatively lower than that for firms that are observed to be MNEs throughout our sample. Table 2 provides key summary stats for the distribution of wages in Figure 3 for each year in our sample period, where we see that higher average wages paid by MNEs for each individual year. Over the whole sample, wages at MNEs are approximately 11% higher. The key question is whether or not the higher wages observed among MNEs are a consequence of their participation in the global economy, or attributable to other worker and firm characteristics.

In this section we present our estimates of the multinational wage premium obtained using administrative data on French firms and workers. We begin by estimating our preferred specifications of equation (1) comparing MNE wages in the year prior to domestic firms being acquired by foreign multinationals \((t - 1)\); we present estimates of the effects of MNEs separately for the short
and long-run \((t, t + 1, \text{and} \ t + 2)\). Next, we examine the wage dynamics for workers in the years prior to their employer becoming an MNE and show how these systematic reductions in wages prior to acquisition can partially explain why prior studies spuriously found negligible effects of MNEs on wages. Finally, we examine how sector-specific fluctuations in MNE activities influence the estimated impact they have on wages, and show how failing to account for these features may also generate substantial bias.

5.1 The Short-Run and Long-Run Effects of MNEs on Wages

Table 3 presents the results from our preferred empirical strategy across three different time spans: the short-run corresponding to the first year as an MNE \((t)\), the medium-run corresponding to second year as an MNE following acquisition \((t + 1)\), and the long-run effect corresponding to third year as an MNE following acquisition \((t + 2)\). Standard errors are in parenthesis, which are estimated via bootstrapping. All specifications include sector-by-year fixed effects.

For the first year that a firm has MNE status, Column (1) indicates that foreign ownership is immediately associated with higher wages; without any controlling for firm or worker characteristics the simple correlation in between MNE status and wages is 0.018. As Egger & Kreickemeier (2013) and Malchow-Moller et al. (2013) argue, the firm-level wage premium paid to workers employed at MNEs can be attributed to both the access to foreign markets that these firm grant, as well as the superior attributes of firms that select into MNE status. When we introduce the set of firm-level controls to account for other attributes in Column (2), the coefficient on the MNE variable rises to 0.036. In other words, MNEs increase firm-level wages by 3.6% on average with the first year of switching from being a domestic firm, and this effect is significant at one percent level. This increase in firm-level wages is consistent with the large literature extolling the benefits of MNE status; see Aitken et al. (1996), Lipsey & Sjöholm (2004), and Budd et al. (2005). Note that this firm-level effect ignores differences in workforce composition as firms become MNEs, which may confound their estimated impact on worker-level wages.

Column (3) is our preferred estimate of the short-run effect with the full set of worker and firm controls. We find that MNEs increase wages to workers by 4.8% on average. The estimated short-run impact is significant at the one percent level. Both the significance and the magnitude of this estimate are distinct. Prior studies that exploit matched employer-employee data have generally
found insignificant effects of MNEs after controlling for workforce characteristics. Moreover, the point estimates of the MNE wage premium in these studies typically lie between 1% to 3%, even several years after a firm ascends to multinational status: see for example Huttunen (2007), and Hijzen et al. (2013). Some prior evidence even points to a negative wage premium paid by MNEs: see Heyman et al. (2007). Our empirical strategy differs in that we control explicitly for sector-specific oscillations in MNE activity over time, as well as persistent shocks to earnings prior to a domestic firm being acquired by foreign multinational, which reveals an immediate effect of MNEs on worker level wages of nearly 5%, which is significant at high degrees of confidence.

It is worth noting that looking across columns (1)-(3), the coefficient on MNE status becomes larger as we introduce firm- and worker-level controls, rather than becoming smaller. This fact indicates that, near the time of acquisition, that the characteristics of firms that become MNE, as well as the characteristics of workers employed at firms that transition to being MNEs, are both negatively correlated with relative wage levels. Hence these estimates provide evidence consistent with firms suffering negative shocks in performance, and their workforce being negatively selected (i.e., relatively higher ability workers exiting), in the years just prior to acquisition, and therefore confounding DID style estimates of the impact of MNEs on wages.

