The Real Cost of Conglomerates

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This version: NOVEMBER, 2011

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The Real Cost of Conglomerates

Abstract

The literature on conglomerates has focused on the misallocation of investments as the cause of the conglomerate discount. I study inefficiencies in the internal labor market as a possible cause of misallocation of investments. Using detailed plant level data, I document *wage convergence* in conglomerates: workers in low-wage industries collect higher-than-industry wages when the diversified firm is also present in high-wage industries (by 8%). This pattern is evident in a variety of tests including those where ownership of plants changes between firms with differing presence in high-wage industries. I confirm this effect by exploiting a quasi-experiment involving the implementation of NAFTA agreement that exogenously increases worker wages of exporting plants. I track the evolution of wages in non-exporting plants in diversified firms that also own exporting plants and find a significant increase in wages of these plants relative to unaffiliated non-exporting plants after the event. This pattern of wage convergence affects investments. Plants with more "overpaid" workers increase the capital labor ratio in response to their higher labor cost – and this response to higher wages leads to "overinvestment" in some divisions.

I Introduction

Ever since Coase (1937) seminal paper on the nature of the firm, there has been a widespread interest in what determines the boundaries of firms and how they shape the resource allocation of firms. Much of the finance literature has focused on the effect of firms' boundaries on the allocation of investments.[1] Less attention has been paid on their effect on labor costs.[2] If firms' boundaries alter the compensation workers receive, "misallocation" of investments can be an optimal response to these altered wages. In this paper I study whether firms' boundaries affect wages and how investments respond. I show that diversified organizational form impacts the wages in internal labor markets: there is *wage convergence* in these firms with workers in low-wage industries collecting higher-than-industry wages when the diversified firm is also present in high-wage industries. Moreover, I show that there are real consequences of this behavior as it alters investment behavior of diversified firms.

There are several views on how wages might be set within firms. One view is that wages are set solely based on the marginal productivity of labor. Under this view, firm boundaries have no role in wage setting per se, other than through their impact on productivity. Alternatively, there are two broad arguments that suggest that firm boundaries could impact wage setting due to peer effects: those based on social interactions and those based on information acquisition.[3]

The first set of theories have in common the feature that wages of other workers enter directly as an argument in the utility function.[4] Using this framework Frank (1984) argues that high paid workers derive 'status' utility from being in the presence of low paid workers and conversely low paid workers get a disutility from interacting with their high wage colleagues.[5] This idea also gives rise to that of 'fairness' of wages, presented in Akerlof and Yellen (1990).[6] Workers evaluate their wage relative to a benchmark and assess the fairness of their wage. Worker's that perceive their wage as unfair may take actions of revenge or sabotage against

[1] There is a vast empirical literature that examines the nature of investments by conglomerates. For recent surveys, see Stein (2003) and Maksimovic and Phillips (2007).

[2] For more discussion see Zingales (2000). There is a small but growing empirical literature on labor, capital structure and financial constraints (e.g., Matsa (2010), Chen et al. (2011), Benmelech et al. (2011), Simintzi et al. (2010)).

[3] In addition to the two mechanisms discussed here there is scientific research that suggests an evolutionary aspect towards maintaining equality. In particular, Brosnan and De Waal (2003) conduct a series of experiments to show that monkeys display a strong aversion to inequality.

[4] The idea of social interactions has also been explored in settings other than the labor market, for example in Becker (1991).

[5] This leads Frank (1985) to call for the importance of "Choosing the right pond". In pop culture this idea is present in the famous cartoons "Keeping up with the Joneses" (Momand (1920)) and in the recent Hollywood movie "The Joneses".

[6] Akerlof (1982) and Akerlof (1984) also mention the notion of fairness and the importance of social norms in determining wages. More recently Hart and Moore (2008) construct a model where contracts act as a way to establish reference points that determine the notion of fairness.

the firm. Consequently, the firm may have an incentive to pay the workers a wage that they would perceive as fair, even if it differs from the marginal product of labor.

In the second group of theories, the wages of other workers don't enter directly in the utility function, but they may still provide information about the firm or the future of workers in the firm. Levin (2002), for instance, presents a model where the actions of the firm towards a group of employees can undermine the firm's reputation with everyone else. For example, some firms may be reluctant to lay off workers or reduce wages for a subgroup of employees in a downturn as that could undermine the perception of job security or the wage expectations for the remaining workers.

The importance of wage equity inside firms is not just a theoretical possibility and is discussed in several news reports. For instance, a recent Wall Street Journal article reports auto workers trying to end a wage structure with two-levels to a single-level for everybody in the firm, arguing that doing so would increase fairness.[7] Similarly, the manager of Tennaco, who in the late 1980's acquired Houston Oil and Minerals Corporation, also expressed his desire for wage harmonization within his firm when he argued that "we have to ensure internal equity and apply the same standard of compensation to everyone" (see Milgrom and Roberts (1990) for more details).[8]

In my empirical analysis I seek to understand if there is a systematic pressure for wage convergence inside firms and whether organizational form influences this behavior. Diversified firms provide a good laboratory to study the existence of peer effects in wages of workers. The reason is that a conglomerate's presence in different industries generates a natural dispersion in wages across workers in the firm, providing a setting where concerns for internal equity could be more pronounced. Additionally, the existence of comparable stand alone firms provides a benchmark for what the wages ought to be if firm boundaries were not relevant.

Using detailed plant level data from the US Census Bureau over the period 1977 to 2000, I document evidence for wage convergence in conglomerates: workers in low-wage industries collect higher-than-industry wages when the diversified firm is also present in high-wage industries. In particular, workers in low-wage segments whose firm is present in high-wage segments collect an 8% premium relative to what would be expected if productivity was the sole determinant of wages. In contrast, a firm's presence in a low-wage industry does not display a clear pattern. Wages of workers in high wage segments whose firm also employs low wage workers are dragged down by at most 3%, although several specifications show no impact.

[7] 'Some UAW Workers Seek End to Two-Tier Wages', Wall Street Journal August 13, 2011.

[8] Additionally, Bewley (1999) in his book "Why wages don't fall during a recession" has numerous quotes from executives describing the extreme importance of internal equity in the compensation structure of their firms.

While I include several controls in my specifications, it is difficult to rule out all possible alternatives. I conduct several tests that together alleviate concerns that the relationship I establish is spurious. Specifically, I am able to account for plant specific (time invariant) unobservable characteristics by examining the dynamics of wages in plants whose ownership changes between firms with differing presence in high-wage industries. I observe that when plants move to a firm that pays higher wages to its employees in other plants, the wages of workers in the acquired plant are adjusted upwards. This pattern is not visible when plants are acquired by a firm that pays lower wages to its employees in other plants.

Though my tests on dynamics of worker wages are suggestive of wage convergence in diversified firms, they are not conclusive. In particular, there might be time varying unobservables which prompt firms to choose plants they buy or sell, that could be affecting my estimates. To alleviate such concerns, I exploit a quasi-experiment involving the implementation of NAFTA agreement that exogenously increases worker wages of exporting plants.[9] I compare the evolution of wages of non-exporting plants ('treatment plants') in diversified firms that also own exporting plants with those of unaffiliated non-exporting plants ('control plants') after the event. Strikingly, though there are no differences in the wage patterns of treatment and control plants before the NAFTA event, there is a stark divergence in wages after the event.

Having established that diversified firms exhibit wage convergence, I next examine the consequences of this behavior on their investment. There is a dramatic change in the investment policy of diversified firms that exhibit wage convergence: plants with more 'overpaid' workers tilt their investment policies towards a higher capital labor ratio. This can be rationalized easily. The presence of peer effects in the wage structure of diversified firms creates a wedge between the price of labor in diversified and non-diversified firms. As an optimal response to this difference in input prices, diversified firms that are present in high wage industries and 'overpay' their workers in the low wage industries tilt their input use in these plants away from the expensive labor towards the relatively cheaper capital. Importantly, the difference in input allocation leads to differences in investment levels for the plants of diversified firms relative to stand alone ones. I show that the peer effects in wages account for a significant part of the lower sensitivity of investment to Tobin's Q in diversified firms relative to stand-alone firms (e.g., Ozbas and Scharfstein (2010) and Matvos and Seru (2011)) and results in 'overinvestment' by diversified divisions in low investment industries.

Finally, I then explore some mechanisms that affect the strength of the wage compression pattern in diversified firms. In particular, I use variation in labor unionization, geographic proximity, level of centralization of the firm and product market competition to generate

[9] I discuss several reasons why the wages of exporting plants might have gone up after NAFTA in Section V.B

results that are suggestive of incentives to keep intra-firm equity as driving my findings on wage convergence.

This paper connects several strands of literature in corporate finance and personnel economics. First and foremost it relates to the literature that studies corporate diversification. This literature has focused almost exclusively on value creation (Lang and Stulz (1994), Berger and Ofek (1995), Servaes (1996), Schoar (2002), Graham et al. (2002), Campa and Kedia (2002), Villalonga (2004b) and Laeven and Levine (2007)), allocation of capital (Stein (1997), Shin and Stulz (1998), Chevalier (2000), Rajan et al. (2000), Gertner et al. (2002), Matvos and Seru (2011), Stein (2002) and Ozbas and Scharfstein (2010)) and R&D productivity (Seru (2010)). My paper is also connected to literature that studies the investment behavior of conglomerates and stand-alone firms using plant level data (e.g., Villalonga (2004a), Schoar (2002), Maksimovic and Phillips (2002), Maksimovic and Phillips (2008) and Maksimovic et al. (2011)). More recently, in a closely related paper, Tate and Yang (2011) also study the internal labor markets of diversified firms. They examine the allocation of workers across different segments of conglomerates and present evidence on a "bright side" of internal labor markets, with workers facing lower costs of moving across divisions within diversified firms. My paper examines how internal labor market in these firms shape the wage setting process, and shows a "dark side" of these markets. In general, my paper differs from this literature by arguing that wage setting inside conglomerates may be important to assess previous results on investment behavior.

It is also related to the literature that studies the importance of internal labor markets as a determinant of the employment relation and wages. Baker and Holmstrom (1995) and Baker et al. (1994) show the existence of persistent cohort effects in wages, and Doeringer and Piore (1985) describe 'ports of entry' into firms, indicating that once workers are inside the firm, the treatment they receive is substantially different than if they were outside. It has also been shown that the wages of workers depend crucially on the industry their firm operates in (e.g., Krueger and Summers (1988) and Dickens and Katz (1987)).[10] My paper confirms that internal labor markets allow workers to be partly shielded from the external labor markets and that the wages of workers depend on the industries their firm operates in.

Finally, this paper contributes to the study of peer effects. Peer effects have been shown to be important determinants of happiness (Luttmer (2005)), determinants of perks in firms (Rajan and Wulf (2006)), executive compensation and investment (Shue (2011)) and labor

[10]This puzzling fact was addressed in an article in the Economist magazine on May 28, 1998 entitled *Secretaries in investment banks tend to earn far more than secretaries in hotels.* My findings suggest that not only do secretaries in investment banks earn more than secretaries in hotels, but also that secretaries in hotels receive higher wages if their firm has an investment banking branch.

productivity and turnover (Pfeffer and Langton (1993), Pfeffer and Davis-Blake (1991), Card et al. (2010) and Bloom (1999)). My paper shows that the importance of peer effects to wages within firms is a pervasive phenomenon across sectors of the US economy with consequences for firm investment.

The rest of the paper is organized as follows. In Section 2, I describe the data and define the variables of interest. In Section 3, I discuss the empirical design. Section 4 presents the main empirical findings. In Section 5, I present the implications of my findings on wage equality for investment decisions. Section 6 examines factors that affect the strength of wage convergence in diversified firms. Section 7 concludes.

II Data and Variables

II.A Data Sources

In this section I discuss the various sources of data used in my analysis. The main source of data used in this paper is the US Census Bureau (henceforth Census), which provides clear advantages in studying questions involving corporate diversification relative to using the Compustat Segment files, due to the higher accuracy in firm's reporting.[11] For the years 1977 to 2000, I combine three datasets from the Census: the Longitudinal Business Database (LBD), the Census of Manufacturers (CMF) and the Annual Survey of Manufacturers (ASM).

