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Mufaddal Baxamusa
University of St. Thomas, Minnesota, mufaddalb@stthomas.edu

Abu M. Jalal
Suffolk University, ajalal@suffolk.edu

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The decline in stock exchange listed firms[1]

By

Mufaddal Baxamusa and Abu Jalal

Abstract

The number of exchange-listed firms has declined dramatically in the U.S. We argue that increases in payroll cost decrease the firm's output and consequently, the need for capital. Thus, fewer new firms list on exchanges. Similarly, more firms delist as payroll costs reduce profits. We find empirical results that support our hypotheses. The results are stronger when firms are located in areas with greater regulatory restrictions on residential use of land - suggesting that increases in payroll costs is one of the factors driving this phenomenon.

Keywords: Listed firms; Payroll costs; Labor Economics

JEL Classifications: G10, G34

[1] Mufaddal Baxamusa is at the University of St. Thomas, MCH 316, 2115 Summit Avenue, St. Paul, MN 55105, Phone (651) 962-5845, E-mail: baxa0428@stthomas.edu. Abu Jalal is at Suffolk University, Boston, MA, Phone (617) 570-4898, E-mail: ajalal@suffolk.edu. We thank Raj Aggarwal, Thomas Chemmanur, Andy (Young Han) Kim, Anand Jha and William Johnson. We also thank seminar participants at the University of St Thomas and Suffolk University for helpful comments. All errors are our own.

I. Introduction

Stock-exchange listed firms are a substantial part of the economy. However, the number of listed firms has fallen sharply in the U.S. – by about fifty percent between 1997 and 2015. The decrease in listed firms predates recent regulatory and legal changes, like SOX and Regulation Fair Disclosure, and therefore, is hard to reconcile with the literature on voluntarily deregistering by firms (i.e. going "dark"). It is a subject of active policy[2] and academic debate. In this study, we propose that the prevailing payroll costs in the location of a firm's headquarters can provide an explanation.

Agglomeration is an important reality in this country as firms' headquarters cluster in certain metropolitan areas. Firms prefer these locations because they offer them benefits like access to customers (Hotelling, 1929), financing (Gao, Ng, and Wang, 2011), innovation (Moretti, 2018), and skilled employees.[3] In contrast, the urban economics literature documents negative externalities like housing shortages that arise as cities expand. As the attractiveness of a location grows, employees, seeking better job opportunities, relocate to these areas. In order to maintain the quality of life of its existing residents, many of these locations enact zoning restrictions and restrictive building codes and consequently make the housing shortage even more acute (Ganong and Shoag, 2017; Herkenhoff, Ohanian, and Prescott, 2017). To compensate for increases in living costs, firms must pay employees more. At the same time, these firms cannot simple move to a less expensive area since the potential employees may not follow them there, as apparent from steadily

[2]On the policy front, the Council of Economic Advisers in 2016 expressed their concerns about the increasing industry concentration and the resulting decline in competition. The full report from the council of Economic Advisers can be found in the following link: https://obamawhitehouse.archives.gov/sites/default/files/page/files/20160502_competition_issue_brief_updated_cea.pdf.

[3]It also matters for corporate policies and decisions, such as capital structure (Gao, Ng, and Wang, 2011), dividend policies (Graham and Kumar, 2006; John, Knyazeva, and Knyazeva, 2008), financing choices (Loughran, 2008; Becker, Ivkovic, and Weisbenner, 2010), monitoring (Lerner, 2008), and CEO compensation (Francis, Hasan, John and Waismann, 2007).

decreasing internal migration rates in the country (Autor, Dorn, and Hanson, 2016). These increased cost is especially important for small and medium sized firms as they have become less profitable over time (see Kahle and Stulz, 2017). The end result is that higher payroll costs help create an environment where larger, more established firms thrive and newer, smaller firms often end up being acquired – which leads to fewer listed firms.

To develop our hypothesis we turn to one of the largest operating expenses for a firm – payroll costs (Krueger, 1999). We argue that increases in payroll costs caused by location-specific factors reduce firm profit. As payroll costs tend to be sticky (Amaral, and MacGee, 2017), this is a long run shock to the profit of the firm.[4] There are two possible outcomes. First, as expected profit drops, the firm undertakes fewer positive NPV projects. The firm's investments and possibly the long-term funds to finance them decline (Acharya and Xu, 2017). Consequently, fewer firms would need to raise funds by issuing stocks and so the listing of new firms declines. Second, as labor costs in the area increases, it makes it difficult for some firms to remain profitable – leading to an increase in exits either through delisting or relocating to lower labor cost areas. Thus, we hypothesize that an increase in location based payroll costs leads to a decrease in the number of listed firms.

To empirically test our hypotheses, we obtain information on the listed firms from the Center for Research on Security Prices (CRSP) for the years between 1987 and 2015. The summary statistics reveal that the decline in listed firms is not uniformly distributed across the different metropolitan areas. Some metropolitan areas like New York-Northern New Jersey-Long Island have had some of the largest declines in the number of listed firms, while Austin-Round Rock-San Marcos experienced a large increase in listed firms. The Metropolitan Statistical Area (MSA) level

[4] Even in times of economic recessions, employers tend to fire employees rather than simply adjusting the compensation downwards. Once compensation for an employee goes up, it is very hard to reduce it.

payroll variables, obtained from the publicly available files of the Census Bureau, are lagged by one year in our regression equations to avoid simultaneity. We estimate that a $1,000 increase in average annual real payroll cost for the metropolitan area decreases total listings in it by 0.68%.

An analysis of the flow of listed firms reveals that higher real payroll costs tend to be associated with a decrease in the number of new lists and an increase in the number of delists. We verify these results by generating ratios of total listed firms, new lists, and delists by dividing them with the real GDP or the sum of public and private firms within the MSA. Additionally, we split the sample based on the number of residential land use regulations. We find that the impact of real payroll costs appears to be stronger in MSAs that have more residential land-use regulations. This finding supports our assumption that increases in payroll costs are causing the decline in listed firms.

We hypothesize that the channel through which labor costs affect listing is employee reallocation, i.e. employees changing jobs between firms within the same MSA. As pay increases because of location specific factors, employees are likely to have fewer incentives to change jobs since the new pay being offered has to be higher than that from the current employer. Consequently, there is a decrease in the supply of labor that makes it harder for firms to invest in new projects. We hypothesize that if labor reallocation rate declines as a result of increased payroll costs, it may reduce the number of listed firms. The empirical results support our hypothesis.

Next, we extend the research by exploring the response of firms to higher payroll costs. First, we argue that if a firm's business is fundamentally sound and if it has to exit the market only because of increases in employee payroll costs, then an alternative to bankruptcy proceedings is to be acquired. An acquisition would mean that the acquirer believes that the target's business can be operated profitably. Consistent with this argument, we find that merger, rather than liquidation, is

the primary reason for delisting from an exchange.[5] Second, we argue that an acquirer, seeking to create synergy by lowering labor costs of the target, would prefer targets from a higher payroll cost area. The regressions estimates support this argument. The higher the prevailing payroll costs in the location of targets, the higher the likelihood of these firms being acquired by an acquirer from lower payroll cost MSAs.

Additional results show that majority of the firms choose to get acquired rather than go dark. This indicates that firms prefer to be part of larger corporation than to exist as a deregistered independent company. This finding is consistent with the scope arguments put forward in Gao, Ritter, and Zhu (2013). Finally, we explore firms' decision to relocate their headquarters. We find that firms located in higher payroll cost areas are more likely to relocate their headquarters to lower payroll cost areas.

Omitted variables and identification are possible concerns about our methodology, especially as our unit of analysis is the MSA. We attempt to mitigate them in three ways. First, we use fixed effects for the different MSAs. These fixed effects should control for unobservable time-invariant heterogeneity arising from the MSAs' geography, natural endowments, and industry structure. Second, we use instrumental variables. In addition to omitted variables, instrumental variables methodology mitigate concerns about reverse causation. In the context of our study, a reverse causality may exist since an increase in the number of listed firms in a metropolitan area may cause payroll costs to also increase. While such a positive relationship runs counter to our story, there are instances that can happen. For example, San Francisco-Oakland-Freemont metropolitan area has seen a large increase in average payroll costs and contemporaneously, a

[5] While mergers appear to be a process of efficient disposition of weaker firms, they may have unintended consequences of increasing the concentration of industries and creating virtual monopolies that extract rent from consumers. In fact, this is the concern echoed in the Council of Economic Advisors 2016 reports.

large increase in the number of listed firms. We employ the Bartik (1991) instrument which has recently been used by Adelino, Ma, and Robinson (2017). This instrument is generated by multiplying the preexisting composition of a metropolitan area's industry with the national growth rate in employment for that industry. The instrument reflects the employment in the industries that would have occurred if all the firms in the MSA hired at the national rate. The literature (Blanchard, Katz, Hall and Eichengreen 1992; Saks and Wozniak, 2011) has argued that the Bartik instrument is exogenous as it is generated using the national rates, while the analysis is at the local level. Our results are robust to this approach.

Third, we employ the difference-in-difference methodology. We use the negative exogenous shock to payrolls in the U.S. due to the sudden large increase in imports from China. Pierce and Schott (2016) identify 2001 as the year after which imports from China increased dramatically. On that year, the U.S. government enacted a law giving China lower tariff rates on a permanent basis and enabling China to join the World Trade Organization (WTO). We exploit this shock by identifying the top 25th percentile of the MSAs that had the largest imports from low payroll cost countries before the shock. These MSAs are most likely to be affected by increased imports from China and thus, would have a significant reduction in payroll costs due to competitive pressures. We argue that if labor costs are indeed linked to the listing of firms, we would observe a significant increase in the number of non-manufacturing listed firms in those MSAs. The difference-in-difference estimations support our arguments and suggest that after 2001, the number of non-manufacturing new and listed firms increased for MSAs that had lower payroll costs.

We contribute to the literature in three distinct ways. First, we explore the potential trade-off associated with being a desirable location for employers and employees. For an employee, the jobs are plentiful, but the cost of living is high. For an employer, it is easier to find employees with

the right skills, but these employees are expensive. This trade-off creates an environment where larger firms thrive and smaller firms tend to struggle. It has been noted in the financial press that the country is becoming "a nation of monopolies" as fewer large companies dominate the business landscape.[6] We show that the location-specific payroll costs can provide one of the reasons for this phenomenon.