In addition to short-run effects, we note that if parent companies make investments in the productive capabilities of firms following acquisition, as documented by Guadalupe et al. (2012), then wages may continue to increase for several years after acquisition. Malchow-Moller et al. (2013) provide some evidence that MNEs exhibit faster wage growth in addition to higher wage levels. Relatedly, Huttunen (2007) does find some evidence that foreign acquisition increases wages among high skill workers several years after acquisition, despite little or no effect detected immediately. Frictions in the wage setting process could also delay potential increases in earnings. Hence, the short-run effects in Column (3) may understate the total effects MNEs have on wages.

Columns (4)-(6) of Table 3 present results for the changes in payments to workers two years after a French domestic firm is acquired by a foreign MNE. Column (4) indicates that foreign acquisition by an MNE has a positive correlation with wages of 0.027 in the second year as an MNE. Columns (5) & (6) sequentially introduce firm and worker-level control variables. Including firm-level controls we find that MNE status is associated with 6.3% higher wages. Our preferred estimate of the MNE wage premium in medium-term with both worker and firm-level controls in
Column (6) is 0.06, which is significant at the one percent level. This 6.0% increase in wages after two years suggests that MNEs may continue to increase wages beyond their initial impact; however we note that the estimated 6.0% effect in the second year as an MNE does not differ statistically from the estimated immediate effect of 4.8%. The difference between the two point estimates corresponds to approximately one standard error.

In Columns (7)-(9) of Table 3, we consider the increase in wages realized by workers employed by a firm in its third year as an MNE. Column (7) indicates that there is much higher correlation between MNE status and wages after three years; 0.115 as opposed to 0.027 or 0.018 in the medium and short-run, respectively. Even after we introduce firm and worker characteristics the long-run impact of MNEs on wages appears larger than the shorter term impacts. Our preferred estimate in Column (9) suggests that MNEs pay a wage premium of 7.8% three years after the switch from being a domestic firm, and this estimate is significant at the one percent level. By way of comparison, the estimated long-run impact is more than 60% larger than the immediate effect of joining an MNE. The estimated long-run impact of 7.8% is also statistically different from the point estimate of the increased wages realized in the first year as an MNE; by way of comparison the long-run impact is more than two standard errors away from the estimated short-run effect. Moreover, the magnitude of the effect in Column (9), relative to the simple correlation between wages and MNE status in Column (7), indicates that a significant majority of the observed MNE wage premium is due to access to global markets, rather than selection effects.

Across each time horizon, we find that the estimated coefficients on worker and firm characteristics corresponds with prior evidence. Male workers earn between 20% and 27.5% higher wages than female workers. Job tenure is associated with higher wages, albeit with decreasing returns. Workers classified in low-skill occupation categories earn relatively less. Conditional on worker characteristics we also see that firms which use skill intensive and capital intensive production methods tend to pay higher relatively higher wages. One potentially surprising finding is that, although exporting firms tend to pay higher wages in the short- and medium-term, being an exporter in the third year as an MNE are associated with lower wages. However, the endogeneity surrounding the acquisition of firms with pre-existing export networks, as evidenced in Blonigen et al. (2013), as well as investments in export capacity after acquisition, documented by Guadalupe et al. (2012), suggests that the coefficient on the export indicator should not be interpreted as a causal effect.
5.2 Pre-Acquisition Wage Dynamics

The positive and significant wage premium estimated in the previous section for both the short and long-run contrasts with prior evidence that MNEs have negligible impacts on worker wages. We have argued that standard DID empirical strategies which examine changes in wages as domestic firms are acquired by foreign multinationals may be downward biased estimates of the MNE wage premium because they fail to account for persistent reductions in wages during pre-treatment (i.e., pre-acquisition) periods. In this section we elucidate this source of bias by comparing the wages paid by MNEs to several years prior to a firm being acquired by a foreign firm.