The LBD contains information on all establishments in the United States that have at least one paid employee. For each establishment, there is data on the number of employees, payroll, geographic location, industry and firm. By virtue of the completeness of this dataset, that encompasses about 7 million establishments per year, it is possible to build very accurate measures of geographic and industry diversification, and firm and division size. Unfortunately, the LBD does not contain information on productivity that is crucial for my paper, thus I supplement it with two other Census datasets that have more detailed information.

For the years that end in 2 and 7 (the census years), the US Census Bureau conducts the Census of Manufacturers which collects detailed information on virtually all establishments (also referred to as plants) in the manufacturing sector - SIC codes 2000 to 4000 - representing about 350,000 establishments per year. In the remaining years, the Census Bureau does not conduct a survey on all establishments in the manufacturing sector. Instead they collect

[11] Several papers (Lichtenberg (1991), Davis and Duhaime (1992),Denis et al. (1997), Hyland and Diltz (2002) and Harris (1998)) document lack of accuracy in the Compustat reporting either because firms under report the segments they are in, or because they use discretionary power in reporting changes to segments when no real change occurred. Due to this shortcomings, others have used Census data to study diversification in the past, such as Schoar (2002), Villalonga (2004a) and Maksimovic and Phillips (2002).

information only on plants that have 250 or more employees and a random sample of the smaller establishments, through the Annual Survey of Manufacturers, which corresponds to roughly 50,000 establishments per year. The main data items from the CMF and the ASM that I use in this paper are: sales, value added, wages of production and non production workers, number of workers, production worker hours, investment, and book value of assets.

The main sample used in the paper is constructed the following way: I take all the establishments in the LBD that have a positive number of employees, firm identifier and industry information. At this point I construct measures of corporate diversification, firm size, division size and firm wage level. These variables and their importance to this study will be discussed in detail later. I then merge the yearly LBD files with the ASM and CMF using a unique plant identifier that is common to all three datasets. As is common in the literature that uses Census data, I exclude administrative records for whom information is imputed (e. g. Foster et al. (2008)). Finally, I also exclude the establishments that are present in the LBD but are not in the ASM or CMF. Thus, in the final sample only plants in the manufacturing sector for whom I have information on productivity are included. The use of these three datasets combined gives me the opportunity to take advantage of the extensive plant level information of the ASM and CMF combined with the accurate firm level characteristics computed using the LBD.

To test different explanations for the results, I will complement the main data with two additional datasets: the Auxiliary Establishment Survey and state level data on labor unionization. The Auxiliary Establishment Survey (AUX) is a survey conducted by the Census Bureau in the census years in order to collect information of auxiliary facilities of manufacturing plants. So, for the years 1977, 1982 and 1987, I also have data on the importance of headquarters or firm's central offices. The state level labor unionization data is constructed using the Current Population Survey (CPS) conducted by the Bureau of Labor Statistics[12] for the years 1983 to 2000, and contains the percentage of workers that are members of a labor union.

II.B Variable Description

This section contains the description of the main variables used in the empirical analysis. The first part of the paper analyzes wages in diversified firms and as such, the main variable of interest and the dependent variable in the regressions is wages. In particular I study the wage per hour of production workers, which is constructed simply by dividing the total wages

[12]The labor unionization data is available online at http://unionstats.gsu.edu/ and a description of it can be found in Hirsch and Macpherson (2002). This data is also used in Chen et al. (2009) study of the impact of labor unionization on stock returns.

(including bonus and benefits) paid to production workers by plant and year, by hours of production workers at plant level in that year. I chose production workers because these are the ones for whom an accurate measure of quantity (in this case number of hours) exists. To minimize the influence of outliers on the results, each year I winsorize the wages at the 1st and 99th percentiles.

Using the wages of workers in stand alone firms in the LBD I classify industries (defined at the 3 digit SIC level) into wage quintiles every year. Quintile 1 contains the industries with the lowest wages while quintile 5 contains industries with the highest wages. Notice that with this procedure I classify all industries, not only those in the manufacturing sector, into one of the five wage quintiles. I then use this classification to construct measures of firm presence in these quintiles. For example, the variable *Present in q5* $_{ft}$ is a firm level variable that takes the value of 1 if firm f owns at least one establishment in an industry that is in quintile 5 of wages in year t, and zero otherwise. Similarly, the variable *Present in q1* $_{ft}$ is a dummy variable that takes the value of 1 if the firm is present in wage quintile 1 in year t, and takes the value of zero otherwise.

In all my wage regressions I include labor productivity as an explanatory variable. In particular, I measure labor productivity as value added per hour of labor ($VA/hour$).[13] Another important explanatory variable in the analysis is size, since it is well established in the literature as a key determinant of wages (e.g., Brown and Medoff (1989) and Oi and Idson (1999)). I create 11 size controls that are included in all my regressions. The first five size controls are designed to control for the impact of firm size on wages, where size is measured as number of employees. I create firm size quintiles every year to allow for different impact of firm size on wages for the different firm size quintiles. I use a similar procedure to construct five division size controls. I sum firm's workers at the 3 digit SIC level and as before allow the size controls to have different slopes by division size quintile.[14] I also include a plant size control which is constructed as plant sales per year. Plant age in years is controlled for using the variable *Age*.

Next, a critical variable for my analysis is the extent of diversification of the firm. Accordingly, I construct two different measures of diversification. The first measure is $Divdummy_{ft}$, a dummy variable that takes the value of 1 if firm f is present in more than one 3 digit SIC industry in year t. Alternatively, I construct *log(number of divisions)* $_{ft}$, the logarithm of the number of 3 digit SIC industries the firm f is present in year t.[15]

[13] I also constructed the variables Sales per hour of labor ($Sales/hour$) and TFP to conduct robustness checks.

[14] For robustness, I also construct size controls that measure the number of plants, instead of number of employees.

[15] To conduct robustness checks I construct two other measures of corporate diversification. The HH_Plants_{ft}, constructed as 1 minus the Herfindahl-Hirschman concentration index of establishments of firm f, in year t. It takes the value of 1 if the firm has several establishments all in the same 3 digit SIC industry. And

Finally, in the analysis that examines the impact of internal labor markets on firm investment behavior, I use as dependent variables capital-labor ratio and investment. The capital-labor ratio (*K/L ratio*) is constructed by dividing book value of assets by total employees at the plant in a given year. Investment (*CAPX/Sales*) is constructed by dividing capital expenditures by sales for each plant every year.

III Empirical Strategy

In my empirical work I am interested in establishing the existence and importance of peer effects in the wages of workers in diversified firms and study its impact on investment. In particular, if the attribute that drives peer effects in the wages of plant i is *peer*, I evaluate the magnitude and statistical significance of β by estimating a regression of the form below:

$$Wage/hour_{ift} = \alpha + \beta \cdot peer_{ift} + X'_{it}\gamma + \epsilon_{it}$$

There are several challenges in interpreting β as the causal impact of peer effects on worker wages in plant i. First, there are several important factors that impact wages, such as labor productivity and firm size. Failing to control for these factors could bias β if the manner in which I expect peer effects to operationalize inside diversified firms is correlated with these factors. For example, finding that some firms pay higher wages to workers in otherwise low-wage industries could be driven by firms hiring more productive workers. To alleviate this concern I take advantage of the richness of the Census data and include a wide variety of controls (X) for labor productivity, size and plant age.

A second concern that may arise is the existence of unobservable time-invariant plant specific characteristics that impact wages. For example, finding that a plant in a diversified firm pays higher wages to its workers relative to comparable stand alone firms and that the wage difference is correlated with *peer*, could be due to other facts not measured through the controls included in X. It might be that a plant has high wages even before it is a part of a diversified firm.[16] To address this concern, I track the wages of workers when ownership of plants changes between firms with differing presence in high-wage industries.

A final issue in interpreting β as the causal impact of peer effects on wages is that plants

$HH\_Employees_{ft}$ is constructed as 1 minus the Herfindahl-Hirschman concentration index of employees of the firm in year t. It takes the value of 1 if all the firm's employees work in the same 3 digit SIC industry. The results obtained using these measures are qualitatively similar to the ones reported in the paper and are available upon request.

[16] This is a critique raised by Chevalier (2000) regarding the literature that evaluates the impact of conglomerates on their investment policies.

may have been acquired by diversified firms for time-varying unobservable reasons that are correlated with worker wages. In other words, what I want to interpret as treatment effect is in fact a selection effect. To circumvent this problem I will make use of a quasi-experiment that uses a drastic change in trade barriers to generate exogenous variation in wages of some of the plants of a diversified firm. I will then examine the evolution of wages in plants that are unaffected by the trade shock inside the same diversified firm, relative to similar plants of unaffected firms. Tracking the propagation of the shock towards the remaining plants of the affected firm relative to plants owned by firms not exposed to the shock allows me to difference away selection considerations that could be biasing my estimates.

IV Main Results

IV.A Pattern of Wages in the Raw Data

I start my empirical analysis by showing the main patterns in the mean hourly wages of production workers in the manufacturing sector, in the absence of any controls. In Table I I present the mean hourly wage of production workers by wage quintile and type of firm. Each column is associated with a type of firm. The first column shows the wages of plants that belong to non-diversified firms. The second column shows the same information for diversified firms only. Each row of Table I represents a different wage quintile, where Quintile 1 indicates lowest wages and Quintile 5 indicates highest wages. Note that the categorization of industries into quintiles is based on the wages of stand alone firms only.

To understand how the firm's presence in high wage industries relates to the wages in the low wage segments, I sequentially eliminate all plants from the firms that have at least one establishment in the high paying quintiles. In column 3 I exclude from the sample of diversified firms all establishments from firms that have at least one establishment in wage quintile 5. In column 4, I exclude all plants from firms that have establishments in wage quintiles 4 or 5. The same procedure is applied to the remaining columns, where I sequentially apply more restrictions on firms that are present in the sample. Each element of the table corresponds to the average hourly wage for production workers in the wage quintile and firm associated to that row and column. For example, the average hourly wage of production workers in the manufacturing sector that operate in an industry classified as wage quintile 2, in a firm that although diversified has no plant in wage quintile 5 is $10.83 (row 2 and column 3).

This table reveals two main patterns. First, when looking simply at wages in non diversified firms relative to wages in diversified firms we observe that the latter are significantly higher. This is similar to the results reported in Schoar (2002). Second, and more importantly, there

is a positive relation between the wages of workers in plant i and the wages of workers in the other plants of the diversified firm. In other words, workers in a diversified firm obtain a larger wage when that firm also has higher paid workers. Columns 3 through 6 reveal a striking pattern. It is not simply corporate diversification that is associated with higher wages but diversification into high paying sectors that leads to higher wages for the whole firm. The findings in this section although suggestive are univariate comparisons. I now evaluate these patterns more formally in a multivariate setting.

IV.B Multivariate Analysis

In this section I evaluate if the patterns unveiled earlier are robust to inclusion of several important controls such as size, age and productivity. Additionally, the industry and the geographic region in which plants operate can have important impacts on wages, for example workers of some plants may have high wages because they are located in regions with high living costs. To exclude explanations such as these that rely on industry, state or year shocks I include $Industry \times Year \times State$ fixed effects in the regressions.

I start by focusing on plants in wage quintiles 1 through 4 and measure the impact on the wages of workers in those industries if their firm also has workers in wage quintile 5. I do so by estimating regressions of the type:

$$Wage/hour_{ift} = \alpha + \beta \cdot Present\ in\ q5_{ft} + X'_{ift}\gamma + \epsilon_{ift}$$

Where $Present\ in\ q5_{ft}$ is a dummy variable that takes the value of 1 if the firm is present in wage quintile 5. The set of controls X includes VA/hour, plant age, the 11 size controls and $Industry \times Year \times State$ fixed effects. Panel A of Table II presents the findings. Each of the two columns show the coefficients for a specification where the control for degree of diversification is different. Column 1 includes simply a diversification dummy and column 2 uses as control for diversification the variable *log(number of divisions)*. The results show that a worker of a plant in wage quintiles 1 to 4, whose firm is present in the highest wage quintile collects a premium of up to 1 dollar per hour. Note that this estimate is relative to workers of plants in the same industry, year and state whose firm is not present in wage quintile 5 and after accounting for firm, segment, plant size, plant age and labor productivity. This number is economically large and represents a premium of 8% of wages for this group of workers.[17]

Additionally, workers of diversified firms that are not present in the highest wage quintile also collect wages that are higher than those observed in stand alone firms. The magnitude of

[17] The results are qualitatively similar when Herfindahl-Hirschman concentration indices of sales and employees are used as measures of diversification.

this 'premium' is not as large as the one associated with *Present in q5*$_{ft}$. This pattern may also be due to the firm's presence in other high wage quintiles. For example the firm's presence in wage quintile 4 also has a positive impact in workers of wage quintiles 1 to 3.[18] We can also see that the productivity control is not statistically significant. Although surprising, this result could be due to the inclusion of the 11 size controls. Since more productive firms tend to be bigger.