Second, the current Finance literature documents that publicly traded corporations have changed substantially over the last few decades . The existing attempts to understand the decline in listed firms have largely used traditional firm-level corporate finance variables. For example, Jensen (1989) contends that the agency cost in corporate form of organization would lead to a decline in public firms. Doidge, Kahle, Karolyi, and Stulz (2018) blames the inability of the public markets to correctly value the intangible assets of young, R&D intensive companies. Stulz (2020) show that firms possess more intangible assets and thus, the specialized knowledge needed to evaluate the value of such firms may be easier for private equity investors. Furthermore, according to Schlingemann and Stulz (2022), as the U.S. economy moves from manufacturing to a service based one, the decline in listing may not be as impactful. Listed firms have less influence on the labor market or the GDP. Thus, many startups choose to remain private. In a related part of the literature, unusually high mergers and acquisitions have been proposed as a factor driving the listing gap. Doidge, Karolyi, and Stulz (2017) show that the decline in listed firms is explained by high delisting driven by acquisitions. Similarly, Eckbo and Lithell (2022) find that mergers amongst public firms explain some of the decline in listing of public firms in the U.S. While these explanations have significant merit, we argue that macroeconomic variables, i.e. increased payroll costs coupled with lower reallocation rates, are important determinants as well.

[6] John Mauldin, America Has A Monopoly Problem, *Forbes*, Apr 11, 2019.

Third, our results provide additional insights into the economies of scope hypothesis as proposed in Gao, Ritter, and Zhu (2013). They note that mergers are becoming an increasingly preferred method for firms to exit. Our findings suggest that higher payroll costs can be one of the factors driving firms towards mergers.

The rest of the paper is organized as follows. Section 2 reviews the literature and develops the hypotheses. Section 3 provides a detailed discussion of our data and method. Section 4 tests the relationship between listings and payroll costs. Section 5 explores the role of reallocation rate. Section 6 provides evidence on how residential land use restrictions strengthens the negative relationship between listings and payroll costs. We conclude in section 7.

II. Literature Review and Hypothesis Development

Porter (2018) states that agglomeration is one of the most important economic forces over the last few decades. We develop our hypothesis by trading off the costs and benefits of agglomeration for the firm. We present a simple model in Appendix A to provide further intuition for our arguments. We also draw a chart, Figure 1, to visualize our reasoning.

2.1) Benefits of Agglomeration

One of the key advantages of agglomeration is that when firms are densely populated, it leads to increased interaction among them, which in turn leads to knowledge spillover and the development of human capital. This has been summarized by Marshall (1890), "Great are the advantages which people following the same skilled trade get from near neighborhood to one another. The mysteries of the trade become no mystery: but are as it were, in the air…. " A strand of the urban economics literature has empirically tested Marshall's conjecture and found that gains in human capital is a primary benefit of agglomeration (see Glaeser 2005; Glaeser 2010).

Anecdotally, Amazon Inc. cited these benefits in its decision to locate a second headquarters in New York City and Arlington, Virginia[7] , rather than locate to many smaller cities offering lower costs and greater subsidies.

Agglomeration also has financing benefits. Firms requiring external funding and financing entities providing easy access to capital tend to co-locate in certain areas (Porter and Stern, 2001). For example, one of the highest concentration of venture capital firms is in the Silicon Valley; and investment banks are highly concentrated in New York City. This co-locations of firms and their financiers could be because of existing relationships (Hochberg, Ljungqvist, and Lu, 2007), social networks (Sorenson and Stuart, 2001), cheaper monitoring costs (Mao, Tian and Yu, 2016), and reduced information asymmetry between investors and the firm (Loughran, 2008).

The literature has put forward other reasons too. In the seminal paper Hotelling, (1929) shows that firms prefer to be closer to customers, which in turns leads to agglomeration. Another strand of the literature finds that industries cluster in certain geographic regions because of access to raw materials and sources of innovation (Moretti, 2018).

2.2) Living Costs

Firms may have to incur higher payroll costs as they locate in certain locations. This happens as a result of workers with desirable skills and trainings locating to these clusters. These employees need to find housing, but land is limited. Additionally, many densely populated locations have erected significant barriers to entry into the MSA for potential employees. Ganong and Shoag (2017), Herkenhoff, Ohanian, and Prescott (2017), and Hsieh and Moretti (2015) blame zoning laws, land-use restrictions, and the resulting housing shortage for increases in costs for

[7] https://www.nytimes.com/2018/11/05/technology/amazon-second-headquarters-split.html

employees living in these locations. Glaesar and Ward (2009) estimate that there is a 10% increase in housing price for each new regulation. Furthermore, Glaeser and Gyourko (2018) find that housing prices are far higher than the socially optimal level in these desirable locations. Similar to Hotelling (1929), the transportation cost to work also increases, as employees stay further away from work in search of affordable housing. As cost of living and competition for employees increase, employees must be compensated with higher wages (Roback 1980).

2.3) Long Run Tradeoff between Benefits and Costs of Location

Labor cost tends to be the largest operating cost a firm incurs. Moreover, location specific labor costs tends to be sticky and persists over the long run (Amaral, and MacGee, 2017). As labor costs go up, a firm's cost of production goes up. A profit-maximizing firm typically has a production function where its level of output depends on labor and capital investments. In general, the empirical research finds that labor and capital are inelastic substitutes (see Chirinko, 2008; Hall, 1988) and so increased labor cost may not result in substituting capital for labor. The ability of the firm to pass on this increased cost to customers depends on the price elasticity of demand. For an overwhelming number of goods and services, the downward sloping demand curve indicates that as price increases, demand decreases – limiting a firm's ability to pass on the increased production cost. Firms, unable to raise price to recover all the additional costs, may respond by reducing the level of output. As output declines firms may need less capital, which in turn may result in the firm needing less long-term financing (e.g. may not need to issue stocks through an IPO). Similarly, currently publicly listed firms may decide to exit the market through delisting due to higher labor costs. Thus, we should observe a decrease in the total number of listings. We hypothesize,

H_1: The total listing of firms on stock exchanges declines as payroll costs increase.

Similarly, the same behavior for new debt issuance should also be observed as debt is an alternative source of external finance.

H_{1A}: The issuance of new debt declines as payroll costs increase.

As the firm pays more to compensate for increases in wages, the employees' incentives to change jobs decreases. Thus, firms may not be able to replace employees as new employees may need higher compensation. This in turn, will lead to fewer listings as we argue previously. Our second hypothesis follows:

H_2: Higher payroll cost reduces the reallocation rate, which in turn lowers total listings.

To develop our hypothesis we have relied on the cost side of agglomeration, and so the benefits side are captured by the null hypothesis. The benefits side of agglomeration has already been documented in the literature (see Gao, Ng and Wang, 2011) and so we abstract from it.

III. Data and Methodology

3.1) Testing Strategy

We primarily test the relationship between average real payroll cost and the number of listed firms in the MSAs. The Census Bureau defines an MSA as a geographic area with close economic ties and having a high population density at its core. Of course, total payroll cost varies substantially by MSAs. For example, the Census Bureau reports that the average payroll cost in 2014 was $29,547 for the MSA of Manhattan, KS while it was $100,871 for the MSA of San Jose-Sunnyvale-Santa Clara, CA. Some researchers use commuting zones (CZ) as a geographic unit

(Killian and Parker, 1991). However, for our study, the data on the key variables (like reallocation rate) are from the Business Dynamics Statistics that report at the MSA level, and not the county level needed to compute CZ level variables. The estimation model we employ is:

$$Listed\ Firms_{i,t} = \alpha + \beta * Log(Payroll)_{i,t-1} + \gamma X_{i,t-1} + \varepsilon_{i,t} \quad \ldots (1)$$

The dependent variable $Listed\ Firms_{i,t}$ represents the different measures of listed firms for MSA i in year t. $Log(Payroll)_{i,t}$ is the primary independent variable and is represented by the natural logarithm of the average real payroll cost paid to all employees in MSA i. Our testing strategy relies on estimating β, which captures how shocks to payroll costs influence the number of listed firms in an MSA. To avoid simultaneity the independent variables are lagged by one year i.e. $t-1$. *X* is a vector of additional control variables. Finally, robust standard errors are used.

To mitigate concerns about omitted variables bias, we undertake a number of empirical strategies. There are two possible types of omitted variables. The first one is the presence of unobserved heterogeneity that does not change with time. We conduct our analyses at the MSA level. As a result, the characteristics of an MSA that are fairly stable over time, such as the availability of natural resources, weather, culture, universities, regulatory environment, etc. can be controlled by including MSA fixed effects. Additionally, the effects of business cycles are controlled using year fixed effects. The second type of omitted variables bias is due to unobserved heterogeneity that changes over time. As is commonly done in the literature, we utilize instrumental variables regression methodology. An added benefit of instrumental variables is that it can mitigate concerns about reverse causality. For out study, reverse causality could be an issue due to the fact that as firms become larger, they pay their employees more (Bayard and Thoske, 1999).

We use the instrument developed in Bartik (1991) and frequently used in the literature (see Blanchard, Katz, Hall and Eichengreen 1992; Saks and Wozniak, 2011; Adelino, Ma and Robinson, 2017). To generate this instrument, we first find the one-year growth in employment in each of the manufacturing industries at the national level. At the MSA level, we multiply the national growth rates by the number of employees in the corresponding industry in the previous year. This gives us the projected employment for each manufacturing industry present in an MSA. We aggregate the industry level projections to obtain the projected manufacturing employment for each MSA. This weighted aggregation of the manufacturing industries' employment growth rates is popularly called the "Bartik Shock" (see Saks and Wozniak, 2011) or "Bartik" (see Adelino, Ma and Robinson, 2017). The instrument reflects the employment in the industries that would have occurred if all the firms in the MSA hired at the national rate.

The Bartik Shock is a valid instrument as it is exogenous and relevant. The literature has argued that the instrument is generated using national rates and so, should not be impacted by local factors and is exogenous. We add one more layer of exogeneity by using manufacturing industry's projected employment as the instrument; while our dependent variable in instrumental variables regressions excludes firms from manufacturing industries. Bartik is also a relevant instrument as the neoclassical theories and the Keynesian theories predict that the relationship between wages and employment should be negative.

3.2) Variable Construction

Our key dependent variables are constructed following Doidge, Karolyi and Stulz (2017). The variable *List* counts the number of publicly traded stocks in the CRSP dataset with share codes

10 and 11 and listed in the major domestic exchanges NYSE, NASDAQ and AMEX (exchange codes: 1, 2, and 3). Consistent with the literature, we exclude investment funds and trusts (SIC 6722, 6726, 2798, and 6799). *New* is the number of stocks listed for the first time for that year. *Delist* is the number of stocks that are no longer listed on CRSP for that year. Since *List, New* and *Delist* are non-negative integers with a number of MSA-years having zero observations, OLS regression methodology is not appropriate. Thus, we use negative binomial regressions when we use these variables as the dependent variables.