Table 4 reports the results from estimating the wage regression in (1), comparing the year of a domestic firm is acquired by a foreign MNE to the two and three years prior to acquisition; i.e., we estimate the difference between wages in year \(t\) and years \(t-2\) and \(t-3\), separately. Contrary to the increase in wages observed after a firm becomes an MNE reported in the last section, Column (1) indicates that wages paid in the first year that a firm becomes an MNE are negatively correlated with wage levels two years before; the correlation is -0.075. Additionally, Column (2) reports that firm-level wages in the first-year after acquisition are 5.7% lower on average than the same firm paid two years prior. Even with additional controls for worker characteristics, Column (3) indicates that, on average, wages paid to similar workers are 3.2% lower in the first year a firm becomes an MNE than they were two years before. This estimated reduction in wages prior to acquisition is significant at the five percent level.

Columns (4)-(6) of Table 4 consider an additional year lag, and report estimates of the difference in wages between the first year a firm joins an MNEs and wages paid three years prior. The reduction in wages prior to acquisition is even more pronounced with the additional lagged year. Column (6) is the preferred estimate which includes both worker and firm controls, and indicates that wages in the first year of a firm becomes an MNE are 7.9% lower than they were three years prior to acquisition by a foreign multinational. The estimated reduction in wages across this time span is significant at the one percent level.

The results in Table 4 demonstrate that workers that are employed at the firms that are acquired by foreign MNEs have recently suffered significant wage reductions. To illustrate these systematic patterns in wage changes across different time horizons, Figure 4 plots the coefficient estimates
Figure 4: Estimated Change in Wages Across Various Pre- and Post- Acquisition Time Spans

Notes: The length of each line indicates the time span over which the change in wages is estimated, while the vertical position of the line indicates the actual estimated change in wages. The bar on each line represents the magnitude of standard errors. All estimates are from our preferred specifications in Tables 3 & 4, with a full set of controls.

from our preferred specifications with both worker and firm controls for the various time spans reported in Tables 3 and 4. If foreign ownership, or foreign takeovers of domestic firms, truly had no wage effects, then we should expect to see that there is little difference in wages regardless if we consider the two and three years prior to acquisition, or if we consider the two and three years after acquisition. In other words, a true ‘null’ effect of MNEs on worker-level wages would be illustrated in Figure 4 by estimates that lie on or near the horizontal axis. Instead each of the estimates differ substantially from zero. Moreover, the systematic reductions in wage levels that occur prior to acquisition confound simple DID estimates of the MNE wage premium, and may have led several previous studies to underestimate the effects of MNE status on wages that we observe after firms switch from domestic status.
5.3 Sector-Specific Dynamics in MNE Activity and Wages

Figure 1 demonstrates that there is substantial heterogeneity across sectors in the average volume, the variation, and the growth of multinational activity over time. If these sector-specific dynamics are correlated with inter-industry wage differentials, then empirical specifications that fail to account for sector specific effects could lead to substantially biased estimates. Moreover, the propensity for multinational activity to occur in merger waves makes this source of bias generally difficult to sign for arbitrary sample periods. Across our entire sample period 2002-2007 there is an upward trend in M&A activity, led principally by a few sectors. If these sectors are those that have relatively higher wages, then specifications which omit sector-specific effects will be upward biased. However, if the sample were restricted to the period of 1997-2004 (for example), then we would observe a downward trend in M&A activity that is particularly driven by the same high wage sectors; in this case, the omission of sector-specific effects would lead to downward biased estimates of the multinational wage premium.9

Table 5 reports estimates from the wage regression in (1) for both the short and long-run including sector fixed effects and year effects, rather than the preferred sector-by-year effects. Across all time horizons, the coefficient on the MNE variable is significant at the one percent level. The estimated short-run effect reported in Column (3), which includes a full set of worker and firm-level controls, is 0.052. This estimate is quite close to the preferred estimate of the short-run effect of 0.048 from the corresponding specification in Table 3. Moving to the second year after a firm switches to being an MNE we find that, for specifications in Column (6) with a full set of controls but omitted sector-by-year effects, MNEs are associated with wages that are approximately 6.5% higher. By comparison, the preferred estimate with sector-by-year effects for the corresponding specification is a 6.0% increase in wages. Finally, in the the long-run, estimates which omit sector-specific effects suggest that MNEs are associated with 10.9% higher wages after the third year of acquisition (Column 9), while the preferred estimate with sector-by-year effects from Column (9) in Table 3 is only a 7.8% MNE wage premium. Importantly, the estimated long-run effect