Next, I inspect the impact of low wage workers on the wages of workers in the better paid industries, and assess if the peer effects have a symmetric impact on wages. I do so by estimating regressions of the form:

$$Wage/hour_{ift} = \alpha + \beta \cdot Present\ in\ q1_{ft} + X'_{ift}\gamma + \epsilon_{ift}$$

Where *Present in q1*$_{ft}$ is a dummy variable that takes the value of 1 if the firm has at least one establishment in the industries belonging to wage quintile 1. The set of controls X is the same as in the previous regressions. Note that here I focus my attention on the workers whose industry is in wage quintiles 2 to 5 and measure the impact of being employed by a firm that also owns establishments in industries in wage quintile 1. Panel B of Table II shows that workers whose firm is present in the lowest wage quintile are negatively affected by up to 3% of their wage. Here the evidence is weaker than in Panel A, both in terms of the magnitudes and statistical significance, with the results depending crucially on which diversification control is used.[19] As can be observed, the estimates on diversification measures are large. This is because some firms in wage quintiles 2 to 4 are present in wage quintile 5 – which has a large positive impact on wages. When I include a control for the firm's presence in wage quintile 5, the magnitude of the diversification measures coefficients is greatly reduced. I also find that the estimate on labor productivity exhibits a positive and statistically significant coefficient in columns 3 and 4 of the table. A \$10 increase in the hourly value added of the plant is associated with an increase of 3 cents per hour in the wages of each production worker of the plant.

Although the results in this section are for production workers only, I note that they also hold for non-production workers. Additionally, the results hold when the analysis focus on wages excluding benefits, which implies that the wage convergence pattern cannot be explained simply by firms offering the same benefit package to all employees. As a final robustness check, I estimate my regressions for firms that only operate in the manufacturing sector where I am

[18] When I estimate the regressions including a control for presence in wage quintile 4, the magnitude of the diversification measures is reduced.

[19] I also estimate the regressions using as control for diversification the Herfindahl-Hirschman concentration index of sales and employees and find qualitatively similar results.

able to include measures of firm level productivity. This is an important step since it allows me to exclude concerns that the activities in one plant affect the remaining plants of the firm. For example, the activities in one plant could boost the firm's brand that would in turn have a positive impact on the sales of the other plants owned by the firm. If that was the case, measuring plant productivity would not suffice to control for the real productivity of labor through its effects in the rest of the firm. The inclusion of firm productivity measures in addition to plant productivity allows me to alleviate these concerns. As can be seen in Table III, doing so has a minimal impact on the magnitude of β, suggesting that these concerns do not drive my results.[20]

Overall, the results in thi section suggest that there might be peer effects in wages. However, there seems to be an asymmetric pattern to these effects: low-wage workers get a higher pay when their firm is present in high-wage industries, but the highest paid workers do not get harmed in the same proportion (if any) from working in a firm that also employs low-paid workers, suggesting that it may be easier for firms to overpay their workers than to offer subpar wages to employees.

IV.C Evidence from changes in plant ownership

I now extend my empirical analysis to account for plant idiosyncracies. Plants could have unobservable characteristics that leads them to have higher or lower wages even in the absence of peer effects. I now turn to a setting where I am able to include plant fixed effects and track the evolution of wages when there are changes in plant ownership.

I divide the plants that change ownership in two subgroups. The first group includes plants that go to a firm where the wage level is higher than was the case in the original firm. In this group I expect the peer effects to drive wages up. The second group includes plants that move to a firm where the other workers are paid less than in the original firm, where I expect peer effects to drive the wages down. To avoid possible confounding effects I exclude from the sample plants that change firm more than once. I then conduct an event study on the wages of plants that change firm for whom I have 6 consecutive years of data around the event (3 years before and 3 years after). In order to account for any broad macro-economic movements around these events, I compare the wage changes to a control group of plants that did not change ownership during the sample period.

To identify the subgroup of plants that change to a firm where the wage level of other workers is higher than in the original firm I construct two variables. The first one is a dummy

[20] I also note that in these regressions, where only firms diversified within the manufacturing sector are present, the coefficients associated with *Divdummy* and *log(number of divisions)* are negative.

that takes the value of 1 if the plant moves to a new firm that has a larger presence in high wage industries than the original firm. I call this variable *Industry wage H*. Alternatively, I construct a variable that uses the actual wages paid by the acquiring and original firms, and takes the value of 1 if there is an increase in the wages of other workers when the plant changes ownership, and zero otherwise. I call this variable *Firm wage H*. I then use a similar procedure to identify the plants that go to a firm where peer effects should bring wages down and construct the variables *Industry wage L* and *Firm wage L*. Here I also construct the variable *After* that takes the value of 1 for the three years after the plant changes firm and zero in the three years before. It also takes the value of zero for plants that never change firm.

I use continuous measures of firm wages to classify the movement of plants into higher or lower paying firms, instead of the dummy variables of presence in wage quintiles 1 and 5 because the former provide a more accurate comparison of the level of wages in the original and acquiring firm. I check that my results hold if I run the regressions using the dummy variables *Present in q5* $_{ft}$ and *Present in q1* $_{ft}$ instead.

My analysis involves estimating the following two regressions:

$$Wage/hour_{it} = \alpha + \beta_1 \cdot (After \times Industry\ wage\ H_{it}) + \beta_2 \cdot (After \times Industry\ wage\ L_{it}) + X'_{it}\gamma + \epsilon_{it}$$

And,

$$Wage/hour_{it} = \alpha + \beta_1 \cdot (After \times Firm\ wage\ H_{it}) + \beta_2 \cdot (After \times Firm\ wage\ L_{it}) + X'_{it}\gamma + \epsilon_{it}$$

In this case, X includes VA/hour, plant age, the 11 size controls, plant fixed effects and $Year \times Industry$ fixed effects. Since I include plant and $Year \times Industry$ fixed effects, the regression measures the impact on wages of workers of a plant moving to a higher or lower paying firm relative to those of plants that did not experience an ownership change event. Notice also that a plant that changes firm either moves to a higher or a lower paying firm, and as such I do not include the variable $After$ in the regression.

Table IV confirms the results from the previous sections. The difference in differences regression shows that when a plant moves to a higher paying firm the wages of its workers tend to go up relative to the wages of other plants in the same industry and time period that did not change firm (by about 22 cents per hour). Conversely, when plants are acquired by firms whose wage level is lower than the original firm, the wages of production workers do not seem to be adjusted down in an economic or statistically significant manner. It can also be observed that plants that suffer higher productivity growth experience a larger wage increase. Moreover, when the firm is more highly diversified workers tend to collect higher wages.

There is one caveat that is worth mentioning. I am not able to observe individual workers in my analysis. As a result, I don't know if when a plant changes to a new firm the same workers keep working in that plant or if the new firm replaces the workers of the acquired plant. Additionally, unlike the previous section, here I am not able to include $State \times Year \times Industry$ fixed effects because it is computationally unfeasible.[21] Instead, I include $Year \times$ *2 digit SIC Industry* fixed effects.

Overall, the results in this section confirm the asymmetric pattern of wage convergence. In the analysis I employed changes in plant ownership to show that plants that move into lower paying firms don't seem to see their wages adjusted down but those that move to better paying firms see their wages adjusted upwards. This wage pattern cannot be explained by changes in productivity or firm size. Neither can they be explained by shocks to industries to which plants belong because the regressions control for these factors.

V Evidence from a Quasi-experiment

My analysis so far has shown a strong positive association between wages of workers across divisions of conglomerates that is not likely driven by plausible reasons such as plant-specific time-invariant attributes. However, there could be other concerns which might bias my results. In particular, it might be that some unobservable makes firms with plants in high-wage industries acquire plants in low-wage industries where workers are paid higher than industry wages. In this section I exploit a quasi-experiment that allows me to rule such selection explanations out.

I use the implementation of the North America Free Trade Agreement (NAFTA) as an exogenous source of variation in the wages of exporting plants. The thought experiment is as follows. Suppose there are two sets of non-exporting plants – those plants ('treatment') that are affiliated with a diversified firm that has exporting plants and those plants ('control') that are not affiliated with any exporting plant. The experiment uses unaffiliated non exporting plants as a control group to assess the counter-factual level of wages for treatment plants in the absence of the NAFTA shock. If the peer effects I documented earlier are operational, I expect the treatment plants in a diversified firm to respond to the exogenous wage change in exporting plants inside the firm boundaries. In other words, the identifying assumption is that in the absence of peer effects, the treatment group and the control group should have the same pattern of wages around the NAFTA event.

I use data from 1991 to 1996 to categorize plants into three groups. The first group contains

[21] Giroud (2010) and Bertrand and Mullainathan (2003) also faced similar dimensionality problems when using Census data.

plants that have strictly positive exports.[22] These are plants whose wages should be directly impacted by the NAFTA shock. I will examine if this is the case in the data in the 'first-stage'. Additionally, and because I am interested in studying how wages in one part of the firm affect the wages in the rest of the firm, I construct the treatment group that includes plants that despite not exporting belong to a diversified firm that owns exporting plants. The final group is the control group that includes plants that have no exports and belong to firms that have no exporting plants. My analysis will then compare the evolution of wages in treatment group relative to control group. I now describe briefly the NAFTA agreement before describing my findings.

V.A NAFTA Agreement

The North America Free Trade Agreement is an agreement signed by the governments of Canada, Mexico and the United States of America creating a trade block in North America. The agreement came into force on January 1994. After being signed by the presidents of the US and Mexico and the Canadian prime minister in December 1992, the agreement was ratified by the parliament or legislative branch of the three countries. January 1st 1994 brought the immediate elimination of tariffs on more than one half of U.S. imports from Mexico and more than one third of U.S. exports to Mexico. Within 10 years of the implementation of the agreement, all US-Mexico tariffs would be eliminated except for some U.S. agricultural exports to Mexico that were to be phased out in 15 years. Most US-Canada trade was already duty free. NAFTA represents a major change in import and export barriers within the North America region that is exogenous to the network of plants owned by a firm. In my analysis I focus on three years before and after the NAFTA came into effect (i.e., 1991-1993 as period before and 1994-1996 as period after).

V.B Impact on wages of exporting plants

I first provide evidence that the NAFTA shock dramatically altered the wages of exporting plants.[23] This is a critical first step to establish before I am able to trace the effects of this wage increase for treatment plants relative to control plants. In Panel A of Table V I present the coefficients from estimating the following specification:

$$Wage/hour_{it} = \alpha + \beta_1 \cdot Exports + \beta_2 \cdot After + \beta_3 \cdot (After \times Exports) + X'_{it}\gamma + \epsilon_{it},$$

[22] Census collects information on exports at the plant level and it is possible to know how much of plant sales are directed abroad.

[23] Consistent with results in Bernard and Jensen (1997) that also show increases in wages associated with exporting activity.

where *After* is a dummy variable that takes value 1 in the period after the NAFTA shock and 0 otherwise and *Exports* is the share of plant sales that are exported. The coefficient of interest here is β_3, which measures how the degree of exposure to NAFTA (measured by exports) impacts wages. Since the identification exploits time-series variation, I also include the control group plants to account for any macro-economic trends. Therefore, the specification can be thought of as a difference in difference estimation of wages in exporting plants relative to unaffiliated non-exporting ones. As before, X includes VA/hour, plant age, the 11 size controls, plant fixed effects and $Year \times Industry$ fixed effects.