Consistent with the literature, the firm's location is the same as that of its headquarters (see Hilary and Hui, 2009; Baxamusa and Jalal, 2014). As Pirinnsky and Wang (2006, p. 1994) state "[this approach is] reasonable given that corporate headquarters are close to corporate core business activities." We do not assume that all the employees of the firm are located in the same MSA, rather the firm's headquarters is where the senior managers are based and a large number of employees work there. Thus, we exploit the fact that the headquarters accounts for a significant amount of payroll costs. For some firms this may not be true – in which case, our estimates will be biased towards statistical insignificance.

In addition to using the levels, Doidge, Karolyi and Stulz (2017) calculate a number of ratios and use them as the dependent variables. These ratios are generated by dividing the numerator, either *List, New* or *Delist*, by either the lagged GDP or the total number of firms. We, thus, generate two additional sets of dependent variables. In the first set, we use the natural logarithm of the lagged national GDP as the denominator. This captures the changing nature of the economy that could be due to advances in technology that have substantially reduced the cost of selling goods and services to customers or due to changes in customer preferences (for a survey of this literature please see Lieber and Syverson, 2012).

In the second set, we use the previous year's total number of firms (both public and private) in that MSA as the denominator. This accounts for the issue that certain MSAs may have a concentration of certain resources and industries. Such dynamics could affect the entries and exits of firms in that particular MSA. This ratio therefore tells us how much larger the impact would be on listed firms, as compared to private firms. Acahrya and Xu (2017) find that innovative firms access the stock market to fund their growth; in contrast, they find that comparable private firms are not that innovative. An interpretation of the ratio can be that it captures the impact of growth opportunities.

Our primary independent variable *Payroll* captures labor costs and is constructed using publicly available data from the Census Bureau's County Business Pattern dataset. The Census Bureau reports salaries, wages, commissions, dismissal pay, bonuses, vacation allowances, sick-leave pay, and employee contributions to qualified pension plans as part of *Payroll*. The data is publicly available in a downloadable format beginning in 1986. Fortunately, the dataset spans our event of interest i.e. the sharp decline in the number of listed firms since 1997. Given the availability of data, our sample period is for the years from 1986 to 2014 and the dependent variable is for the years from 1987 to 2015. We specifically use the Metropolitan Area file from this dataset. The real total payroll expenses (in 2015 dollars) paid to all employees in the MSA is calculated by adjusting the total annual payroll in thousands of dollars (Census code: AP) for inflation using the consumer price index. Next, we divide this real total payroll expenses by the total number of employees in that year in the MSA (Census code: EMP) to generate the real average payroll costs for that MSA. This measure has recently been used by Mian and Sufi (2014). Figure 2 reports that average real payroll costs has steadily increased since 1996. In 1996 the average real payroll earned by all employees in MSAs was about $35,078, while in 2015 the real

payroll had increased by about 19.95% to $42,076. In contrast, the number of listed firms peaked in 1997 with 7,511 firms and then has declined steadily. Between 1997 and 2015, 49.67% of the listed firms were delisted.

A potential drawback of the payroll data is that it does not include all the items, for example health insurance benefits, that would constitute total compensation. As a result it may not give a complete picture of the total costs of hiring an employee. Due to data limitations, we are constrained in our analyses. The Bureau of Labor Statistics realizes the limitations of this variable and has adopted plans in 2017 to provide the total compensation data in the future. As a short-term bridge, BLS has gone back to their old data files and computed the total compensation costs for the 15 largest MSAs since 2006. Even though it gives us only about 150 data points, we conducted regression analyses as robustness checks and found that our results hold.

Our second variable of interest is the reallocation rate (see Hathaway and Litan, 2014), which is defined by the Census Bureau as the sum of the number of jobs created and the number of jobs destroyed divided by the total number of jobs in the MSA. This measure reflects how quickly jobs are moving from shrinking firms to expanding firms in an MSA. This rate is obtained from the Business Dynamics Surveys conducted by the Census Bureau and is the focus of a large number of studies (Davis and Haltiwanger, 1992). Figure 3 shows that the reallocation rate fell from 1986 to 1995 and from 2002 to 2015. When the number of listed firms peaked in 1997 the reallocation rate was about 28.6. By 2015, the reallocation rate has declined by about 19.93% to 22.9. Figure 4 takes the information on average payroll expenses and reallocation rates side-by-side. There appears to be a negative relationship between the two.

Table 1 Panel A lists the MSAs with largest number of listed firms at the start of our sample, i.e. 1986. While Panel B lists the MSAs with the largest number of listed firms at the end

of our sample period in 2015. In both the panels the New York-Northern New Jersey- Long Island MSA has the largest number of listed firms. In Panel B, New York-Northern New Jersey- Long Island MSA has moved to the third spot for average real payroll cost behind San Jose-Sunnyvale-Santa Clara and San Francisco-Oakland-Fremont MSAs.

Table 1 Panel C lists the MSAs with the largest decline in listed firms. Notice that each of the MSA has higher real payroll cost in 1986 than the national average across all MSAs i.e. $35,363. Also, seven of the MSA's percentage increase in real payroll cost was larger than that of the national average. Panel D lists the MSAs that experienced the largest increase in listed firms. Four of these MSAs had lower average real payroll cost in 1986 than the national average. The two MSAs with the largest increase in listed firms also experienced significant increase in real payroll cost. For example, the MSA of San Jose-Sunnyvale-Santa Clara had an 84% increase in real payroll cost. This suggests that as the number of listed firms in an MSA increases, it may increase the real payroll cost for the MSA.

Using the median year of our sample, i.e. 1999, to split the sample, Table 2 Panel A reports that there is an average of twenty-three listed firms in an MSA in the years 1987-1999. The number of listed firms drops by three to twenty in the years 2000-2015. This decline in the number of listed firms can also be seen in the number of new firms being listed on publicly traded exchanges. There are about 1.76 new listings during the years 1987-1999, while there are about 0.73 firms in the years 2000-2015. The number of firms delisted from exchanges also increases; however, the change in the number of delists per MSA per year during the two periods is not statistically significant.

Doidge, Karolyi and Stulz (2017) use startups and GDP growth rates as controls. *Startups* is the number of firms with age zero reported by the Census Bureau for each MSA-year divided

by the beginning of the year number of firms in the MSA. *GDP_growth* is the annual percentage change in per capita real GDP. In addition, we control for the business dynamism of the MSA by using the rates of *Establishment Exits* and *Establishment Entries*. The Census Bureau defines an establishment as a physical location where business is conducted or where services or industrial operations are performed e.g. factory, retail shop, etc. Consequently, there are more business establishments than firms. The regulatory burden for doing business is captured by *log(Regulations)*. *Regulations* is the number of individual restrictions in the federal government's administrative code for each industry. MSA level regulatory burden is the average of the different restrictions faced by the different industries in the MSA, weighted by the number of workers employed by that industry in that MSA. The Economics literature finds a strong relationship between earnings and education. Thus, we include *Education* as a control variable. It is the percentage of the survey population that has a high school diploma in that year for that MSA. The literature on Initial Public Offerings (IPOs) suggests that firms may list to take advantage of favorable market conditions. We control for it by including *S&P 500* and *CAPE*. *S&P 500* is the level of the S&P 500 index value at the end of the year and *CAPE* is the cyclically adjusted PE ratio as provided by Robert Shiller. These higher stock prices may also be driven by expectations about future business activities. We control for it by using proxies of how consumers feel about the current economic condition (*Current_consumer*) and what they feel about future economic condition (*Consumer_expect*). It is also possible that firms list and delist to take advantage of the economic environment and credit conditions. As such, we include the spread between AAA-rated corporate bonds and treasury bills, *AAA-Treasury*, and the dollar value of real earnings by listed firms, *Real_earnings* in our regressions. The summary statistics of these control variables are presented in Table 2 Panel B.

IV. Listed Firms and Real Payroll Costs

To test our first hypothesis regarding the negative relationship between the number of listed firms and the payroll costs prevalent in the MSA, we take the three variables *List*, *New*, and *Delist* as dependent variables and *Log(Payroll)* as the independent variable of interest. Since there are different definitions of these dependent variables in the literature, we simultaneously present robustness tests with alternate measures of delisting and alternate regression methodologies. The results are presented in Table 3.

Table 3 Panel A presents the results with various measures of total listing as dependent variable. Column (1), explores the bivariate relationship between *List* and *Log(Payroll)* and column (2) controls for additional variables in a multivariate setting. In column (1) and (2), we use negative binomial regression as the dependent variable *List* can only take discrete values and a number of MSAs have zero listed firms. We notice that the coefficient of *Log(Payroll)* is negative and statistically significant in both models. In column (1), a $1,000 increase in average real payroll cost decreases total listings by 0.6835%. After controlling for additional factors, this effect increases slightly and a $1,000 increase in average payroll cost decreases total listings by 0.90%. A drawback of negative binomial regression methodology is that it does not allow for dynamic modeling. Thus, we go back to OLS regressions wherever possible. In columns (3) to (6), we estimate OLS regressions with year and MSA fixed effects. The dependent variable in columns (3) and (4) is *List* scaled by the total number of firms (sum of both private and public ones). In column (5) and (6), it is *List* scaled by *Log(GDP)* of the country. In all cases, we find negative and

statistically significant coefficient estimates of *Log(Payroll)*, supporting a negative relationship between listing and labor costs.

The adjusted R^2 is high in these regressions. To ensure that we are not picking up a spurious relationship, we conduct the Levin–Lin–Chu unit root test. The Levin–Lin–Chu unit root test has an adjusted t-statistics of 4.027 for the regression presented in column (5). When we use the option to de-mean the data and remove cross-sectional correlations, the adjusted t-statistics for the test declines to 2.84. Both these t-statistics reject the null that the series has a unit root. These results suggest that the data is stationary.

Among the control variables, *Startups*, *Establishment Exits*, and *Establishment Entries* are statistically significant in all regression models. As the number of start-ups goes up, listing of firms goes up. Similarly, as more firms exit the business, the number of listing goes down. The relationship between establishment entries and listing is negative. This indicates that as there are higher number of establishments in an area, the competition for employees acts as a barrier to entry and lowers the number of new listings.

In Panel B we present the instrumental variable results where we use the Bartik shock to instrument *Log(Payroll)*. Here the intuition is to capture the relationship between an exogenous increase in manufacturing employment and its impact on the average real payrolls in the MSA. The empirical literature in economics notes a strong relationship between payroll costs and business cycles (see Tatom, 1980). We control for business cycle in column (1) with year fixed effects and in column (2) with S&P 500 stock index. After controlling for business cycle effects, neoclassical economics (e.g. Rueff, 1951) and Keynes (1937, 1939) predict a negative relationship between demand (i.e. exogenous increase in employment) and prices (i.e. real payroll costs). Columns (1), (2) and (3) control for the business cyclicality and find a negative relationship

between increase in employment and real payroll. In Column (4), presenting the second stage results, we use instrumental variable regression methodology mainly to control for possible omitted variables bias and potentially establish the direction of the relationship. Again, the negative relationship between *List* and *Log(Payroll)* is robust.