9The differences in the direction of the bias generated by omitting sector-specific dynamics across different sample periods is important in this context given that previous studies have typically focused on periods of contraction in cross-border M&A activity (typically, 1997-2004), whereas our sample period covers an expansion period in M&A activity. Although we report a strong upward bias, the opposite would be expected in estimates obtained across periods of contraction, as in Hijzen et al. (2013) and Heyman et al. (2007).
for specifications that omit information about sector-specific dynamics are nearly four standard errors larger than the preferred estimate in Table 3. In other words, the results in Table 5 suggest that ignoring sector-specific dynamics when estimating the MNE wage premium leads to negligible biases in the short and medium time horizons, but economically substantial biases in the long-run.

The omission of sector-specific dynamics may also confound estimates of pre-acquisition wage dynamics. Table 6 reports the estimates of the changes in wages from two and three years prior to acquisition, respectively. These estimates correspond to the specifications in Table 4, but include only sector and year effects individually. Column (3) includes all worker and firm-level control variables, and the coefficient on the MNE variable is -0.037, which is significant at the one percent level. This estimate corresponds closely to the estimate of -0.032 obtained when sector-by-time effects are included in Table 4. However, the estimates look much with an additional lag. When sector-specific dynamics are omitted, worker-level earnings three prior to acquisition are indistinguishable from those paid in the first year that a firm becomes an MNE. The point estimate for the three-year lag is -0.013, as compared to the -0.079 obtained when sector-by-year fixed effects are included. By way of comparison, the point estimates are more that four standard errors apart. As we found with the post-acquisition wage changes, there appears to be substantial upward bias generated as on considers time periods further away from the year a firm switches to MNE status.

The upshot from the estimates in Tables 5 and 6 is that worker-level wages still exhibit a distinct U-shaped dynamic pattern, with a substantial reduction in earnings observed prior their domestic employer being acquired by a foreign firm, and increasing for several years after a firm has switched to MNE status. However, the level of wages observed across these years is spuriously higher when sector-specific dynamics are omitted from the analysis, especially several years before and after acquisition.

6 Conclusion

Cross-border investment by MNEs is known to respond to several national and international policies; in fact, the key purpose many of globalization policies is to facilitate incoming investment by foreign multinationals. Most of the prior evidence has suggested individual workers do not necessarily benefit from increased MNE activity that result from these policies, as the greater entry for
foreign firms appeared to have negligible impacts on worker-level wages. The results that we have presented here indicate that the specific wage dynamics of workers before their employer becomes an MNE masks the true benefits in labor earnings. Contrary to prior evidence that MNEs do not increase worker-level wages, we find that globalization policies that promote cross-border investment can have a economically substantial impact on worker-level wages in both the short- and long-run.

We have documented that the employees of MNEs face a distinct U-shaped pattern in earnings as their employer switches from domestic to MNE status, such that wages decline for several years before being acquired by an MNE, and increase for several years afterward. The pre-acquisition earnings dip is significant in both its duration and its magnitude, such that workers earn almost 8% less in the year that their employer is first acquired by a foreign MNE than they did three years prior. Failing to account for these dips in earnings causes standard estimation strategies to understate the benefits of MNE status. Here we find that MNEs increase worker-level wages by 4.8% within one year, and by 7.8% in the third year after acquisition.