The first-stage analysis shows that plants that have positive exports see an increase in the worker wages after NAFTA relative to wages of workers in the control group. The effects are both statistically and economically significant. For instance, the estimates suggest an increase by 2% for exporting plants relative to non-exporting ones after the NAFTA shock. In addition, plants that experience larger productivity increase experience a larger wage increase. Moreover, the diversification measures are positive, although not always statistically significant. I also depict the results in Figure 1. The figure confirms that the workers of exporting plants saw a significant increase in their wages in the years 1994 through 1996 relative to the plants in the control group.

Note that it is not clear ex-ante if the NAFTA agreement should increase or decrease the wages of exporting plants. On the one hand, because these plants face international trade competition from Mexico and Canada, there might be a downward pressure on the wages. Alternatively, the agreement might provide access to new markets for exporting plants which helps the plants increase their profits, and worker wages. Furthermore, NAFTA can act as a shock to the demand for labor and consequently to wages. The analysis suggests that the latter effect may be dominant in the period of my analysis. For my subsequent analysis I am agnostic about the exact reasons for this wage increase in exporting plants. Rather I use this fact to assess the wage response in non exporting plants of diversified firms with exporting plants that saw a wage increase for its workers after NAFTA.

V.C Wages in Treatment and Control groups before NAFTA

Before establishing an effect on treatment group relative to control group after the NAFTA shock, I need to establish that there was no differential pattern in wages between the two sets of plants before the shock. I now show this is indeed the case. Figure 2 shows the wage evolution of the treatment group relative to the control group. As is evident, for the periods before the shock (-3 to -1), I find no statistical difference in the wages of the workers in the treatment group when compared to the wages of workers in the control group. Overall, this analysis

suggests that the treatment and control groups are very comparable before the NAFTA shock.

V.D Main Finding

I now show my main findings by estimating the following regression:

$$Wage/hour_{it} = \alpha + \beta_1 \cdot Firm\_Exp_{it} + \beta_2 \cdot After_{it} + \beta_3 \cdot (After_{it} \times Firm\_Exp_{it}) + X'_{it}\gamma + \epsilon_{it}$$

In this 'second-stage' regression I include only plants in the treatment and control groups (i.e., all the plants included in this regression have zero exports) and present the results in Panel B of table V. The coefficient of interest is β_3 which traces the potential effect of wage increase in exporting plants on wages of the treatment group. The control group serves as a counterfactual that accounts for macro-economic and other factors that may also have changed around the NAFTA shock and impacted worker wages of non exporting plants. The set of controls X are the same as the ones used in the regressions that measure the impact of NAFTA on exporting plants.

As is evident, β_3 is positive and statistically significant. This implies that wages in the treatment group increased after the NAFTA shock when the wages of exporting plants inside the diversified firm increased. This is consistent with peer effects within the diversified firm being an important determinant of wages. As before, the plants that experience larger growth in productivity also experienced larger wage growth. However, in this case the diversification measures do not always have a positive sign. This pattern of wages is visible in Figure 2 as well. Notably, the impact only occurs in 1995 and 1996, consistent with a small delay it might take for wages to get transmitted across plants within the firm.

V.E Placebo and other tests

I now conduct several auxiliary tests to confirm the robustness of my findings. I start by conducting a placebo test by choosing an alternative period for the analysis (1985 to 1990). Table VI shows the placebo test for this period and shows that there is no visible pattern in terms of changes in wages of exporting plants or non exporting plants in diversified firms relative to unaffiliated non exporting plants. It is worthwhile noting also that for this time period three out of the four regressions exhibit a negative coefficient associated with the diversification measures (although not statistically distinguishable from zero).

I also estimate my regressions classifying plants into quintiles formed on the basis of exports by their industry rather than by plant level exports. I then use plants that belong to the industries in the highest exporting quintiles, based on the industry classification, as the directly

exposed group of plants. The treatment group is then defined as plants in the lowest exporting quintile whose firm is present in the highest exporting quintile. Finally, the control group includes plants in the lowest exporting quintile whose firm has no plant in the highest export quintile. The results presented in table VII are qualitatively similar under this specification.

Another concern with the analysis may be that non exporting plants in the firm may produce output that serves as input to the exporting plants. As a result, these non exporting plants could be *de facto* directly affected by the NAFTA shock. To alleviate such concerns, I re-run my second stage regressions including only plants that have zero transfers to other plants in the firm. This is feasible since Census data allows me to see the interplant transfers within firms. The results are qualitatively and quantitatively similar to those reported (see table VIII). This is not a surprise in light of Hortaçsu et al. (2009) that shows that interplant transfers are small even for vertically integrated firms.

V.F Summary

The results in this section demonstrate that there are strong peer effects on wages inside diversified firms which are unlikely driven by selection considerations. There are a few caveats of this analysis. First, information on exports is only available for the manufacturing sector, so there might be establishments outside of SIC sectors 20 to 40 that may have exporting activity but are excluded from my analysis. While this is a potential source of bias, my results could still be relevant if the exclusion affects treatment and control groups similarly. Second, the data does not provide any information on imports. As a result, I am able to only use exports to construct NAFTA exposure measures. Again, it is hard to envisage scenarios where this omission impacts treatment and control groups differentially. Having established wage convergence in conglomerates, I now turn to the consequences of this behavior on firm investment.

VI Implications for Input Utilization and Investment

VI.A Capital Labor Ratios

The wage convergence pattern documented in the first part of the paper implies the existence of a wedge between the wages of workers in diversified and non diversified firms. Provided that capital and labor are not perfect complements in production, firms should exhibit some degree of substitutability between capital and labor. Thus, I expect that plants that remunerate their labor above market level move away from the more expensive input and substitute towards

capital. In addition, the opposite pattern should be observed at the other extreme. When plants underpay their workers they should move away from the relative expensive capital input towards the cheap labor.

In my analysis I start by examining if this pattern is present in the cross section of plants and subsequently assess if these patterns persist when I observe plant ownership changes. Table IX, shows the coefficients from estimating the following regression:

$$K/L\ Ratio_{ift} = \alpha + \beta_1 \cdot Present\ in\ q5_{ft} + \beta_2 \cdot Present\ in\ q1_{ft} + X'_{it}\gamma + \epsilon_{it}$$

The set of controls X includes VA/hour, plant age, the 11 size controls and $Industry \times Year \times State$ fixed effects. The results suggest that the presence in wage quintile 5 has a strong positive impact on the capital labor ratios of plants. On the other hand, and just like was observed in my previous findings, the presence of the firm in the low wage industries (as measured by the firm's presence in wage quintile 1) has an ambiguous impact on capital labor ratios.

Next, I track the capital labor ratios when there are plant ownership changes. I use the same specification used in the analysis of wages around firm ownership changes but replace the dependent variable from wages to capital labor ratio. Panel A of Table X shows that plants that move to higher wage firms and see their wages go up, also tend to adjust their input use towards more capital. In contrast, plants that move to lower paying firms adjust their input use towards labor. Panels B and C examines the evolution of capital and labor for plants that change firms. Although total number of employees decrease in all plants that change firms, they decrease more in the plants that are acquired by high wage firms. Furthermore, the level of capital adjusts up when plants go to higher paying firms and adjust down when they are acquired by a lower paying firm. Note that, as before, all these effects are relative to the control group of plants in the same industry and time period that did not change firm.

One concern that could arise is the possibility of the effects on wages being driven by change in K/L ratios. In particular, it might be the case that it is the existence of high K/L ratios in some plants that leads to higher wages. To address this concern, in figure 3 I examine the timing of the increase in wages and K/L ratios when plants change firm and find that only three years after the ownership change there is a statistically significant change in the wages and K/L ratios. It is also visible that although the K/L ratios seem to remain almost flat and jump in the third year after the event, the wages seem to have a more gradual adjustment that starts in year 2. Altogether the evidence does not seem to support the view that higher capital labor ratios cause the wage premium.

Overall, I conclude from my analysis that firms use their input allocation policies to partly undo the potential adverse impact of the wage convergence pattern. In the next section I

explore implications of this behavior for investment decisions of the firm.

VI.B Investment

I now explore if differences in input allocation driven by wage equality could impact investment decisions of firms. In particular, I am interested in examining if the differences in input allocation can help explain the difference in investment behavior between diversified and stand alone firms documented in the literature. I start by estimating regressions of the form:

$$CAPX/Sales_{ift} = \alpha + \beta_1 \cdot Divdummy_{ft} + X'_{it}\gamma + \epsilon_{it}$$

Where the vector X includes plant age, the 11 size controls and $Industry \times Year \times State$ fixed effects. Panel A of Table XI starts in column 1 by confirming that the low investment industries in diversified firms tend to overinvest relative to their stand alone counterparts. Moreover, the first column of Panel B shows that diversified firms tend to underinvest in high investment industries relative to their stand alone comparables. This pattern of investment has been extensively shown in the literature and has been referred to as 'socialistic' investment or the dark side of internal capital markets (see for example Stein (1997) for a theoretical argument and Scharfstein (1998) for empirical evidence). In my analysis I try and evaluate how much of this deviation in investment between diversified and stand alone firms can be explained by the effect of peer pressure in wages.

In the second column of Panel A, I include the variable *Present in q5* $_{ft}$ and examine if the plants where the wages tend to be higher than comparable plants also tend to have higher investment. The answer is affirmative. This is consistent with the analysis in the previous section where I showed that these firms tend to have higher use of capital. Strikingly, when the variable *Present in q5* $_{ft}$ is included, the diversification measures are no longer significant.[24] Thus, it is not simply being diversified that leads to the result that diversified firms 'overinvest' in low growth industries. Rather, an important factor driving this result is the firm's presence in high wage sectors and the consequent differential wage policy.

In the second column of panel B, I include the variable *Present in q1* $_{ft}$ to understand how much of the 'underinvestment' in high growth industries by diversified firms is due to the peer effect phenomenon. I find that firm's presence in low wage quintiles also has a negative impact in investment. However, even after controlling for presence in low wage quintile, the diversification measures still show a significant negative impact.

[24] And in unreported regression where I use *log(number of divisions)* as a measure of diversification, it even turns negative.

Finally, I also analyze whether my measures of firm presence in high and low wage quintiles are simply measuring dispersion in firm's investment opportunities. If that was the case, what I am interpreting as an effect of distortions in the internal labor market could instead be distortions in internal capital markets.[25] To address this concern in the third column of Panels A and B, I include in the regressions the variables *Present in Investment q1* and *Present in Investment q5*. These are dummy variables that take the value of 1 if the firm has at least one establishment in investment quintile 1 and 5 respectively. They control for the amplitude of investment opportunities the firm has.

The third column of Panel A, shows that the inclusion of *Present in Investment q5* in the regression does not affect the coefficient associated with *Present in q5*. Furthermore, in the third column of panel B the variable *Present in Investment q1* is included in the regression. It can be seen that the coefficient associated with *Present in q1* suffers only a small ajustment relative to the second column of panel B. The results also show that despite amplitude in investmet opportunities available to the firm being associated with distortions in the investment policies of conglomerates, a stronger determinant of the documented investment socialism pattern seems to be rooted in distortions originated in the internal labor markets of these firms.

The results presented in this section suggest that peer effects phenomenon and upward convergence pattern in the wages of diversified firms may explain a large part of investment behavior documented in the literature. When firms overpay their workers, they tend to invest more than stand alone comparables and this largely accounts for the difference in investment policies between diversified and stand alone firms in the low investment industries. The results are weaker when examining the high investment industries – even after taking into account the peer effect in wages phenomenon, diversified firms still tend to underinvest. Overall, this section suggests that it is important to understand the functioning of internal labor markets in order to assess investment behavior in internal capital markets.

VII When is wage convergence stronger?

I have so far established that peer effects are an important determinant of wages inside conglomerates and that they impact investment decisions of these firms. However, I have not yet analyzed how external factors affect their strength. I turn to this issue now. This should help us understand whether this phenomenon applies generally or if it is driven by particular cases such as unionized labor. It also helps us assign weight to which theories (the ones that rely on social interactions or the ones that rely on information acquisition) are most important in

[25]Since it has been found that distortions in internal capital markets may be related to the amplitude of investment opportunities the conglomerate has access to (Rajan et al. (2000)).

driving the results.