In Table 3 Panel C, we replicate these regressions with *New*, *Delist*, and their alternate definitions as dependent variables. In column (1), we present the bivariate relationship between *New* and *Log(Payroll)* using negative binomial regression methodology. The coefficient of *Log(Payroll)* is negative and statistically significant. We observe that a $1,000 increase in average payroll cost decreases new listings by 2.47%. Using alternate regression methodologies and alternate definitions of the dependent variable in Columns (2)-(4) do not alter this basic finding of a negative relationship between *New* and *Log(Payroll)*. Similarly, in column (5), we present the bivariate relationship between *Delist* and *Log(Payroll)* using negative binomial regression methodology. The coefficient of *Log(Payroll)* is positive and statistically significant. An $1,000 increase in average payroll cost increases delistings by 0.49%. As we conduct our tests with alternative definitions of delisting, we notice that when the dependent variable is *Delist* divided by total number of firms in Column (6), the coefficient of *Log(Payroll)* becomes statistically insignificant. This result, along with the findings in the bivariate regression in Column (5), implies that increases in delisting and decreases in total number of firms (both public and private) are happening at the same time as payroll costs go up. When we use *Delist* scaled by *Log(GDP)* of the country as the dependent variable in column (7), the coefficient of *Log(Payroll)* is positive and statistically significant. A similar result is found using the instrumental variable regression methodology in column (8). Overall, our findings confirm that that higher labor cost decreases the number of new listing, increases the number of delisting, and decreases the total number of listed

firms. Furthermore, a $1,000 increase in average payroll cost creates a larger change in new listing than delisting – consistent with Doidge, Karolyi, and Stulz's (2017) observation that the drop in new listings is more prevalent than the increase in delistings.

4.1) Robustness: Debt – An alternative Source of External Finance

We turn to our Hypothesis H_{1A} next. Debt is an alternative form of external finance. If payroll costs reduce profits that, in turn, reduce the demand for new equity, we should observe the same behavior for new debt. We formulate a variable called *New Debt*, which is the number of firms issuing new debt. We estimate the same empirical models as before and present the findings in Table 3 Panel D. The coefficient of *log(Payroll)* is negative and statistically significant in column (1) with negative binomial model. In columns (2) and (3) this negative relationship remains statistically significant even when we scale the New Debt variable with Firms or log(GDP). Finally, the relationship persists in an IV regression model. Thus, we observe that both debt and equity issuances are declining.

4.2) Robustness: Labor Intensive Sectors and Payroll Costs

If payroll costs are a significant factor, we should observe that the labor-intensive firms or sectors would be more sensitive to payroll costs shock. A measure of labor-intensity is the ratio of output (such as sales) and number of employees. Compustat database reports the sales for each of the firms in our sample, but does not report the number of employees for some of the firms in the sample. We address this limitation of the data by using the labor-intensity at the industry level. The data are from *Employment and Output by Industry: U.S. Bureau of Labor*

Statistics (bls.gov). We first separate the average labor intensity of the firms in an MSA. Afterwards, we sort the MSAs into two groups. The first group consists of MSAs which have more labor-intensive firms, the estimates of this sample are reported in odd numbered columns of Table 3 Panel E. The second group consists of firms that are less labor-intensive, the results of the estimates are reported in odd numbered columns. Our approach is likely valid as industries tend to cluster around different metropolitan areas as has been documented in the literature. In columns (1) and (2), we find that the relationship between total listing and payroll is statistically significant among high labor intensive sectors, while it is insignificant among low labor intensive sector. In columns (3) and (4), the relationship between new listing and payroll is negative and statistically significant among both high and low labor intensive sectors. However, the magnitude of the coefficient is much bigger for high labor intensive sectors. In columns (5) and (6), we observe that delisting is statistically significantly positively related to payroll cost only for the low labor intensive sectors. Thus, the results suggest that more labor intensive sectors are more adversely affected by payroll costs when it comes to total listings and new listings. The relationship between delisting and payroll costs is more prominent among the low labor intensive industries.

4.3) Reasons for Delisting

We dig deeper into why firms delist. In general, a distressed firm has two choices – merger or liquidation. Shleifer and Vishny (2011) document that liquidation leads to severe undervaluation of assets. If the firm's underlying business is sound, then a strategic option is to become acquired by another firm. We argue that increased payroll costs push firms to delist. We can further argue that mergers should be more prevalent than liquidations as the target firm's payroll costs can be

reduced through restructuring. This is consistent with Dessaint, Golubov, and Volpin (2017) who find that firms may get acquired because of labor costs as the core business is scalable.

We create two variables identifying the reason for delisting. We construct the variable *Merger* by dividing the number of firms merging in an MSA-year by the total number of delisted firms in the same MSA-year. Similarly, the variable *Liquidation* is the number of firms liquidated in an MSA-year divided by the total number of delisted firms in the same MSA-year. 60.21% of the delists are because of mergers and 8.36% are because of liquidation. We use two different regression methodologies – OLS with year and MSA fixed effects and instrumental variables. The results are presented in Table 4.

In columns (1) and (2), where the dependent variable is *Merger*, the coefficient estimates of *Log(Payroll)* is positive and statistically significant. On the other hand, in columns (3) and (4), the coefficient estimates of *Log(Payroll)* are negative and statistically significant where the dependent variable is *Liquidation*. These results support the argument that firms struggling with higher labor costs choose to exit the product market. The negative results from *Liquidation* suggests that the underlying core businesses appear to be sound. This finding is also consistent with the economies of scope hypothesis of Gao, Ritter, and Zhu (2013) who note that going through an IPO as an exit strategy has become less attractive.

4.4) Payroll Costs and Selection of Targets

As mergers are the main vehicle used to delist, we explore whether payrolls costs play a role in a firm's selection of acquisition targets. We investigate cross-MSA acquisitions where the acquirers and the targets are from different MSAs. Surprisingly, such cross-MSA acquisitions are

widespread, as shown in column (1) of Table 5 Panel A. Over 83% of the acquisitions involve targets from a different MSA. This proportion goes up significantly when the acquirer is in a high payroll cost location. Approximately 88% of the acquisitions involve cross-MSA targets when the acquirer is located in an area where the average payroll is higher than the median. Therefore, it appears that firms are more likely to acquire a target from a lower cost location.

We find similar results using regression analyses, as presented in Table 5 Panel B. The dependent variable *Cross-MSA Target* is the proportion of publicly traded targets that were acquired by publicly traded acquirers not in the same MSA. *Log(TargetPayroll)* is the natural logarithm of the real average payroll in the MSA of the target in 2015 dollars. *Log(AcquirerPayroll)* is the natural logarithm of the real average payroll in the MSA of the acquirer in 2015 dollars. *Log(TargetPayroll) – Log(AcquirerPayroll)* is the difference between the two averages. Column (1) presents the bi-variate relationship between *Log(TargetPayroll)* and *Cross-MSA Target*. The coefficient of *Log(TargetPayroll)* is positive and statistically significant. This indicates that as the payroll costs of the target's location goes up, it is more likely to be part of a cross-MSA acquisition. This is consistent with our story since the acquirer can reduce the payroll costs of the target by shipping some of the jobs to the lower cost location of the acquirer. We find similar results in a multivariate regression with the usual controls. We also look at the payroll cost differentials of the acquirer's and the target's locations. The dependent variable remains *Cross-MSA Target*, but the independent variable of interest is *Log(TargetPayroll) – Log(AcquirerPayroll)*. Here we test whether the target's location has higher payroll costs than the acquirer's. In columns (3) and (4) of Table 5 Panel B, we find that as the difference between the payroll costs goes up, the firms are more likely to participate in a cross-MSA acquisition. This

again supports our story and is consistent with Dessaint, Golubov, and Volpin (2017) that targets are acquired because of their higher labor costs.

4.5) Payroll costs and Relocation of Corporate Headquarters

To develop our hypothesis, we argue that a choice for the firm is to exit an MSA. Here we consider whether payroll costs affect the headquarters relocation decision of firms. The literature finds significant differences in corporate behaviors and performances depending on the location of corporate headquarters. Pirinsky and Wang (2006) find that stock prices of companies co-move more with the firms in their new locations and less with the old locations after a relocation of headquarters. Alli, Ramirez, and Yung (1991) notice that investors react negatively, as represented by abnormal returns, when a firm announces a headquarters relocation to an area with higher cost of living.

We collect information on headquarters relocation from the Compact Disclosure files between 1992 and 2006. We augment this dataset by hand collecting data for the years 2006 – 2014 through Factiva search for corporate relocations. The results are presented in Table 6. Panel A displays the summary statistics. Columns (1) and (2) show that the average payroll costs of the location from which the companies are relocating away are higher than the payroll costs of the location to which they are going. This difference is also statistically significant. Thus, the companies appear to relocate their headquarters to a less costly area.

The regression analysis in Table 6 Panel B support this finding. We estimate two variables *RelocationFROM* and *RelocationTO*. They count the number of firms relocating their headquarters away from and to that location, respectively. In columns (1) and (2), the dependent variable is

RelocationFROM, while it is *RelocationTO* in columns (3) and (4). In the odd numbered columns, we present simple OLS fixed effects models and in the even numbered columns, instrumental variable regressions methodology involving the Bartik instrument. We notice statistically significant and positive coefficient estimates for *Log(Payroll)* in columns (1) and (2). This indicates that as payroll costs go up, more firms are likely to relocate their headquarters away from that location. On the other hand, the coefficients of *Log(Payroll)* are negative and statistically significant in columns (3) and (4) – meaning that as payroll costs go up, fewer firms are likely to relocate to that location.

4.6) Identification: The China Import Shock

To develop a better understanding of the relationship between labor costs and listing gap and possibly establish causality, we exploit a natural experiment involving U.S. trade relationship with China and conduct difference-in-difference analyses. The exogenous shock under consideration is the Permanent Normal Trade Relations (PNTR) status approved by the U.S. for China in 2001. Obtaining PNTR status from partner countries in the World Trade Organization (WTO) was an essential step for China to become a fully functioning member. While a PNTR with the U.S. was not a prerequisite for China's entry into the WTO, it would have meant that the U.S. firms would not be able to take advantage of trade liberalizations offered by China. The U.S. Congress and later, the President approved the PNTR in 2001 and in the same year, China became a full member of WTO.

Soon after China's accession to the WTO, the trade between the U.S. and China boomed as a significant amount of U.S. industrial production was outsourced to low-cost China. Firms

could now easily reallocate their production to China if labor costs were too high. Following Pierce and Schott (2016), we identify the top 25 percentile of the MSAs that had the largest imports form low labor cost countries before the shock as the treated group. These MSAs are more likely to be affected by increasing imports from China and thus, would have a significant reduction in payroll costs due to competitive pressures. We argue that if labor costs are indeed linked to the listing of firms, we would observe a significant increase in the number of listed firms in those MSAs.