Finally, we have shown that inter-industry wage differentials are correlated with industry-specific dynamics in MNE activities, so that omitting disaggregated information about cross-border investment activity will lead to spurious estimates of the multinational wage premium. Cross-border investment flows oscillate according to merger wages, however these ebbs and flows in MNE activity are quite different across sectors. Accounting for this industry-specific variation over time is necessary to accurately identify the effects of MNEs on wages. Moreover, the fact that cross-border investment flows exhibit a wave pattern means that the direction of the bias generated by omitting industry-specific time effects will depend on whether the sample is drawn from a contraction or expansion period. The difficulty in signing the direction of this bias generally across different time spans should raise caution when trying to compare prior estimates obtained from different sample periods, and should deter future studies from omitting information about sector-specific dynamics in MNE activity.
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### Table 1: Descriptive Statistics

|                          | Mean   | Standard Deviation | Min   | Max   |
|--------------------------|--------|--------------------|-------|-------|
| MNE                      | 0.162  | 0.368              | 0     | 1     |
| TFP shock                | 0.003  | 0.125              | -6.934| 1.517 |
| TFP shock                | 2.898  | 0.850              | -2.566| 6.958 |
| Exporter                 | 0.860  | 0.346              | 0     | 1     |
| Capital Intensity        | 3.637  | 1.061              | -6.171| 8.662 |
| Skill Intensity          | 0.429  | 0.227              | 0     | 1     |
| Male                     | 0.698  | 0.209              | 0     | 1     |
| Unskilled                | 0.179  | 0.210              | 0     | 1     |
| Age                      | 39.69  | 3.969              | 17    | 81.42 |
| Age sq                   | 1696   | 320.0              | 289   | 6655  |
Table 2: Descriptive evidence by type of firms

| Year | Total | MNE | Domestic | Switchers | Avg Hourly Wage | Hours worked |
|------|-------|-----|---------|-----------|-----------------|--------------|
|      | Total | MNE | Domestic | Switchers | Total | MNE | Domestic | Switchers | Total | MNE | Domestic | Switchers |
| 2002 | 1053  | 135 | 918 | - | 10.70 | 11.38 | 10.58 | - | 1509 | 1538 | 1505 | - |
| 2003 | 1484  | 198 | 1272 | 14 | 10.90 | 11.77 | 10.75 | 11.78 | 1512 | 1536 | 1507 | 1518 |
| 2004 | 1324  | 176 | 1137 | 11 | 11.02 | 12.1 | 10.85 | 10.94 | 1516 | 1567 | 1508 | 1460 |
| 2005 | 1383  | 195 | 1157 | 31 | 11.18 | 12.13 | 11.01 | 11.69 | 1520 | 1568 | 1511 | 1558 |
| 2006 | 1789  | 292 | 1472 | 25 | 11.26 | 12.38 | 11.03 | 12.13 | 1517 | 1545 | 1511 | 1541 |
| 2007 | 1811  | 321 | 1454 | 36 | 11.55 | 12.61 | 11.34 | 11.69 | 1504 | 1515 | 1501 | 1554 |
Table 3: Short- & Long-Run Wage Effects of Multinational Firms

|               | First Year as MNE | Second Year as MNE | Third Year as MNE |
|---------------|-------------------|--------------------|-------------------|
| MNE           | 0.018** (0.009)   | 0.027** (0.011)    | 0.115*** (0.019)  |
| TFP           | 0.038*** (0.007)  | -0.040*** (0.007)  | 0.097*** (0.010)  |
| Exporter      | 0.102* (0.059)    | 1.617*** (0.064)   | -0.104** (0.043)  |
| Capital Intensity | 0.049*** (0.005) | 0.050*** (0.006)   | 0.008 -0.005      |
| Skill Intensity | 0.353*** (0.027)  | 0.290*** (0.028)   | 0.237*** (0.028)  |
| Gender        | 0.275*** (0.007)  | 0.205*** (0.008)   | 0.235*** (0.007)  |
| Unskilled     | -0.394*** (0.007) | -0.403*** (0.008)  | -0.399*** (0.011) |
| Age           | 0.219*** (0.003)  | 0.223*** (0.003)   | 0.220*** (0.003)  |
| Age²          | -0.002*** (0.000) | -0.002*** (0.000)  | -0.002*** (0.000) |
| FE r,sxy      | 98.338 98.338 98.338 | 112.028 112.028 112.028 | 99.994 99.994 99.994 |

All Specifications include Sector-by-Year Fixed Effects. Clustered standard errors in parentheses (by firm).