VII.A Unionization

The first aspect that might have an important role in driving the peer effects I documented is the degree of labor unionization.[26] To measure labor unionization I use the variable *Union* which is the share of manufacturing workers that are unionized by state and year.[27] In general, the level of labor unionization can affect the degree of linkage in wages inside firms in several ways. First, it increases the degree of multilateral or firm wide contracting, which could lead to more equalization in wages. Second, it may be a source of information about the wages in other parts of the firm and as such increase the salience of the wages of other workers in the firm.

In Panel A of Table XII I test if wages of plants in low-wage industries (wage quintiles 1 to 4) see stronger response to presence of the firm in high-wage quintile if the plant is in a highly unionized state. In Panel B, I replace the variable *Present in q5* $_{ft}$ by *Present in q1* $_{ft}$ and explore the response to the other extreme of wages. I estimate regressions of the following form:

$$Wage/hour_{ift} = \alpha + \beta_1 \cdot Present\ in\ q5_{ft} + \beta_2 \cdot Present\ in\ q5_{ft} \times Union + X'_{it}\gamma + \epsilon_{it}$$

The set of controls X includes VA/hour, plant age, the 11 size controls and $Industry \times Year \times State$ fixed effects. The results show that labor unionization makes low-wage workers more sensitive to the presence of high wage workers in the firm. When the variables *Union* and the interaction of *Union* with *Present in q5* $_{ft}$ are included in the regression the magnitude of β_1 goes down, meaning that in low unionized states the firm's presence in wage quintile 5 does not has as high of an impact. Furthermore, the coefficient associated with the interaction term is positive and significant and a 1 percentage point higher in labor unionization is associated with a 1.2 cents per hour higher wage.

On the other hand, unionization does not impact the sensitivity of wages to peer effects for the high wage workers. Thus, while the low-wage workers gain with unionization, high-wage workers don't gain or lose. This can be observed in columns 3 and 4 of table XII where the coefficient associated with the interaction of *Union* with *Present in q1* $_{ft}$ is economically small and statistically insignificant. As was the case in other sections, the coefficients associated

[26] The WSJ article quoted in the introduction about pay of auto workers mentions the efforts of unions to achieve a flatter wage distribution.

[27] I also ran the regressions using as a measure of unionization the share of workers in the manufacturing sector that are covered by a collective bargaining agreement and the results are qualitatively similar.

with VA/hour and the diversification measures are positive in all columns of the table.

VII.B Geographic Proximity

The theories that rely more heavily on social interactions depend crucially on workers being in contact with each other. In order to understand if close contact to other workers is the main force behind my findings, I explore if the dependence of worker wages becomes stronger when plants are geographically close. The idea is that if plants are in the same ZIP code, county or even state, one would expect the personal contact between workers of different plants to be more likely and stronger. For instance, this could occur because the firm allows workers to share similar facilities.

To test if geographic proximity is associated with a stronger impact on wages I estimate the following regression:

$$Wage/hour_{it} = \alpha + \beta_1 \cdot Wage\ In\ State_{it} + \beta_2 \cdot Wage\ Out\ State_{it} + X'_{it}\gamma + \epsilon_{it}$$

Here I separate the firm's plants into two subgroups: one group consists of plants that are close to each other (same state) and the second group is the rest of the plants owned by the firm. The variable $Wage\ In\ State_{it}$ measures the wage level of the other establishments of the firm within state borders, while $Wage\ Out\ State_{it}$ contains information on the other plants of the firm outside of the state where plant i is located.[28] My tests examine if the wages are more sensitive to wages of plants in the former group relative to the latter. Where as before, the set of controls X includes VA/hour, plant age, the 11 size controls and $Industry \times Year \times State$ fixed effects.

Table XIII shows the results. As is evident, more geographic proximity is not associated with a higher sensitivity of wages to the wages of other workers. In fact, if anything, worker wages are more sensitive to other workers that are physically far away than to those that are geographically close.

VII.C Headquarters Importance

I next evaluate if the strength of peer effects is related to the degree of centralization of the firm. More centralized decision making should be associated with the central offices taking actions that impact several different divisions of the firm, in contrast with decentralized decision

[28] Formally: $Wage\ In\ State_{it} = \sum_{j \neq i} \frac{workers_{jt} \times Median\ Industry\ Wage_{jt}}{\sum_{j \neq i} Workers_{jt}}$, if plant j is in the same state as plant i. And $Wage\ Out\ State_{it} = \sum_{j \neq i} \frac{workers_{jt} \times Median\ Industry\ Wage_{jt}}{\sum_{j \neq i} Workers_{jt}}$, if plant j is in a different state than plant i.

making where the decisions in one division do not necessarily impact other divisions. In that sense, the importance of the firm's central offices could be associated with a higher degree of multilateral contracting in the spirit of Levin (2002). Thus, if for example the central offices decide to cut benefits for workers in one division, the workers of the other divisions may fear it will also apply to them. while in the case of decentralized decision making, this fear should be less acute due to the fact that the policies applied in one division do not necessarily hold for the other.

To test this notion, I construct the variable HQ which captures the importance of the headquarters in the firm by measuring the share of firm workers that are allocated to the auxiliary production establishments. I then run regressions of the form:

$$Wage/hour_{ift} = \alpha + \beta_1 \cdot Present\ in\ q5_{ft} + \beta_2 \cdot HQ + \beta_3 \cdot (Present\ in\ q5_{ft} \times HQ) + X'_{it}\gamma + \epsilon_{it}$$

Panel A of Table XIV shows the coefficients obtained from estimating this regression. In Panel B I present the coefficients when the variable $Present\ in\ q5_{ft}$ is replaced with the variable $Present\ in\ q1_{ft}$. The results show that a higher degree of centralization makes low wage workers more sensitive to the presence of high wage workers in the firm. Again there is an asymmetric effect since high wage workers do not seem to be more sensitive to the presence of low wage workers in the firm when there is more centralization.

VII.D Product Market Competition

Finally, I evaluate if differing levels of competition faced by firms in the product market affect the strength of peer effects. The idea is that competitive pressures should leave firms less room to pursue inefficient policies and may give us an indication about the optimality of the wage equalization in firms. Using changes in the degree of import competition, Bertrand (2004) finds that internal labor markets loose importance in terms of shielding wages from the external market forces when firms operate in a more competitive environment.

To test the role of competition, I estimate regressions of the following form:

$$Wage/hour_{it} = \alpha + \beta_1 \cdot Present\ in\ q5_{ft} + \beta_2 \cdot (Present\ in\ q5_{ft} \times Comp) + X'_{it}\gamma + \epsilon_{it}$$

And,

$$Wage/hour_{it} = \alpha + \beta_1 \cdot Present\ in\ q1_{ft} + \beta_2(\cdot Present\ in\ q1_{ft} \times Comp) + X'_{it}\gamma + \epsilon_{it}$$

Where the measure of competition: Comp is the number of firms by industry (in thousands).

The results, reported in Table XV show that competition does impact the strength of the peer effects for workers in the low wage industries. These workers do not receive as high a premium when their plant operates in a more competitive industry. However, competition does not seem to affect the wages of the high paid workers.

VII.E Discussion

The evidence from the regressions in this section suggests that concerns to keep intra-firm equity may be the primary driver for the results. Higher degree of labor unionization and more firm centralization lead to stronger wage convergence within firms. Additionally, competition has a statistically significant but economically small impact on the results. Finally and intriguingly, geographical proximity does not seem to have an effect in the expected direction, since workers in plants that are physically close together do not seem to exhibit a greater tendency towards pay convergence. This is something that will have to be investigated in further research.

VIII Conclusion

In this paper, I ask an old question: what is the cost of bringing more activity into a firm? I present a new answer that suggests that an important source may be related to the way workers are paid. I examine the nature of worker wages inside diversified firms and document evidence for *wage convergence*. This pattern is asymmetric: workers in low-wage industries collect higher-than-industry wages (by 8%) when the diversified firm is also present in high-wage industries, but the reverse is not true. There is a dramatic change in investment policy of diversified firms that exhibit wage convergence: plants with more 'overpaid' workers tilt investment policies towards a higher capital-labor ratio. In other words, plants with high-wage workers, tend to shift their input use away from the expensive labor towards the relatively cheaper capital. This effect is large and when one accounts for the investment needed to offset wage distortions, it is harder to find evidence of capital 'misallocation' in conglomerates documented in the previous literature.

Most research in economics and finance has focused on examining investment behavior inside internal capital markets without a regard to internal labor markets. My findings suggest that a firm may have to pay higher wages when it combines two different activities (as in a conglomerate) than when each of those activities are undertaken by separate firms. Moreover, I show that decisions taken by firms in their internal labor markets directly impact investment behavior of firms. Therefore, it may be critical to understand the functioning of internal labor

markets in order to advance our assessment of what drives investments decisions inside firm boundaries.

It is important to note that while the pattern in wages I document can be thought of as a 'dark side' of internal labor markets inside diversified firms, there may be a 'bright side' to these markets too. One such mechanism is the possibility of allocating workers across divisions inside diversified firms which allows for better matching between workers and industries, and consequently higher productivity. Recent work of Tate and Yang (2011) provides strong evidence supporting the existence of this bright side of internal labor markets.[29] Whether these are the only effects of internal labor markets remains a fruitful area of future research.

[29]In addition there is anecdotal evidence that suggests this is an important consideration for several diversified firms. For example, General Electric, advertises itself on its website as giving its employees unparallel opportunities to build their career and capabilities by being able to work across a diverse set of business: "GE is renowned for hiring exceptional people and giving them unparallel opportunities to build their career and capabilities. There is simply no other company in the world with such a diverse set of business in which to work".

Table I: Hourly Wage depending on which sectors the firm is present

		Diversified				
Wage Quintile	Stand Alone	All	Not Present in q5	Not Present in q4 or q5	Not Present in q3 to q5	Not Present in q2 to q5
1	7.90	11.69	10.12	9.21	8.90	8.19
2	8.75	11.92	10.83	9.97	9.54	.
3	10.90	14.21	12.76	11.83	.	.
4	13.33	16.69	13.89	.	.	.
5	15.21	20.57	.	.	.	.
Total	12.58	16.62	12.77	10.71	9.43	8.19

Notes: This table shows the Average Hourly Wage for production workers in the Manufacturing Sector. Each row of the table is associated with a wage quintile. The wage quintiles are constructed by categorizing 3 digit SIC industries based on the wages of workers in stand alone firms. Where quintile 1 represents the lowest wage industries and quintile 5 the highest wage industries. Once industries are placed in one of the five quintiles, this definition is applied to both diversified and non diversified firms.
Each column of the table is associated with a type of firm. The first column contains wages for workers of stand alone firms, while the second column contains wages of workers from diversified firms. Then in column 3 only workers of firms that although diversified have no establishment in wage quintile 5 are included. In column 4 the sample is further restricted to include only workers of diversified firms that are not present in wage quintiles 4 or 5. Column 5 contains workers of diversified firms that have no establishments in wage quintiles 3 to 5 and finally, column 6 contains the average hourly wage for workers of firms that are diversified within industries categorized as belonging to wage quintile 1.

Table II: Wage Convergence Multivariate Analysis - Firm's Presence in wage quintiles 1 and 5

	Panel A		Panel B	
Variable	Wage/hour	Wage/hour	Wage/hour	Wage/hour
Present in q5	1.008***	0.609***		
	(0.064)	(0.065)		
Present in q1			0.066	-0.548***
			(0.098)	(0.109)
Divdummy	0.521***		1.229***	
	(0.048)		(0.047)	
log(number of divisions)		0.433***		0.735***
		(0.042)		(0.031)
VA/hour	0.004	0.004	0.003***	0.003***
	(0.003)	(0.003)	(0.001)	(0.001)
Rounded N	1,600,000	1,600,000	2,040,000	2,040,000
R-squared	0.486	0.487	0.520	0.522
Size & Age Controls	Yes	Yes	Yes	Yes
State × Year × Industry FE	Yes	Yes	Yes	Yes

Notes: Panel A presents coefficients obtained by estimating regressions of the type:

$$Wage/hour_{ift} = \alpha + \beta \cdot Present\ in\ q5_{ft} + X'_{ift}\gamma + \epsilon_{ift}$$

where the matrix of controls X includes $VA/hour$, the 11 size controls, plant age, State × Year × Industry fixed effects and a measure of diversification (Divdummy in column 1 and log(number of divisions) in column 2). *Present in q5*$_{ft}$ is a dummy variable that takes the value of 1 if the firm has at least one establishment in wage quintile 5. Panel A includes only plants that operate in wage quintiles 1 through 4.