As manufacturing firms are likely to be directly impacted by the shock, we increase the exogeneity of the shock by only considering non-manufacturing firms. To find the control group of MSAs, we propensity score match them according to fraction of manufacturing employment to total employment, year, size, startups, exits, establishment entries, education, and log(regulations). We limit our sample to 1990 – 2009, centering on 2001 and present our findings in Table 7. Columns (1) and (2) show the average of the control and the treated firms before the shock while Columns (5) and (6) show the average values after the shock. Column (3) reports the difference between the two groups before the shock; while column (6) reports this difference after the shock. We present the average of *List*, *New*, and *Delist*, as well as the two additional sets where these variables are scaled either by *Log(GDP)* or total number of firms. Column (3) presents the difference between columns (1) and (2). All these values are statistically insignificant – giving us comfort that the matching exercise is successful. Similarly, we present the averages of the listing variables for the control and treated groups during the period 2001 – 2009 in columns (4) and (5), respectively. Column (6) subtracts the values in column (4) from the values in column (5). The differences are all statistically significant. There are more listed firms, more new firms, and less delisted firms among the treated group. Finally, we conduct the difference-in-difference tests in column (7) that show that there have been an increase in total listing, an increase in new listing,

and a decrease in delisting in the treated group during these two periods. The estimates suggest that after 2001, the number of non-manufacturing new and listed firms increased for MSAs that had the largest exposure to import competition from China. In addition to our previous empirical tests showing that higher payroll cost would decrease the number of listing, this experiment allows us to establish that lower payroll costs would lead to increases in the number of listed firms.

V. Reallocation Rate and Payroll Costs

We now test our second hypothesis regarding the impact of reallocation rate on firm listings. Reallocation is necessary for an economy as it deploys the resources to their most productive uses. In the labor market, there is constant job destruction and job creation to ensure that the industries remain dynamic and the economy achieves sustained growth. Hathaway and Litan (2014) notice that there is significant decrease in business dynamism in all fifty states of this country. Only about 20% of American workers are employed by organizations formed after the 1990s. Older and more mature firms dominate the business landscape and thus, newer firms are struggling for prominence. This bodes poorly for the creation and renewal of firms. To understand the role of labor costs on business dynamism and the listing gap, we estimate two sets of regressions. First, we establish the relationship between reallocation rate and labor costs. Then, using three-stage least squares models; estimate the joint effects of labor costs and reallocation rates on listing of firms. Table 8 reports the empirical estimates.

In columns (1) to (3), the dependent variable is the reallocation rate. In column (1) we estimate the bivariate relationship between the reallocation rate and *Log(Payroll)*. The coefficient of *Log(Payroll)* is negative, statistically significant, and implies that an $1,000 increase in average

payroll decreases reallocation rate by 0.63%. This negative relationship remains robust in a multi-variate OLS model (column (2)) with our usual control variables and the fixed effects for MSA and year. We also conduct a two-stage least squares regression methodology using the fitted values from the first stage of the IV regression as presented in Table 3 Panel A column (7). The second stage estimates are presented in column (3) of Table 8. The statistically significant negative relationship between *Log(Payroll)* and reallocation rate appears to remain robust even after using this instrumental variable regression methodology.

In columns (4) to (6), we estimate the three-stage least squares regressions where the dependent variables are *List*, *New*, and *Delist*. The fitted values from the two-stage regressions presented in column (3) are entered as the independent variable of interest *Reallocation Rate Fitted*. We observe negative and statistically significant coefficients of *Reallocation Rate Fitted* where the dependent variables are *List* and *New*. However, the positive relationship between *Reallocation Rate Fitted* and *Delist* is statistically insignificant in column (6). This could be because delisting of firms causes reallocation, rather than the opposite direction we tested in this model. The results support our hypothesis that higher payroll costs along with lower reallocation rates cause lower listing of firms. Moreover, the dearth of new listings is an important reason for lower total listing.

5.1) Robustness: Conditioning on Firm Size

Since larger firms on average pay their employees more (Bayard and Troske, 1999), it should be harder to poach their employees. As a result, reallocation rate may decline if the MSA has a greater number of larger firms. Therefore, we can argue that if decreased reallocation rates

lead to a decline in listing, then this relationship should be more prominent in MSAs with larger public firms. To understand the firm size effects, we split our sample into large and small firms based on ~~real total assets~~the number of employees. In Table 9, we report the results with *List*, *New*, and *Delist* scaled by *Log(GDP)* as the dependent variables. Odd numbered columns present the estimates for large firms and even numbered columns report the estimates from small firms. Taking columns (1) and (2) together, we observe that the relationship between *Log(Payroll)* and total listing is negative and statistically significant for MSAs with larger firms. The nature of the relationship changes for MSAs with small firms. We observe a statistically significant positive relationship between *Log(Payroll)* and total listing. This implies that the effects of *Log(Payroll)* on total listing are different among the MSAs. The MSAs that are dominated by smaller firms are not feeling the negative effects of high payroll costs.

The negative relationship between Log*(Payroll)* and new listing is statistically significant only for MSAs with larger firms in column (3). Column (4) shows that the relationship between Log(*Payroll*) and new listing is statistically insignificant among MSAs with mostly small firms. Finally, a comparison of the estimates in columns (5) and (6) show that the delisting is positively related to labor costs only among the MSAs with small firms. Firms in these MSAs are less able to absorb shocks in the labor input costs and thus, are more likely to delist.

VI. Land Use Restrictions and Its Impact on Listings

A key assumption underlying our hypothesis is that payroll costs increases because of agglomeration. We argue that one such friction is the regulatory restrictions limiting the supply of residences. A strand of literature in Urban Economics argues that housing supply restrictions in

certain MSAs might be driving payroll costs higher (Ganong and Shoag, 2017). We build on this literature by using two indices to measure regulatory constraints on housing supply. Ganong and Shoag (2017) provide the first index. This state-level index counts the word "land use" in state appellate court cases. They argue that any regulation is likely to be tested in courts and over time, states accumulate a set of precedents from these cases. Ganong and Shoag (2017) report that land use lawsuits have increased by 400% between 1960 and 2010. To maintain the exogeneity of this index, we use the index values for the year 1980. We use the median index value to separate the sample into two equal halves. The sub-sample with the higher number of such cases is labelled as *High*; while the sub-sample with the lower index values is labelled as *Low*. In Table 10, Panel A reports that MSAs belonging to states with higher land use lawsuits have more payroll costs than MSAs belonging to states with lower number of land use lawsuits. This finding is consistent with conclusions from Ganong and Shoag (2017).

In Panel B, the odd numbered columns have MSAs with higher index values; while the even numbered columns have MSAs with lower index values. Column (1) reports that the lists decline more with increases in payroll. Column (3) reports that new lists decline because of higher payroll costs. Consistently, column (5) reports that delists also increase because of higher payroll costs. These results suggests that MSAs in states with higher number of land use lawsuits experience a decline in lists because of increases in payroll costs. In contrast, the even numbered columns are not statistically significant, suggesting that MSAs in states with lower land use lawsuits do not experience a statistically significant decline in lists because of payroll cost increases.

To test the robustness of our results we turn to another index. The Wharton Residential Land Use Regulation Index (WRLURI) is based on surveys and interviews and is publicly

available only for the year 2008. An advantage of this index is that it is constructed at the MSA level. Similar to the methodology applied in the last paragraph, the sample is split into two halves based on the median index value. The results with the higher index values are reported in odd numbered columns; while the results with the lower index values are reported in even numbered columns. Table 11 reports that the coefficient estimates in the odd numbered columns are statistically significant; while the estimates in the even numbered columns are not statistically significant. Thus, we can conclude that the lists are more likely to decline, with fewer new lists and more delists, as payroll costs increase, especially if the MSA has more residential land use restrictions.

VII. Conclusions

This study explores the reasons behind the dramatic decline in the number of listed firms. We observe that the number of listed firms has declined in some metropolitan areas and has increased in others. As payroll cost increases, firms maximize profit by reducing output, which decreases the need for capital. As the need for capital declines, fewer firms need access to external financial markets to raise funds. In addition, increased payroll costs may make it more difficult for firms to remain profitable. Since wages are sticky, increased payroll costs creates a permanent shock to the business model of firms – which in turn increases firm exits. We hypothesize that the number of listed firms decline because of increasing real payroll costs.

The empirical tests support our hypothesis. Instrumental variable analyses show that our results are robust to reverse causation. Additionally, the difference-in-difference analysis using the import shock from China following PNTR finds that a decrease in payroll cost does indeed lead to

an increase in non-manufacturing listed firms in those metropolitan areas. We further establish reduced reallocation rate as the channel through which payroll costs impact the number of listed firms. As pay increases, employees have fewer incentives to change jobs since the new pay being offered has to be higher than that from the current employer. Moreover, migration from areas with poor job prospects to the ones with more plentiful jobs may not occur because of the entry barriers in the form of higher housing costs and living expenses. This reduces the ability of firms to remain profitable, leading to some of their exits.

We contribute to the literature by presenting an explanation for the decline in the number of listed firms in the U.S. Future research can examine whether increase in real payroll costs is the main driver behind a number of unexplained recent changes observed among U.S. corporations (for a survey of these changes see Kahle and Stulz, 2017). This research can also guide policy makers as we find that increased payroll coupled with decreased reallocation rate is behind the decline in business dynamism.

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Appendix A) Toy Model To Provide Intuition for Hypothesis

Let I indicate the firm specific capital needs and S refer to the location. Thus, the benefits of easy access to finance means $\frac{\partial I}{\partial S} > 0$ and $\frac{\partial^2 I}{\partial S^2} < 0$. Payroll cost (w) depends on the location of the firm and increases with the location variable S, i.e., $\frac{\partial w}{\partial S} > 0$ and $\frac{\partial^2 w}{\partial S^2} > 0$.

Now, let's turn to the firm's decision. We assume that, as inputs, the firm uses capital I and labor L. The quantity of goods produced is equal to $I * L$. This production function is a simpler version of the classical production functions like Cobb-Douglas where capital and labor multiplicatively produce output. For simplicity, the price at which the product can be sold is assumed to be a unit. In production functions, the implicit assumption is that $L \geq 1$, i.e. in order to generate output, a minimum of one person is needed. A simplifying assumption in the model is that I is externally funded through equity. As debt financing may not be available to new and smaller companies (Frank and Goyal, 2009), we do not consider debt financing to keep our model simple. Additionally, notice that payroll cost does not enter the production function directly. In our model payroll costs increase due to increases in living expenses.