*** p < 0.01; ** p < 0.05; * p < 0.1.
|                  | (1)          | (2)          | (3)          | (1)          | (2)          | (3)          |
|------------------|--------------|--------------|--------------|--------------|--------------|--------------|
|                  | (t)-(t-2)    | (t)-(t-2)    | (t)-(t-2)    | (t)-(t-3)    | (t)-(t-3)    | (t)-(t-3)    |
| MNE              | -0.075***    | -0.057***    | -0.032**     | -0.054***    | -0.100***    | -0.079***    |
|                  | (0.012)      | (0.016)      | (0.014)      | (0.016)      | (0.019)      | (0.015)      |
| TFP              | -0.049***    | 0.001        | -0.009       | 0.034***     |              |              |
|                  | (0.009)      | (0.008)      | (0.010)      | (0.010)      |              |              |
| Exporter         | 0.188***     | 0.205***     | -0.016       | 0.042        |              |              |
|                  | (0.042)      | (0.040)      | (0.073)      | (0.054)      |              |              |
| Capital Intensity| 0.117***     | 0.066***     | 0.211***     | 0.113***     |              |              |
|                  | (0.006)      | (0.006)      | (0.011)      | (0.009)      |              |              |
| Skill Intensity  | 0.312***     | 0.057*       | 0.402***     | 0.126***     |              |              |
|                  | (0.032)      | (0.031)      | (0.035)      | (0.033)      |              |              |
| Male             | 0.259***     |              | 0.253***     |              |              |              |
|                  | (0.008)      |              | (0.009)      |              |              |              |
| Unskilled        | -0.399***    |              | -0.403***    |              |              |              |
|                  | (0.009)      |              | (0.011)      |              |              |              |
| Age              | 0.203***     |              | 0.211***     |              |              |              |
|                  | (0.004)      |              | (0.003)      |              |              |              |
| Age$^2$          | -0.002***    |              | -0.002***    |              |              |              |
|                  | (0.000)      |              | (0.000)      |              |              |              |
| Observations     | 68,586       | 68,586       | 68,586       | 59,443       | 59,443       | 59,443       |
| R-squared        | 0.046        | 0.052        | 0.236        | 0.054        | 0.063        | 0.249        |

All Specifications include Sector-by-Year Fixed Effects. Clustered standard errors in parentheses (by firm).

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$. 

Table 4: Wage Dynamics Prior to Domestic Firm Acquisition by MNE
Table 5: Short- & Long-Run Wage Effects of Multinational Firms Ignoring Sector-Specific Dynamics