Panel B presents coefficients obtained by estimating regressions of the type:

$$Wage/hour_{ift} = \alpha + \beta \cdot Present\ in\ q1_{ft} + X'_{ift}\gamma + \epsilon_{ift}$$

where the matrix of controls X includes $VA/hour$, the 11 size controls, plant age, State × Year × Industry fixed effects and a measure of diversification (Divdummy in column 3 and log(number of divisions) in column 4). *Present in q1*$_{ft}$ is a dummy variable that takes the value of 1 if the firm has at least one establishment in wage quintile 1. Panel B includes only plants that operate in wage quintiles 2 through 5.

In all columns the standard errors in parenthesis are clustered by firm. Statistical significance at 1%, 5% and 10% is market with ***, ** and * respectively.

Table III: Wage Convergence Multivariate Analysis - Inclusion of Firm Level Productivity Controls

	Panel A				Panel B			
Variable	Wage/hour	Wage/hour	Wage/hour	Wage/hour	Wage/hour	Wage/hour	Wage/hour	Wage/hour
Present in q5	0.344***	0.368***	0.340***	0.367***				
	(0.081)	(0.080)	(0.081)	(0.080)				
Present in q1					-0.188	-0.181	-0.208	-0.199
					(0.446)	(0.446)	(0.464)	(0.463)
VA/hour - Firmwide			0.046***	0.046***			0.029***	0.029***
			(0.006)	(0.006)			(0.006)	(0.006)
Divdummy	-0.132***		-0.100**		-0.013		0.009	
	(0.047)		(0.046)		(0.038)		(0.037)	
log(number of divisions)		-0.149***		-0.124***		0.007		0.027
		(0.056)		(0.055)		(0.046)		(0.046)
VA/hour	0.045***	0.045***	0.010**	0.010**	0.036***	0.036***	0.012***	0.012***
	(0.006)	(0.006)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)
Rounded N	598,000	598,000	598,000	598,000	764,000	764,000	764,000	764,000
R-squared	0.526	0.526	0.534	0.534	(0.542)	(0.542)	(0.545)	(0.545)
Size & Age Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State × Year × Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Panel A presents coefficients obtained by estimating regressions of the type:

$$Wage/hour_{ift} = \alpha + \beta \cdot Present\ in\ q5_{ft} + X'_{ift}\gamma + \epsilon_{ift}$$

where the matrix of controls X includes $VA/hour$, the 11 size controls, plant age, State × Year × Industry fixed effects and a measure of diversification (Divdummy in columns 1 and 3 and log(number of divisions) in columns 2 and 4). *Present in q5* $_{ft}$ is a dummy variable that takes the value of 1 if the firm has at least one establishment in wage quintile 5. Panel A includes only plants that operate in wage quintiles 1 through 4 and only plants owned by firms that have 90% or more of their employees in the manufacturing sector. Columns 3 and 4 include also a control for firmwide productivity: *VA/hour - Firmwide*.

Panel B presents coefficients obtained by estimating regressions of the type:

$$Wage/hour_{ift} = \alpha + \beta \cdot Present\ in\ q1_{ft} + X'_{ift}\gamma + \epsilon_{ift}$$

where the matrix of controls X includes $VA/hour$, the 11 size controls, plant age, State × Year × Industry fixed effects and a measure of diversification (Divdummy in columns 5 and 7 and log(number of divisions) in columns 6 and 8). *Present in q1* $_{ft}$ is a dummy variable that takes the value of 1 if the firm has at least one establishment in wage quintile 1. Panel B includes only plants that operate in wage quintiles 2 through 5 and only plants owned by firms that have 90% or more of their employees in the manufacturing sector. Columns 7 and 8 include also a control for firmwide productivity: *VA/hour - Firmwide*.

In all columns the standard errors in parenthesis are clustered by firm. Statistical significance at 1%, 5% and 10% is market with ***, ** and * respectively.

Table IV: Wage Evolution Around Plant Ownership Changes

Variable	Wage/hour	Wage/hour
After × Industry wage H	0.215**	
	(0.110)	
After × Industry wage L	-0.014	
	(0.129)	
After × Firm wage H		0.222**
		(0.120)
After × Firm wage L		0.049
		(0.125)
log(number of divisions)	0.153*	0.153*
	(0.092)	(0.092)
VA/hour	0.003*	0.003*
	(0.002)	(0.002)
Rounded N	1,428,000	1,428,000
R-squared	0.814	0.814
Size & Age Controls	Yes	Yes
Industry × Year FE	Yes	Yes
Plant FE	Yes	Yes

Notes: Column 1 contains the coefficients from estimating the following regression:

$$Wage/hour_{it} = \alpha + \beta_1 \cdot (After \times Industry\ wage\ H_{it}) + \beta_2 \cdot (After \times Industry\ wage\ L_{it}) + X'_{it}\gamma + \epsilon_{it}$$

Column 2 contains the coefficients from estimating the following regression:

$$Wage/hour_{it} = \alpha + \beta_1 \cdot (After \times Firm\ wage\ H_{it}) + \beta_2 \cdot (After \times Firm\ wage\ L_{it}) + X'_{it}\gamma + \epsilon_{it}$$

In both columns, the matrix of controls X includes $VA/hour$, the 11 size controls, plant age, plant fixed effects, Year × Industry fixed effects and *log(number of divisions)* as a measure of diversification. They include also a measure of wages at the 3 digit SIC, state and year level – the median wage of stand alone firms by *State* × *Year* × *3 digit SIC Industry*.
The regressions include plants that change firm once during the sample period, but excludes the cases in which both the acquiring and target firms are undiversified. It also includes plants that never change firm as a control group. It analyses the evlotution of wages around plant ownership changes. The standard errors in parenthesis are clustered by firm. Statistical significance at 1%, 5% and 10% is market with ***, ** and * respectively.

Table V: Exogenous shock - the NAFTA Agreement

	Panel A		Panel B	
Variable	Wage/hour	Wage/hour	Wage/hour	Wage/hour
After × Export	2.130***	2.125***		
	(0.429)	(0.429)		
After × Firm_Exp			3.926***	3.961***
			(1.275)	(1.264)
Export	-0.132	-0.101		
	(0.469)	(0.469)		
Firm_exp			-0.961	-1.132
			(1.324)	(1.311)
Divdummy		0.176		0.106
		(0.182)		(0.239)
log(number of divisions)	0.178**		-0.136	
	(0.089)		(0.116)	
VA/hour	0.006**	0.006**	0.007***	0.007***
	(0.003)	(0.003)	(0.001)	(0.001)
Rounded N	56,000	56,000	47,000	47,000
R-squared	0.886	0.886	0.866	0.866
Size & Age Controls	Yes	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes	Yes
Plant FE	Yes	Yes	Yes	Yes

Notes: The regression model used to compute the coefficients in Panel A is:

$$Wage/hour_{it} = \alpha + \beta_1 \cdot Exports + \beta_2 \cdot After + \beta_3 \cdot (After \times Exports) + X'_{it}\gamma + \epsilon_{it}$$

The sample used to estimate the coefficients includes only years 1991 to 1996 and exporting plants or plants owned by firms with zero exports. The variable Exports is the share of plant sales that are exported, After is a dummy variable that takes the value 1 if the year is 1994, 1995 or 1996 and zero otherwise.

The regression model used to compute the coefficients in Panel B is:

$$Wage/hour_{it} = \alpha + \beta_1 \cdot Firm\_Exp + \beta_2 \cdot After + \beta_3 \cdot (After \times Firm\_Exp) + X'_{it}\gamma + \epsilon_{it}$$

The sample used to estimate the coefficients includes only years 1991 to 1996 and non exporting plants. The variable Firm_Exp is the share of the firm sales that are exported.

In all columns, the matrix of controls X includes $VA/hour$, the 11 size controls, plant age, Plant fixed effects, Year × Industry fixed effects and Divdummy or log(number of divisions) as measures of diversification. It includes also a measure of wages at the 3 digit SIC, state and year level – the median wage of stand alone firms by *State* × *Year* × *3 digit SIC Industry*.
The standard errors in parenthesis are clustered by firm. Statistical significance at 1%, 5% and 10% is market with ***, ** and * respectively.

Table VI: NAFTA - Placebo test

	Panel A		Panel B	
Variable	Wage/hour	Wage/hour	Wage/hour	Wage/hour
After × Export	0.753	0.754		
	(0.527)	(0.527)		
After × Firm_exp			0.947	0.947
			(1.354)	(1.348)
Export	0.189	0.213		
	(0.743)	(0.743)		
Firm_exp			0.457	0.459
			(1.481)	(1.470)
Divdummy		-0.003		-0.015
		(0.152)		(0.195)
log(number of divisions)	0.152*		-0.002	
	(0.088)		(0.090)	
VA/hour	0.008**	0.008**	0.006*	0.006*
	(0.004)	(0.004)	(0.003)	(0.003)
Rounded N	39,000	39,000	33,000	33,000
R-squared	0.883	0.883	0.872	0.872
Size & Age Controls	Yes	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes	Yes
Plant FE	Yes	Yes	Yes	Yes

Notes: The regression model used to compute the coefficients in Panel A is:

$$Wage/hour_{it} = \alpha + \beta_1 \cdot Exports + \beta_2 \cdot After + \beta_3 \cdot (After \times Exports) + X'_{it}\gamma + \epsilon_{it}$$

The sample used to estimate the coefficients includes only years 1985 to 1990 and exporting plants or plants owned by firms with zero exports. The variable Exports is the share of plant sales that are exported, After is a dummy variable that takes the value 1 if the year is 1988, 1989 or 1990 and zero otherwise.

The regression model used to compute the coefficients in Panel B is:

$$Wage/hour_{it} = \alpha + \beta_1 \cdot Firm\_Exp + \beta_2 \cdot After + \beta_3 \cdot (After \times Firm\_Exp) + X'_{it}\gamma + \epsilon_{it}$$

The sample used to estimate the coefficients includes only years 1990 to 1996 and non exporting plants. The variable Firm_Exp is the share of the firm sales that are exported.

In all columns, the matrix of controls X includes $VA/hour$, the 11 size controls, plant age, Plant fixed effects, Year × Industry fixed effects and Divdummy or log(number of divisions) as measures of diversification. It includes also a measure of wages at the 3 digit SIC, state and year level – the median wage of stand alone firms by *State × Year × 3 digit SIC Industry*.
The standard errors in parenthesis are clustered by firm. Statistical significance at 1%, 5% and 10% is market with ***, ** and * respectively.

Table VII: NAFTA - Treatment and Control Groups Defined based in Exporting Industries

	Panel A		Panel B	
Variable	Wage/hour	Wage/hour	Wage/hour	Wage/hour
Export q5	-0.198	-0.185		
	(0.128)	(0.128)		
After × Export q5	0.806***	0.801***		
	(0.134)	(0.135)		
Present in Export q5			-0.254	-0.298*
			(0.155)	(0.158)
After × Present in Export q5			0.489***	0.503***
			(0.153)	(0.153)
Divdummy		0.127		0.078
		(0.180)		(0.238)
log(number of divisions)	0.134		-0.139	
	(0.102)		(0.119)	
VA/hour	0.006**	0.006**	0.007***	0.007***
	(0.003)	(0.003)	(0.001)	(0.001)
Rounded N	50,000	50,000	47,000	47,000
R-squared	0.885	0.885	0.865	0.865
Size & Age Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Plant FE	Yes	Yes	Yes	Yes

Notes: The regression model used to compute the coefficients in Panel A is:

$$Wage/hour_{it} = \alpha + \beta_1 \cdot Exportq5 + \beta_2 \cdot After + \beta_3 \cdot (After \times Exportq5) + X'_{it}\gamma + \epsilon_{it}$$

The sample used to estimate the coefficients includes only years 1991 to 1996 and plants in exporting quintile 5 or plants owned by firms that have no plant in exporting quintile 5. The variable *Export q5* is is a dummy variable that takes the value of 1 if the plant operates in an industry that is categorized as being quintile 5 of exports, After is a dummy variable that takes the value 1 if the year is 1994, 1995 or 1996 and zero otherwise.