In order to attract employees to a firm, the wage being offered has to be greater than their reservation wage (w'). The reservation wage is what the employee could have obtained if he worked in some other firm. If w is not greater than or equal to w', then the employee will simply move to a competitor of the firm. We refer to this restriction as the reallocation constraint. The firm's optimization problem is thus:

$$Max_S \; I(S)L - I(S) - Lw(S) \qquad \ldots\ldots (1)$$

$$s.t. w(S) \geq w'$$

We solve this using the Kuhn-Tucker method. We form the Lagrangian Λ:

$$\Lambda = I(S)L - I(S) - Lw(S) + \lambda(w(S) - w') \qquad \ldots\ldots (2)$$

Proposition 1: For $\lambda > L$ and $L > 1$,

$$\left.\frac{\partial I}{\partial w}\right|_{\partial S} = \frac{L-\lambda}{L-1} < 0 \qquad \ldots\ldots (3)$$

Proof:

The Kuhn-Tucker necessary conditions for a solving (2) are:

$$\frac{\partial \Lambda}{\partial S} \leq 0, S \geq 0, and\ S\frac{\partial \Lambda}{\partial S} = 0$$

$$w' \leq w(S), \lambda \geq 0, and\ \lambda(w(S) - w') = 0$$

Since $S \geq 0$, the necessary conditions will be satisfied if

$$\frac{\partial \Lambda}{\partial S} = \frac{\partial I}{\partial S}L - \frac{\partial I}{\partial S} - \frac{\partial w}{\partial S}L + \lambda\frac{\partial w}{\partial S} = 0$$

$$\Rightarrow (L-1)\frac{\partial I}{\partial S} - (L-\lambda)\frac{\partial w}{\partial S} = 0$$

$$\Rightarrow (L-1)\frac{\partial I}{\partial S} = L-\lambda)\frac{\partial w}{\partial S}$$

$$\Rightarrow \frac{\partial I}{\partial S} * \frac{\partial S}{\partial w} = \frac{L-\lambda}{L-1}$$

$$\Rightarrow \left.\frac{\partial I}{\partial w}\right|_{\partial S} = \frac{L-\lambda}{L-1}$$

If $L < \lambda$, the derivative will be negative.

The sufficient condition for a maximum requires that (a) the objective function is differentiable and concave in the non-negative orthant, (b) the constraint function is

differentiable and convex in the non-negative orthant and (c) the solution fulfills the Kuhn-Tucker necessary conditions.

The constraint is convex since $\frac{\partial^2 w}{\partial S^2} > 0$. For the objective function to be concave, its second derivative must be less than zero. Therefore,

$$\frac{\partial^2 I}{\partial S^2} L - \frac{\partial^2 I}{\partial S^2} - \frac{\partial^2 w}{\partial S^2} L < 0$$

$$\Rightarrow \frac{\partial^2 I}{\partial S^2} (L - 1) < \frac{\partial^2 w}{\partial S^2} L$$

$$\Rightarrow \frac{\partial^2 I}{\partial w^2}\bigg|_{\partial S^2} < \frac{L}{L - 1}$$

For a concave investment function, the second derivative is negative. Thus, this inequality will be easily satisfied.

In the context of this problem, the Lagrange multiplier (λ) represents the change in the optimal profit of a firm due to a change in the reallocation rate. Thus, λ can be explained as the marginal cost of the reallocation rate. If labor is less than the marginal cost of the reallocation rate, we observe a decreasing trend in raising capital as payroll costs increase. If housing costs go up in the location of the firm, its competitors are likely to react by increasing wages w'. In order to retain its employees, the firm will have to increase its employees' wages. Now this publicly listed firm has three choices – (a) if it is still profitable, then according to Proposition (1), the firm will use less capital; (b) if the increased wages lead to a loss, the firms can exit the market through a delisting; or (c) move to a new location, subject to the tradeoffs in equation (1).

Figure 1: Visual Summary of Our Arguments

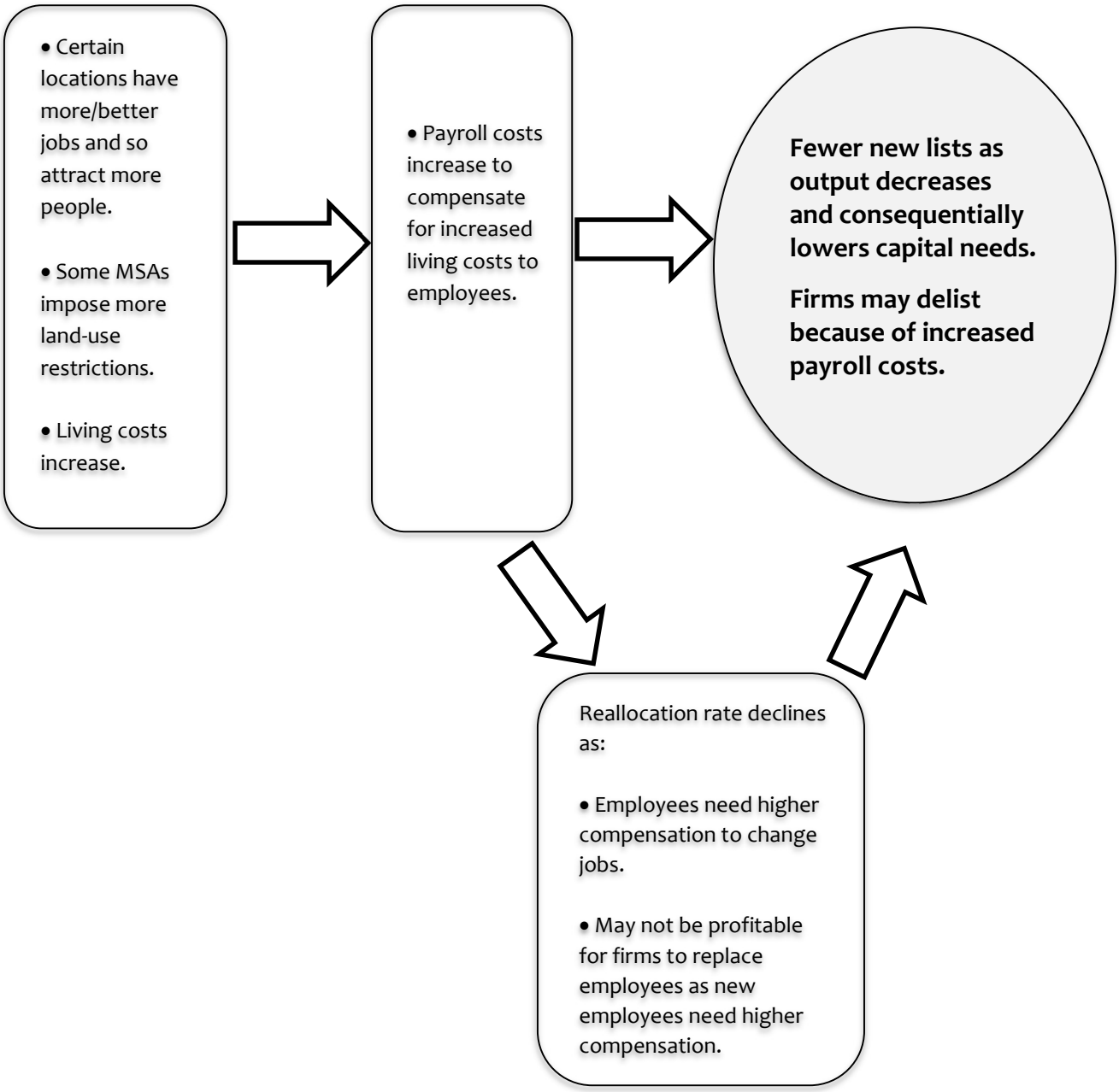

Table 1: Descriptive Statistics for Listed Firms and Real Payroll for MSAs

Panel A) Top 10 MSAs by Listed Firms in 1986

Rank (1)	MSA (2)	MSA Name (3)	Listed Firms (4)	Payroll Costs (5)	Reallocation Rate (6)
1	35620	New York-Northern New Jersey-Long Island, NY-NJ-PA	754	$48,662.16	31.8
2	31100	Los Angeles-Long Beach-Santa Ana, CA	356	$45,947.02	34.4
3	14460	Boston-Cambridge-Quincy, MA-NH	262	$43,507.74	30.8
4	16980	Chicago-Joliet-Naperville, IL-IN-WI	249	$45,157.61	28.6
5	37980	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	205	$41,671.98	28.6
6	19100	Dallas-Fort Worth-Arlington, TX	199	$43,611.32	37.6
7	19740	Denver-Aurora-Broomfield, CO	175	$42,210.11	38.0
8	12060	Atlanta-Sandy Springs-Marietta, GA	161	$41,467.39	29.6
9	33460	Minneapolis-St. Paul-Bloomington, MN-WI	155	$42,189.95	31.2
10	26420	Houston-Sugar Land-Baytown, TX	148	$44,106.38	37.8

Panel B) Top 10 MSAs by Listed Firms in 2015

Rank (1)	MSA (2)	MSA Name (3)	Listed Firms (4)	Payroll Costs (5)	Reallocation Rate (6)
1	35620	New York-Northern New Jersey-Long Island, NY-NJ-PA	487	$68,291.58	23.4
2	14460	Boston-Cambridge-Quincy, MA-NH	230	$65,967.93	19.4
3	41860	San Francisco-Oakland-Fremont, CA	215	$76,653.09	22.2
4	31100	Los Angeles-Long Beach-Santa Ana, CA	205	$52,220.58	27
5	16980	Chicago-Joliet-Naperville, IL-IN-WI	186	$54,906.64	22.8
6	19100	Dallas-Fort Worth-Arlington, TX	186	$53,124.95	24.4
7	37980	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	171	$53,781.39	21.8
8	41940	San Jose-Sunnyvale-Santa Clara, CA	155	$100,871.30	25.4
9	26420	Houston-Sugar Land-Baytown, TX	152	$62,051.34	25.2
10	19740	Denver-Aurora-Broomfield, CO	138	$54,931.08	28.2

Panel C) MSAs with the largest decreases in listed firms

Rank	MSA	MSA Name	Listed Firms			Payroll		
			2015	1987	(4)-(5)	2014	1986	[(7)-(8)]/(8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	35620	New York-Northern New Jersey-Long Island, NY-NJ-PA	487	754	-267	$68,291.58	$48,662.16	40.34%
2	31100	Los Angeles-Long Beach-Santa Ana, CA	205	356	-151	$52,220.58	$45,947.02	13.65%
3	33460	Minneapolis-St. Paul-Bloomington, MN-WI	80	155	-75	$53,849.76	$42,189.95	27.64%
4	33100	Miami-Fort Lauderdale-Pompano Beach, FL	67	139	-72	$44,900.17	$35,799.86	25.42%
5	16980	Chicago-Joliet-Naperville, IL-IN-WI	186	249	-63	$54,906.64	$45,157.61	21.59%
6	12060	Atlanta-Sandy Springs-Marietta, GA	118	161	-43	$53,256.06	$41,467.39	28.43%
7	17460	Cleveland-Elyria-Mentor, OH	39	79	-40	$45,948.20	$41,879.17	9.72%
8	19820	Detroit-Warren-Livonia, MI	41	80	-39	$50,867.23	$48,589.70	4.69%
9	19740	Denver-Aurora-Broomfield, CO	138	175	-37	$54,931.08	$42,210.11	30.14%
10	14860	Bridgeport-Stamford-Norwalk, CT	54	90	-36	$76,371.34	$51,446.13	48.45%