|                | First Year as MNE | Second Year as MNE | Third Year as MNE | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|----------------|-------------------|--------------------|-------------------|-----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| MNE            | -0.004            | 0.014              | 0.052***          |     |     |     |     |     |     |     |     |     |
|                | (0.009)           | (0.009)            | (0.008)           |     |     |     |     |     |     |     |     |     |
| TFP            | 0.015***          | 0.049***           | 0.022***          | 0.094***        | 0.056*** | 0.065*** | 0.112*** | 0.119*** | 0.109*** |     |     |     |
|                | (0.005)           | (0.006)            | (0.007)           | (0.009)         | (0.009) | (0.007) | (0.007) | (0.009) | (0.008) |     |     |     |
| Exporter       | 0.047             | 0.034              | 1.654***          | 0.015***        | 0.049*** | 0.022*** | 0.098*** | 0.120*** | -0.116*** | -0.142*** |     |     |
|                | (0.045)           | (0.034)            | (0.054)           | (0.005)         | (0.006) | (0.005) | (0.005) | (0.006) | (0.006) |     |     |     |
| Capital Intensity | 0.058***         | 0.022***           | 0.076***          | 0.058***        | 0.022*** | 0.028*** | 0.029*** | 0.022*** | -0.116*** | -0.142*** |     |     |
|                | (0.006)           | (0.005)            | (0.005)           | (0.006)         | (0.006) | (0.005) | (0.005) | (0.006) | (0.006) |     |     |     |
| Skill Intensity | 0.560***          | 0.325***           | 0.332***          | 0.560***        | 0.325*** | 0.120*** | 0.279*** | 0.179*** |     |     |     |
|                | (0.030)           | (0.022)            | (0.028)           | (0.030)         | (0.022) | (0.028) | (0.028) | (0.024) |     |     |     |
| Male           | 0.278***          |                   | 0.206***          | 0.278***        |       |       |       |       | 0.234*** |     |     |
|                | (0.007)           |                   | (0.006)           | (0.007)         |       |       |       |       | (0.007) |     |     |
| Unskilled      | -0.383***         |                   | -0.415***         | -0.383***       |       |       |       |       | -0.407*** |     |     |
|                | (0.008)           |                   | (0.008)           | (0.008)         |       |       |       |       | (0.012) |     |     |
| Age            | 0.219***          |                   | 0.221***          | 0.219***        |       |       |       |       | 0.221*** |     |     |
|                | (0.002)           |                   | (0.002)           | (0.002)         |       |       |       |       | (0.003) |     |     |
| Age^2          | -0.003***         |                   | -0.003***         | -0.003***       |       |       |       |       | -0.002*** |     |     |
|                | (0.000)           |                   | (0.000)           | (0.000)         |       |       |       |       | (0.000) |     |     |
| Observations   | 98,338            | 98,338             | 98,338            | 112,028         | 112,028 | 112,028 | 99,994 | 99,994 | 99,994 |     |     |
| R-squared      | 0.045             | 0.051              | 0.252             | 0.120           | 0.161 | 0.344 | 0.078 | 0.083 | 0.269 |     |     |

All Specifications include Sector & Year Fixed Effects. Clustered standard errors in parentheses (by firm).

*** p < 0.01; ** p < 0.05; * p < 0.1.
Table 6: Wage Dynamics Prior to Domestic Firm Acquisition by MNE
Ignoring Sector-Specific Dynamics

|                | (1)          | (2)          | (3)          | (1)          | (2)          | (3)          |
|----------------|--------------|--------------|--------------|--------------|--------------|--------------|
|                | (t)-(t-2)    | (t)-(t-3)    |              | (t)-(t-3)    |              |              |
| MNE            | -0.096***    | -0.100***    | -0.037***    | -0.116***    | -0.099***    | -0.013       |
|                | (0.012)      | (0.014)      | (0.013)      | (0.015)      | (0.013)      | (0.014)      |
| TFP            | -0.012*      | 0.034***     | -0.034***    | 0.031***     |
|                | (0.007)      | (0.008)      | (0.008)      | (0.007)      |
| Exporter       | 0.087**      | 0.132***     | -0.081       | -0.046       |
|                | (0.035)      | (0.035)      | (0.055)      | (0.045)      |
| Capital Intensity | 0.114***    | 0.057***     | 0.152***     | 0.072***     |
|                | (0.006)      | (0.006)      | (0.009)      | (0.007)      |
| Skill Intensity | 0.419***     | 0.159***     | 0.643***     | 0.281***     |
|                | (0.032)      | (0.026)      | (0.033)      | (0.028)      |
| Male           | 0.268***     |              | 0.261***     |
|                | (0.007)      |              | (0.007)      |
| Unskilled      | -0.398***    |              | -0.398***    |
|                | (0.011)      |              | (0.011)      |
| Age            | 0.204***     |              | 0.212***     |
|                | (0.003)      |              | (0.003)      |
| Age^2          | -0.002***    |              | -0.002***    |
|                | (0.000)      |              | (0.000)      |
| Observations   | 68,586       | 68,586       | 59,443       | 59,443       |
| R-squared      | 0.034        | 0.042        | 0.231        |

All Specifications include Sector & Year Fixed Effects. Clustered standard errors in parentheses (by firm).

*** p < 0.01; ** p < 0.05; * p < 0.1.