The regression model used to compute the coefficients in Panel B is:

$$Wage/hour_{it} = \alpha + \beta_1 \cdot PresentinExportq5 + \beta_2 \cdot After + \beta_3 \cdot (After \times PresentinExportq5) + X'_{it}\gamma + \epsilon_{it}$$

The sample used to estimate the coefficients includes only years 1991 to 1996 and plants in expoting quintile 1, where exporting quintile 1 is defined as the one associated with the lowest exporting industries. The variable *Present in Export q5* is a dummy variable that takes the value of 1 if the firm owns at least one establishment in exporting quintile 5.

In all columns, the matrix of controls X includes $VA/hour$, the 11 size controls, plant age, Plant fixed effects, Year × Industry fixed effects and Divdummy or log(number of divisions) as measures of diversification. It includes also a measure of wages at the 3 digit SIC, state and year level – the median wage of stand alone firms by *State × Year × 3 digit SIC Industry*.
The standard errors in parenthesis are clustered by firm. Statistical significance at 1%, 5% and 10% is market with ***, ** and * respectively.

Table VIII: NAFTA -Plants with zero interplant transfers

Variable	Wage/hour	Wage/hour
After × Firm_exp	3.004**	3.043**
	(1.354)	(1.343)
Firm_exp	0.112	-0.087
	(1.377)	(1.374)
Divdummy		0.150
		(0.253)
log(number of divisions)	-0.137	
	(0.123)	
VA/hour	0.008***	0.008***
	(0.001)	(0.001)
Rounded N	42,000	42,000
R-squared	0.869	0.869
Size & Age Controls	Yes	Yes
Industry × Year FE	Yes	Yes
Plant FE	Yes	Yes

Notes: The regression model used to compute the coefficients is:

$$Wage/hour_{it} = \alpha + \beta_1 \cdot Firm_exp + \beta_2 \cdot After + \beta_3 \cdot (After \times Firm_exp) + X'_{it}\gamma + \epsilon_{it}$$

The sample used to estimate the coefficients includes only years 1990 to 1996, non exporting plants and plants with zero interplant transfers. The variable Firm_exp is the share of the firm sales that are exported. After is a dummy variable that takes the value 1 if the year is 1994, 1995 or 1996 and zero otherwise.
The matrix of controls X includes $VA/hour$, the 11 size controls, plant age, Plant fixed effects, Year × Industry fixed effects and Divdummy or log(number of divisions) as measures of diversification. It includes also a measure of wages at the 3 digit SIC, state and year level – the median wage of stand alone firms by *State* × *Year* × *3 digit SIC Industry*.
The standard errors in parenthesis are clustered by firm. Statistical significance at 1%, 5% and 10% is market with ***, ** and * respectively.

Table IX: Capital Labor Ratio - Firm's presence in wage quintiles 1 and 5

Variable	K/L Ratio	K/L Ratio
Present in q5	7.118***	3.507***
	(0.417)	(0.483)
Present in q1	2.125***	-1.248*
	(0.738)	(0.691)
Divdummy	4.410***	
	(0.267)	
log(number of divisions)		4.109***
		(0.358)
Rounded N	914,000	914,000
R-squared	0.462	0.463
Size & Age Controls	Yes	Yes
State × Year × Industry FE	Yes	Yes

Notes: The regression model used to compute the coefficients is:

$$K/LRatio_{ift} = \alpha + \beta_1 \cdot Present\ in\ q5_{ft} + \beta_2 \cdot Present\ in\ q1_{ft} + X'_{it}\gamma + \epsilon_{it},$$

where the matrix of controls X includes $VA/hour$, the 11 size controls, plant age, State × Year × Industry fixed effects and Divdummy or log(number of divisions) as measures of diversification. The sample includes only plants that operate in wage quintiles 2 through 4.
The standard errors in parenthesis are clustered by firm. Statistical significance at 1%, 5% and 10% is market with ***, ** and * respectively.

Table X: Evolution of Capital Labor Ratio Around Plant Ownership Change Events

	Panel A		Panel B		Panel C	
Variable	K/L Ratio	K/L Ratio	Capital	Capital	Labor	Labor
After × Industry wage H	1.858*		207.752		-51.177***	
	(1.006)		(627.644)		(9.015)	
After × Industry wage L	0.329		-157.869		-28.468***	
	(1.445)		(612.351)		(6.656)	
After × Firm wage H		2.360**		422.803		-46.449***
		(1.025)		(570.984)		(8.054)
After × Firm wage L		0.183		-320.666		-42.723***
		(1.368)		(688.019)		(10.682)
log(number of divisions)	0.847**	0.842**	631.351***	629.626***	-6.850**	-6.870**
	(0.340)	(0.340)	(241.538)	(241.385)	(3.408)	(3.409)
VA/hour	0.088***	0.088***	-3.060	-3.059	-0.198***	-0.198***
	(0.022)	(0.022)	(3.188)	(3.188)	(0.052)	(0.052)
Rounded N	970,000	970,000	970,000	970,000	970,000	970,000
R-squared	0.766	0.766	0.882	0.882	0.945	0.945
Size & Age Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Plant FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: In each Panel (A through C), the first column contains the coefficients from estimating the following regression:

$$Y_{it} = \alpha + \beta_1 \cdot (After \times Industry\ wage\ H_{it}) + \beta_2 \cdot (After \times Industry\ wage\ L_{it}) + X'_{it}\gamma + \epsilon_{it}$$

Whle the second column contains the coefficients from estimating the following regression:

$$Y_{it} = \alpha + \beta_1 \cdot (After \times Firm\ wage\ H_{it}) + \beta_2 \cdot (After \times Firm\ wage\ L_{it}) + X'_{it}\gamma + \epsilon_{it}$$

The dependent variable Y is *K/L ratio* in Panel A, *Capital* measured as book value of assets in Panel B and *Labor* measure as total number of employees in Panel C.

In all columns, the matrix of controls X includes $VA/hour$, the 11 size controls, plant age, Plant fixed effects, Year × Industry fixed effects and log(number of divisions) as a measure of diversification. The regressions include plants that change firm once during the sample period, but excludes the cases in which both the acquiring and target firms are undiversified. It also includes plants that never change firm as a control group.
The standard errors in parenthesis are clustered by firm. Statistical significance at 1%, 5% and 10% is market with ***, ** and * respectively.

Table XI: Wage Convergence impact on Investment Behavior

	Panel A - Investment Quintile 1			Panel B - Investment Quintile 5		
Variable	CAPX/Sales	CAPX/Sales	CAPX/Sales	CAPX/Sales	CAPX/Sales	CAPX/Sales
Divdummy	0.092***	0.043	0.043	-0.197***	-0.171***	-0.143***
	(0.032)	(0.037)	0.037	(0.054)	(0.054)	0.055
Present in q5		0.098**	0.099**			
		(0.045)	0.047			
Present in q1					-0.199**	-0.168*
					(0.093)	(0.093)
Present in Investment q5			-0.004			
			0.063			
Present in Investment q1						-0.144*
						(0.081)
Rounded N	330,000	330,000	330,000	360,000	360,000	360,000
R-squared	0.131	0.131	0.131	0.106	0.106	0.106
Size & Age Controls	Yes	Yes	Yes	Yes	Yes	Yes
State × Year × Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Panel A contains the coefficients obtained from estimating the following regression model:

$$CAPX/Sales_{ift} = \alpha + \beta_1 \cdot Divdummy_{ft} + \beta_2 \cdot Present\ in\ q5_{ft} + X'_{it}\gamma + \epsilon_{it}$$

The Dependent variable is Capital Expenditures divided by sales at the plant level. The regressions in columns 1 to 3 only include plants that operate in industries that belong to investment quintile 1. Furthermore columns 1 to 3 include plants in wage quintiles 1 to 4.

Panel B contains the coefficients obtained from estimating the following regression model:

$$CAPX/Sales_{ift} = \alpha + \beta_1 \cdot Divdummy_{ft} + \beta_2 \cdot Present\ in\ q1_{ft} + X'_{it}\gamma + \epsilon_{it}$$

Columns 4 to 6 include only plants that operate in industries that belong to investment quintile 5. Furthermore columns 4 to 6 include plants in wage quintiles 2 to 5.

The variable *Present in Investment q5* is a dummy variable that takes the value of 1 if the firm has at least one plant in investment quintile 5. While *Present in Investment q1* is a dummy variable that takes the value of 1 if the firm has at least one plant in investment quintile 1.
Finally, the matrix of controls X includes the 11 size controls, plant age, State × Year × Industry fixed effects and Divdummyas measures of diversification.
This table evaluates how much of the equalitarian investment pattern found in the literature is due to the wage convergence pattern found in this paper. The standard errors in parenthesis are clustered by firm. Statistical significance at 1%, 5% and 10% is market with ***, ** and * respectively.

Table XII: Labor Unionization and Wage Convergence

	Panel A		Panel B	
Variable	Wage/hour	Wage/hour	Wage/hour	Wage/hour
Present in q5	0.849***	0.434***		
	(0.118)	(0.121)		
Present in q5 × Union	0.012***	0.012***		
	(0.004)	(0.004)		
Present in q1			0.022	-0.552***
			(0.187)	(0.191)
Present in q1 × Union			-0.001	-0.002
			(0.007)	(0.007)
Divdummy	0.472***		1.304***	
	(0.063)		(0.059)	
log(number of divisions)		0.438***		0.793***
		(0.052)		(0.040)
VA/hour	0.009***	0.009***	0.003***	0.003***
	(0.003)	(0.003)	(0.001)	(0.001)
Rounded N	1,143,000	1,143,000	1,459,000	1,459,000
R-squared	0.374	0.374	0.411	0.413
Size & Age Controls	Yes	Yes	Yes	Yes
State × Year × Industry FE	Yes	Yes	Yes	Yes

Notes: Panel A presents coefficients from regressions of the type:

$$Wage/hour_{it} = \alpha + \beta_1 \cdot Present\ in\ q5_{ft} + \beta_2 \cdot (Present\ in\ q5_{ft} \times Union) + X'_{it}\gamma + \epsilon_{it}$$

where the matrix of controls X includes $VA/hour$, the 11 size controls, plant age, State × Year × Industry fixed effects and a measure of diversification (Divdummy in column 1 and log(number of divisions) in column 2). *Present in* $q5_{ft}$ is a dummy variable that takes the value of 1 if the firm has at least one establishment in wage quintile 5. *Union* is the share of workers that belong to a labor union (on a scale of 0-100) by state. Panel A includes only plants that operate in wage quintiles 1 through 4.

Panel B presents coefficients from regressions of the type:

$$Wage/hour_{it} = \alpha + \beta_1 \cdot Present\ in\ q1_{ft} + \beta_2 \cdot (Present\ in\ q1_{ft} \times Union) + X'_{it}\gamma + \epsilon_{it}$$

where the matrix of controls X includes $VA/hour$, the 11 size controls, plant age, State × Year × Industry fixed effects and a measure of diversification (Divdummy in column 3 and log(number of divisions) in column 4). *Present in* $q1_{ft}$ is a dummy variable that takes the value of 1 if the firm has at least one establishment in wage quintile 1. *Union* is the share of workers that belong to a labor union (on a scale of 0-100) by state. Panel B includes only plants that operate in wage quintiles 2 through 5.

The standard errors in parenthesis are clustered by firm. Statistical significance at 1%, 5% and 10% is market with ***, ** and * respectively.

Table XIII: Geographic Proximity and Wage Convergence

Variable	Wage/hour
Wage In State	0.047***
	(0.007)
Wage Out State	0.109***
	(0.012)
log(number of divisions)	0.396***
	(0.058)
VA/hour	0.001*
	(0.001)
Rounded N	620,000
R-squared	0.604
Size & Age Controls	Yes
State × Year × Industry FE	Yes

Notes: This table presents the coefficients obtained from estimating the following regression:

$$Wage/hour_{it} = \alpha + \beta_1 \cdot Wage\ In\ State_{it} + \beta_2 \cdot Wage\ Out\ State_{it} + X'_{it}\gamma + \epsilon_{it}$$

Where $Wage\ In\ State_{it} = \sum_{j \neq i} \frac{Numberofworkers_{jt} \times Median\ Industry\ Wage_{jt}}{\sum_{j \neq i} NumberofWorkers_{jt}}$, if plant j is in the same state as plant i. And $Wage\ Out\ State_{it} = \sum_{j \neq i} \frac{Numberofworkers_{jt} \times Median\ Industry\ Wage_{jt}}{\sum_{j \neq i} NumberofWorkers_{jt}}$, if plant j is in a different state than plant i.