Panel D) MSAs with the largest increases in listed firms

Rank	MSA	MSA Name	Listed Firms			Payroll		
			2015	1987	(4)-(5)	2014	1986	[(7)-(8)]/(8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	41860	San Francisco-Oakland-Fremont, CA	215	121	94	$76,653.09	$47,746.61	60.54%
2	41940	San Jose-Sunnyvale-Santa Clara, CA	155	116	39	$100,871.30	$54,732.18	84.30%
3	12420	Austin-Round Rock-San Marcos, TX	45	16	29	$51,513.70	$34,787.98	48.08%
4	45940	Trenton-Ewing, NJ	23	7	16	$65,986.39	$42,748.64	54.36%
5	47900	Washington-Arlington-Alexandria, DC-VA-MD-WV	135	123	12	$63,973.88	$42,540.07	50.38%
6	39580	Raleigh-Cary, NC	32	20	12	$48,528.14	$34,962.04	38.80%
7	43620	Sioux Falls, SD	12	2	10	$40,231.20	$33,084.13	21.60%
8	34980	Nashville-Davidson--Murfreesboro--Franklin, TN	47	38	9	$47,974.13	$36,184.53	32.58%
9	31340	Lynchburg, VA	9	1	8	$37,225.40	$32,729.56	13.74%
10	20500	Durham-Chapel Hill, NC	24	16	8	$56,338.89	$39,009.31	44.42%

Table 2: Summary Statistics of the Key Variables Used

Panel A) Key Dependent Variable Split on Year 2000

List, New, and Delist are numbers of listed, newly listed, and delisted firms, respectively.

	1987-1999 (1)	2000-2015 (2)	(1)-(2) (3)
List	23.3458	20.6475	2.6982**
New	1.7601	0.7258	1.034***
Delist	1.4016	1.2561	0.1454

Panel B) Average values of the variables

Log(Payroll) is the natural logarithm of the real average payroll for that MSA in 2015 dollars. *Reallocation rate* is the sum of number of jobs created and number of jobs destroyed divided by the total number of jobs in the MSA. *Startups* is the number of firms with age zero reported by the Census Bureau for each MSA-year divided by the beginning of the year number of firms in the MSA. *Establishment Exits* and *Establishment Entries* are the reductions and increases in the number of establishments per year by MSA. Log(regulation) is the intensity of regulations affecting the industries in that MSA. *Education* is the percentage of the survey population that has a high school diploma in that year for that MSA. *GDP_growth* is the annual percentage change in real per capita growth rate in GDP. *AAA-Treasury* is the spread between AAA-rated corporate bonds and treasury bills. *Current_consumer* captures what consumers feel about current economic condition and *Consumer_expect* indicates how the consumers feel about future economic conditions. *S&P 500* is the level of the index value at the end of the year. *Real_earnings* is the dollar value of real earnings by listed firms. *CAPE* is the cyclically adjusted PE ratio as provided by Robert Shiller. A total of 7821 observations are used. The dependent variables are for the years 1987 - 2015. The independent variables are lagged one year and thus, for the years 1986 to 2014. log is the natural logarithm.

Variable	Mean (1)	Std. Dev (2)	Min (3)	Max (4)
MSA-level:				
log(Payroll)	10.5131	0.1716	10.0231	11.5216
Reallocation rate	26.5179	5.2291	10.4000	62.8000
Startups	0.0849	0.0208	0.0296	0.1806
Establishment Exits	9.9563	1.7919	4.9000	27.2000
Establishment Entries	11.4832	2.6268	5.3000	33.1000
log(Regulations)	7.0520	0 .7039	3.3271	9.0243
Education	0.6143	0.0296	0.3385	0.8356
U.S.-level:				
GDP_growth	2.7115	1.5933	-2.8000	4.7000
AAA-Treasury	1.2899	0.4649	0.5300	2.5300
Current_consumer	100.4891	11.7381	66.4000	117.8000
Consumer_expect	80.7637	11.0929	54.8000	103.4000

S&P 500	895.0304	500.4276	164.5000	2054.2700
Real_earnings	58.2204	24.0669	17.3334	106.7010
CAPE	23.5437	8.0023	9.5951	44.1979