Additionally the matrix of controls X includes $VA/hour$, the 11 size controls, plant age, State × Year × Industry fixed effects and log(number of divisions) as a measure of diversification. The standard errors in parenthesis are clustered by firm. Statistical significance at 1%, 5% and 10% is market with ***, ** and * respectively.

Table XIV: Headquarters importance and Wage Convergence

	Panel A		Panel B	
Variable	Wage/hour	Wage/hour	Wage/hour	Wage/hour
Present in q5	0.699***	0.431***		
	(0.092)	(0.100)		
Present in q5 × HQ	1.717***	1.820***		
	(0.553)	(0.559)		
Present in q1			0.038	-0.330***
			(0.100)	(0.104)
Present in q1 × HQ			0.540	0.607*
			(0.354)	(0.365)
HQ	-0.022	-0.031	0.007	0.006
	(0.035)	(0.034)	(0.033)	(0.032)
Divdummy	0.606**		0.881***	
	(0.265)		(0.252)	
log(number of divisions)		0.231***		0.416***
		(0.059)		(0.049)
VA/hour	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Rounded N	80,000	80,000	111,000	111,000
R-squared	0.589	0.590	0.609	0.611
Size & Age Controls	Yes	Yes	Yes	Yes
State × Year × Industry FE	Yes	Yes	Yes	Yes

Notes: Panel A presents coefficients from regressions of the type:

$$Wage/hour_{ift} = \alpha + \beta_1 \cdot Present\ in\ q5_{ft} + \beta_2 \cdot HQ + \beta_3 \cdot (Present\ in\ q5_{ft} \times HQ) + X'_{it}\gamma + \epsilon_{it}$$

where the matrix of controls X includes $VA/hour$, the 11 size controls, plant age, State × Year × Industry fixed effects and a measure of diversification (Divdummy in column 1 and log(number of divisions) in column 2). *Present in* $q5_{ft}$ is a dummy variable that takes the value of 1 if the firm has at least one establishment in wage quintile 5. *HQ* is the share of workers that work in the auxiliary production facilities of the firm. Panel A includes only plants that operate in wage quintiles 1 through 4.

Panel B presents coefficients from regressions of the type:

$$Wage/hour_{ift} = \alpha + \beta_1 \cdot Present\ in\ q1_{ft} + \beta_2 \cdot HQ + \beta_3 \cdot (Present\ in\ q1_{ft} \times HQ) + X'_{it}\gamma + \epsilon_{it}$$

where the matrix of controls X includes $VA/hour$, the 11 size controls, plant age, State × Year × Industry fixed effects and a measure of diversification (Divdummy in column 3 and log(number of divisions) in column 4). *Present in* $q1_{ft}$ is a dummy variable that takes the value of 1 if the firm has at least one establishment in wage quintile 1. *HQ* is the share of workers that work in the auxiliary production facilities of the firm. Panel B includes only plants that operate in wage quintiles 2 through 5.

The standard errors in parenthesis are clustered by firm. Statistical significance at 1%, 5% and 10% is market with ***, ** and * respectively.

Table XV: Product Market Competition and Wage Convergence

	Panel A		Panel B	
Variable	Wage/hour	Wage/hour	Wage/hour	Wage/hour
Present in q5	1.043***	0.622***		
	(0.068)	(0.066)		
Present in q5 × Comp	-0.024**	-0.008		
	(0.011)	(0.011)		
Present in q1			0.061	-0.540***
			(0.101)	(0.112)
Present in q1 × Comp			0.006	-0.011
			(0.022)	(0.022)
Divdummy	0.531***		1.229***	
	(0.049)		(0.047)	
log(number of divisions)		0.433***		0.735***
		(0.042)		(0.031)
VA/hour	0.004	0.004	0.003***	0.003***
	(0.003)	(0.003)	(0.001)	(0.001)
Rounded N	1,600,000	1,600,000	2,040,000	2,040,000
R-squared	0.486	0.487	0.520	0.522
Size & Age Controls	Yes	Yes	Yes	Yes
State × Year × Industry FE	Yes	Yes	Yes	Yes

Notes: Panel A presents coefficients from regressions of the type:

$$Wage/hour_{it} = \alpha + \beta_1 \cdot Present\ in\ q5_{ft} + \beta_2 \cdot (Present\ in\ q5_{ft} \times Comp) + X'_{it}\gamma + \epsilon_{it}$$

where the matrix of controls X includes $VA/hour$, the 11 size controls, plant age, State × Year × Industry fixed effects and a measure of diversification (Divdummy in column 1 and log(number of divisions) in column 2). *Present in* $q5_{ft}$ is a dummy variable that takes the value of 1 if the firm has at least one establishment in wage quintile 5. *Comp* is the number of firms by 3 digit SIC industry, in thousands. Panel A includes only plants that operate in wage quintiles 1 through 4.

Panel B presents coefficients from regressions of the type:

$$Wage/hour_{it} = \alpha + \beta_1 \cdot Present\ in\ q1_{ft} + \beta_2 \cdot (Present\ in\ q1_{ft} \times Comp) + X'_{it}\gamma + \epsilon_{it}$$

where the matrix of controls X includes $VA/hour$, the 11 size controls, plant age, State × Year × Industry fixed effects and a measure of diversification (Divdummy in column 3 and log(number of divisions) in column 4). *Present in* $q1_{ft}$ is a dummy variable that takes the value of 1 if the firm has at least one establishment in wage quintile 1. *Comp* is the number of firms by 3 digit SIC industry, in thousands. Panel B includes only plants that operate in wage quintiles 2 through 5.

The standard errors in parenthesis are clustered by firm. Statistical significance at 1%, 5% and 10% is market with ***, ** and * respectively.

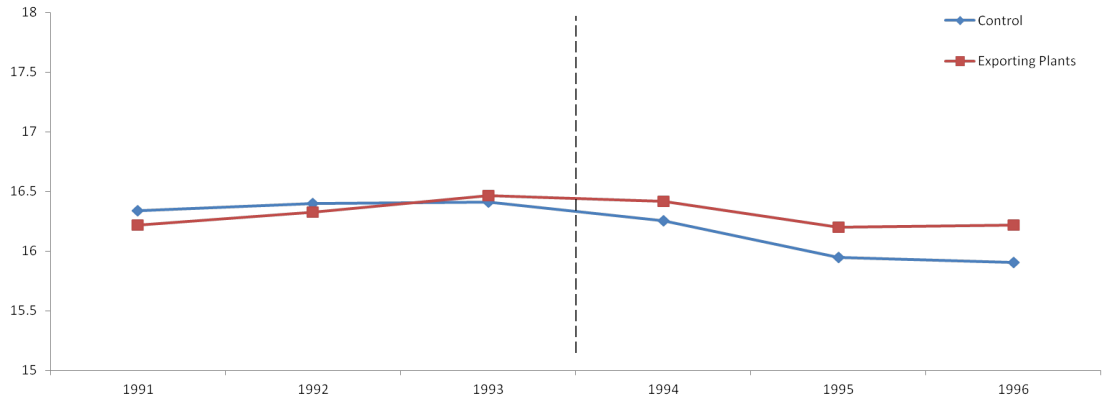

Figure 1: First Stage - Evolution of wages around NAFTA: Exporting Plants vs. Control Group

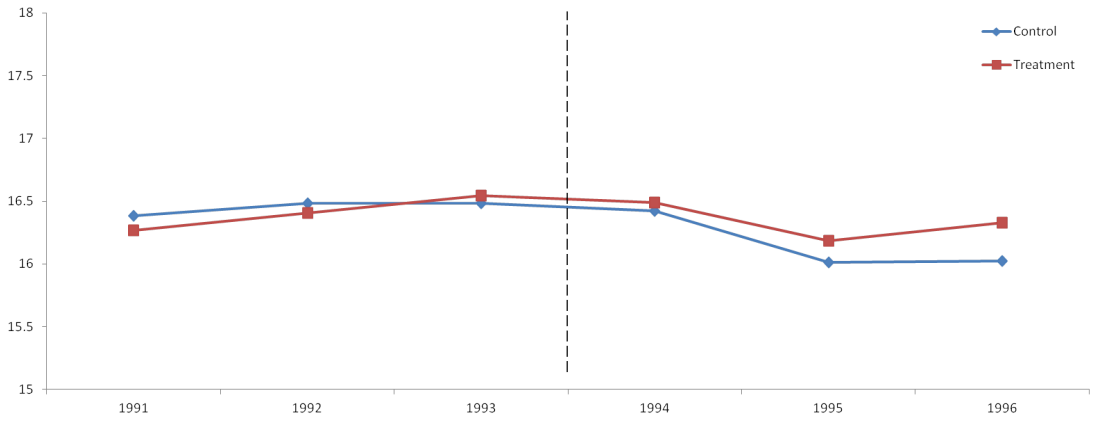

Figure 2: Second Stage - Evolution of wages around NAFTA: Treatment vs. Control

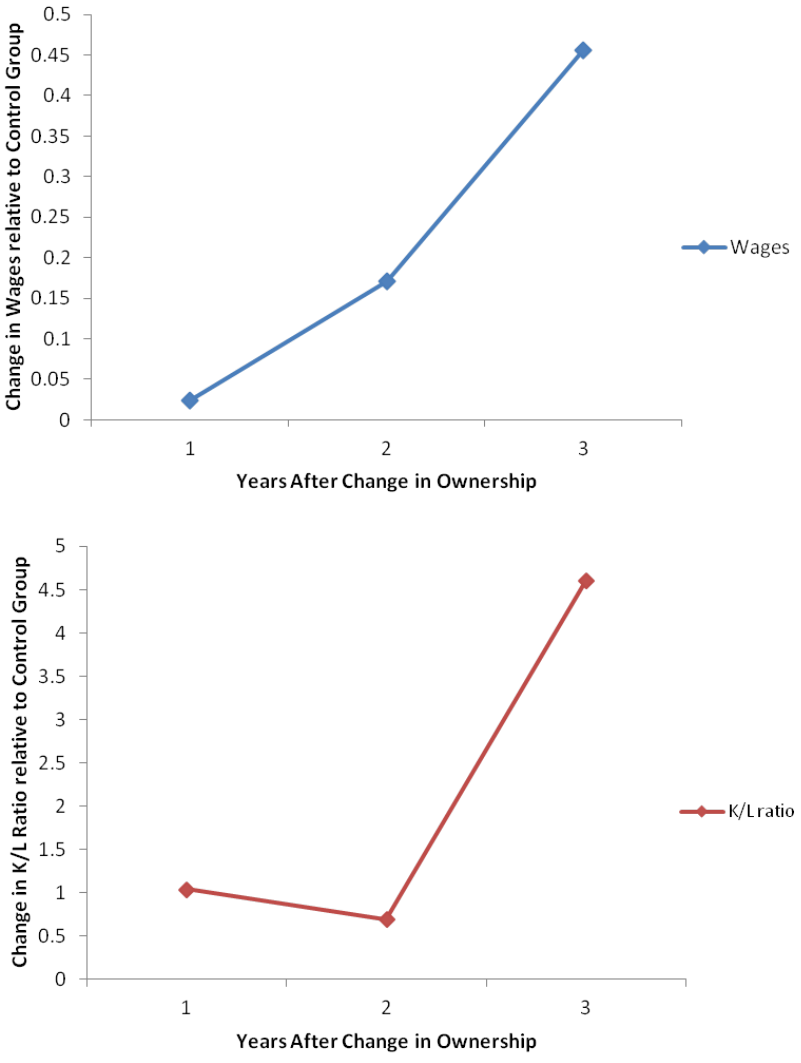

Figure 3: Yearly Evolution of Wages and K/L Ratio After Changes in Plant Ownership for Plants that moved to a higher paying firm

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