Figure 2: Listed Firms and Average Payroll

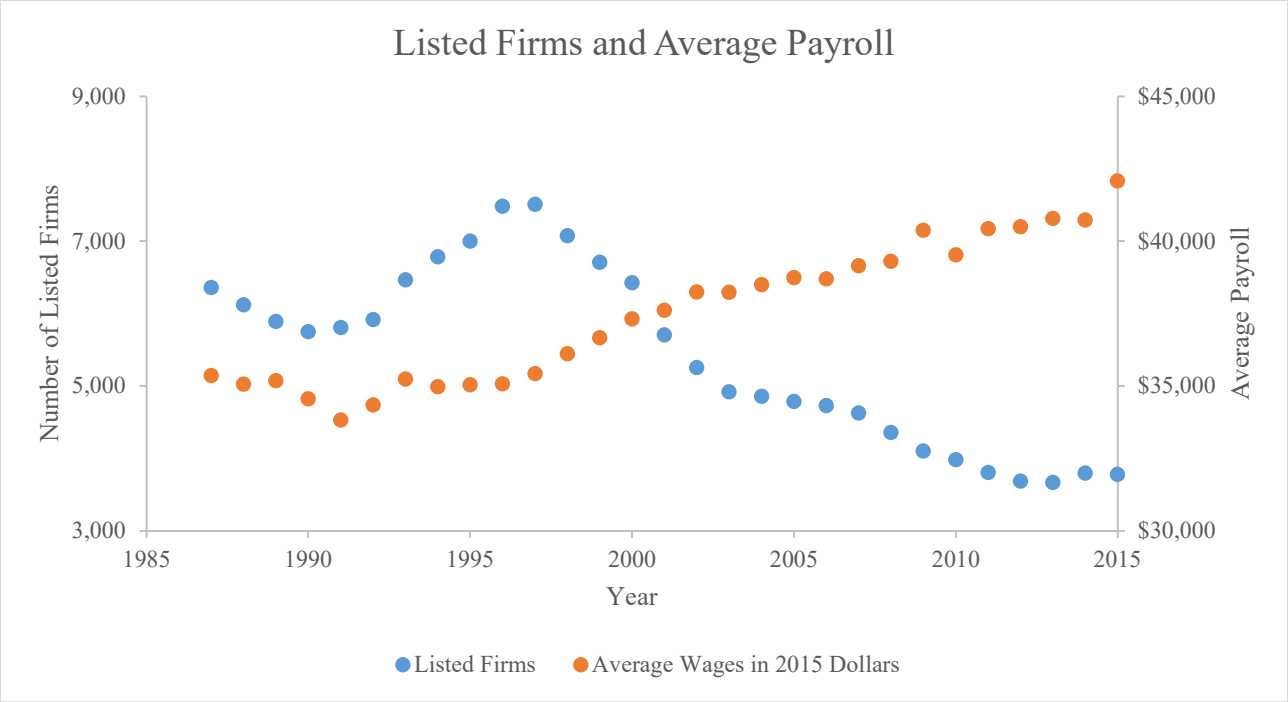

Figure 3: Listed Firms and Reallocation Rates

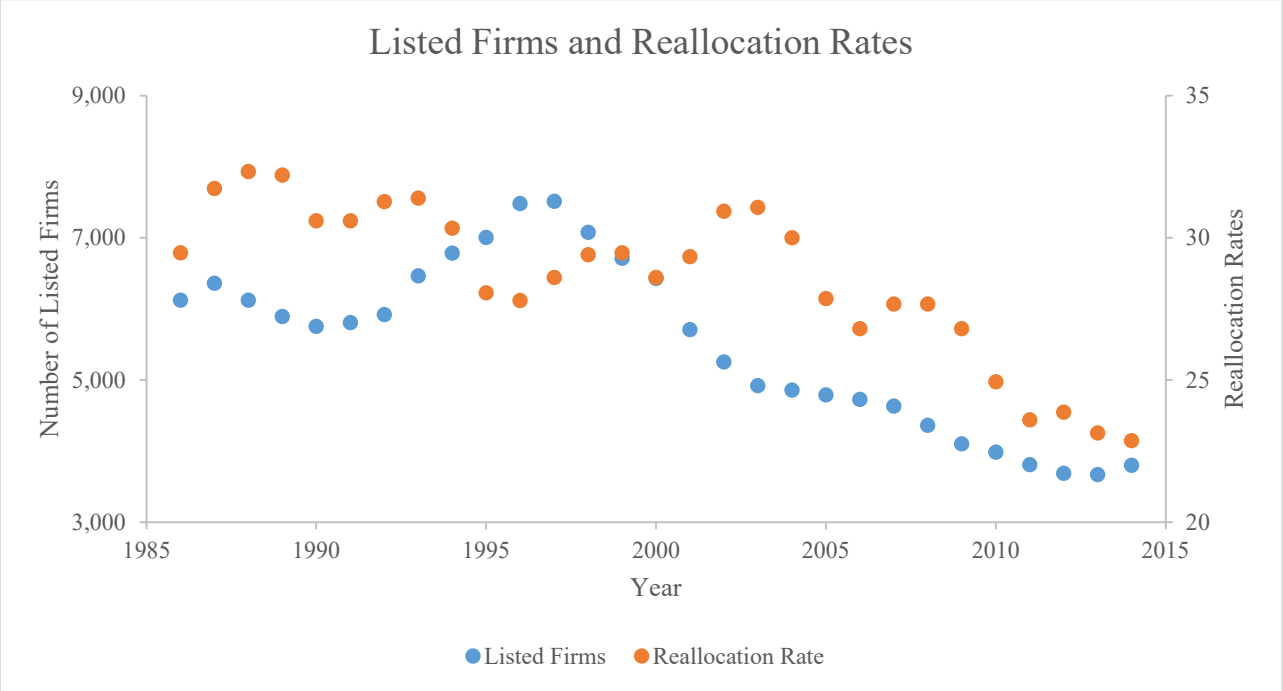

Figure 4: Average Payroll and Reallocation Rates

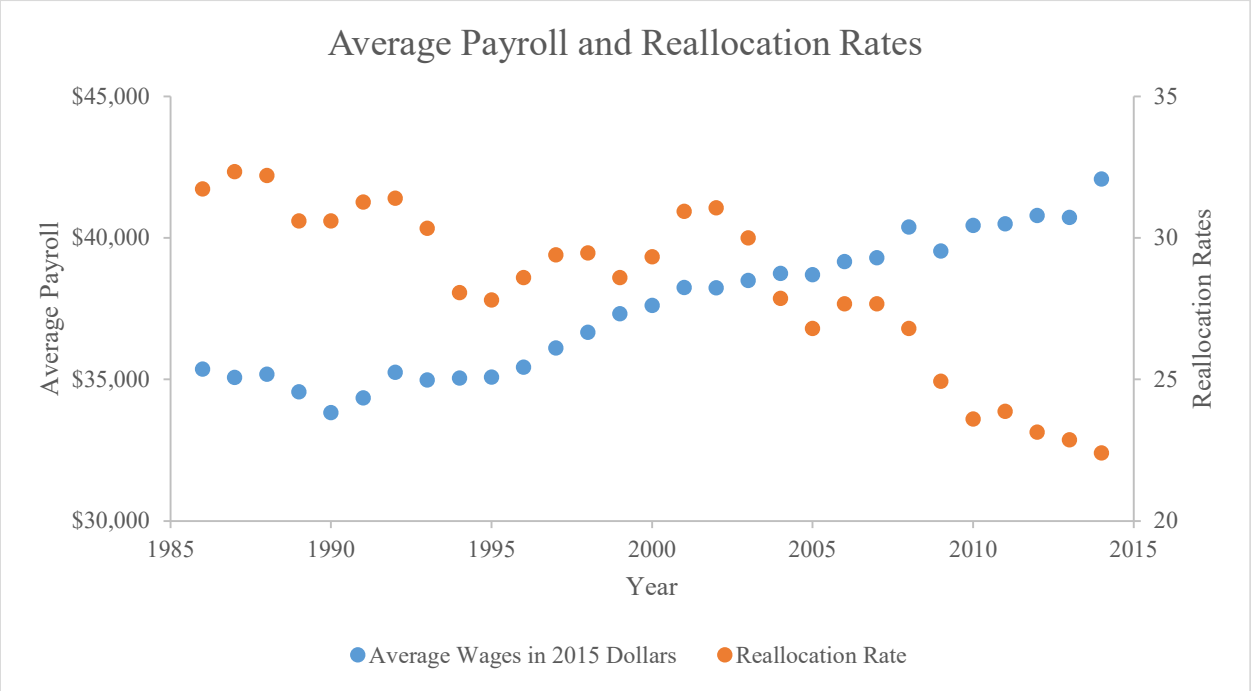

Table 3: Number of Listed Firms Declines as Real Payroll Increase

List, New, and Delist are numbers of listed, newly listed, and delisted firms, respectively. *Log(Payroll)* is the natural logarithm of the real average payroll for that MSA in 2015 dollars. *Reallocation rate* is the sum of number of jobs created and number of jobs destroyed divided by the total number of jobs in the MSA. *Startups* is the number of firms with age zero reported by the Census Bureau for each MSA-year divided by the beginning of the year number of firms in the MSA. *Establishment Exits* and *Establishment Entries* are the reductions and increases in the number of establishments per year by MSA. Log(regulation) is the intensity of regulations affecting the industries in that MSA. *Education* is the percentage of the survey population that has a high school diploma in that year for that MSA. *GDP_growth* is the annual percentage change in real per capita growth rate in GDP. *AAA-Treasury* is the spread between AAA-rated corporate bonds and treasury bills. *Current_consumer* captures what consumers feel about current economic condition and *Consumer_expect* indicates how the consumers feel about future economic conditions. *S&P 500* is the level of the index value at the end of the year. *Real_earnings* is the dollar value of real earnings by listed firms. *CAPE* is the cyclically adjusted PE ratio as provided by Robert Shiller. Firms is the number of firms within an MSA. Log(GDP) is the natural logarithms of the real GDP. *Bartik instrument* reflects the employment in the manufacturing industries that would have occurred if all the manufacturing firms in the MSA hired at the national rate. *New Debt* is the number of firms issuing new debt. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level.

Panel A) Listed Firms

Methodology	Negative Binomial		OLS	Dynamic	OLS	Dynamic
Dep. Variable	List		List/Firms		List/log(GDP)	
	(1)	(2)	(3)	(4)	(5)	(6)
log(Payroll)	-0.6835	-0.8999	-0.0003	-0.0003	-1.5909	-4.7762
	(0.0499)***	(0.0608)***	(0.0001)***	(0.0001)***	(0.3456)***	(0.1527)***
MSA Controls						
Startups		6.0419	0.0036	0.0013	7.1277	1.5748
		(0.8686)***	(0.0011)***	(0.0007)*	(3.6852)*	(1.1212)
Establishment Exits		-0.0380	-0.0000	-0.0000	-0.1255	-0.0089
		(0.0060)***	(0.0000)*	(0.0000)**	(0.0259)***	(0.0069)
Establishment Entries		-0.0173	-0.0000	-0.0000	-0.0816	-0.0222
		(0.0036)***	(0.0000)***	(0.0000)	(0.0162)***	(0.0050)***
log(Regulations)		0.0180	-0.0000	-0.0000	0.1019	0.0050
		(0.0102)*	(0.0000)	(0.0000)**	(0.0407)**	(0.0151)
Education		0.4045	0.0002	0.0001	0.7892	0.0522
		(0.1460)***	(0.0002)	(0.0001)	(0.6028)	(0.2169)

U.S. Controls						
GDP_growth		0.0174	-0.0000	0.0000	-0.0173	-0.1187
		(0.0591)	(0.0000)	(0.0000)	(0.0478)	(0.0113)***
AAA-Treasury		-0.0185	-0.0001	-0.0000	-0.3916	-0.1741
		(0.3362)	(0.0000)***	(0.0000)	(0.1173)***	(0.0304)***
Current_consumer		-0.0112	-0.0000	0.0000	-0.0217	-0.0008
		(0.0061)*	(0.0000)	(0.0000)	(0.0064)***	(0.0014)
Consumer_expect		0.0031	0.0000	0.0000	0.0353	0.0025
		(0.0044)	(0.0000)***	(0.0000)	(0.0068)***	(0.0015)*
S&P 500		0.0003	-0.0000	-0.0000	-0.0003	0.0007
		(0.0002)	(0.0000)***	(0.0000)	(0.0002)*	(0.0000)***
Real_earnings		-0.0005	-0.0000	-0.0000	-0.0060	-0.0073
		(0.0021)	(0.0000)	(0.0000)	(0.0030)**	(0.0007)***
CAPE		-0.0247	0.0000	-0.0000	0.0352	0.0262
		(0.0379)	(0.0000)***	(0.0000)	(0.0066)***	(0.0017)***
Additional Variables						
lag(List/Firms)				0.8728		
				(0.0123)***		
lag(List/log(GDP))						0.9586
						(0.0029)***
Constant	-0.3340	-3.4619	0.0040	0.0036	19.0484	50.3479
	(0.0686)***	(1.2503)***	(0.0012)***	(0.0012)***	(3.7017)***	(1.6233)***
MSA FE	No	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	Yes	Yes	Yes	Yes
Obs.	7821	7821	7821	7821	7821	7821
MSA		335	335	335	335	335
Adj. R^2			0.80		0.96	
Wald Ch2/F-Stat	184.26	4015.61		20357.84		160907.04

Panel B) Bartik Instrument

Methodology	OLS		First Stage	IV
Dep. Variable	log(Payroll)			List
	(1)	(2)	(3)	(4)
log(Payroll)				-3.2643
				(0.4791)***
Instrument				
Projected Manuf. Employ	-0.0822	-0.0823	-0.0813	
	(0.0087)***	(0.0086)***	(0.0086)***	
MSA Controls				
Startups			0.8234	9.2835
			(0.1223)***	(0.9864)***
Establishment Exits			-0.0025	-0.0448
			(0.0009)***	(0.0065)***
Establishment Entries			-0.0019	-0.0250
			(0.0005)***	(0.0039)***
log(Regulations)			-0.0070	-0.0025
			(0.0014)***	(0.0112)
Education			0.0073	0.4068
			(0.0021)***	(0.1510)***
U.S. Controls				
GDP_growth			0.0274	-0.0477
			(0.0016)***	(0.0639)
AAA-Treasury			0.0934	0.0745
			(0.0038)***	(0.3610)
Current_consumer			-0.0012	0.0207
			(0.0002)***	(0.0075)***
Consumer_expect			-0.0004	-0.0128

			(0.0002)*	(0.0050)**
S&P 500		0.0001	0.0001	-0.0007
		(0.0000)***		
			(0.0000)***	(0.0003)**
Real_earnings			-0.0012	-0.0024
			(0.0001)***	(0.0023)
CAPE			-0.0036	0.0942
			(0.0002)***	(0.0429)**
Constant			10.5525	38.5441
			(0.0218)***	(5.0683)***
MSA FE	Yes	Yes	Yes	Yes
Year FE	Yes	No	Yes	Yes
Obs.	7821	7821	7821	7821
MSA	335	335	335	335
Adj. R^2	0.58	0.58	0.59	
Wald Ch2/F-Stat			342.31	57611.88

Panel C) New Lists and Delists

Methodology:	Negative Binomial	OLS	OLS	IV	Negative Binomial	OLS	OLS	IV
Dep. Variable:	New	New/Firms	New/ log(GDP)	New	Delist	Delist/Firms	Delist/ log(GDP)	Delist
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
log(Payroll)	-2.4715	-0.0002	-0.9366	-3.7617	0.4930	0.0000	0.1221	1.7566
	(0.2021)***	(0.0000)***	(0.0680)***	(0.6582)***	(0.1443)***	(0.0000)	(0.0563)**	(0.5868)***
MSA Controls:								
Startups		0.0003	0.4854	11.1403		-0.0005	0.1384	7.8245
		(0.0003)	(0.7250)	(3.7613)***		(0.0003)	(0.6006)	(2.9277)***
Establishment Exits		-0.0000	-0.0138	-0.1365		0.0000	-0.0109	-0.0043
		(0.0000)	(0.0051)***	(0.0257)***		(0.0000)	(0.0042)***	(0.0189)
Establishment Entries		0.0000	-0.0042	-0.0901		-0.0000	-0.0117	0.0206
		(0.0000)	(0.0032)	(0.0147)***		(0.0000)	(0.0026)***	(0.0115)*
log(Regulations)		-0.0000	0.0167	-0.0197		0.0000	0.0129	0.0574
		(0.0000)	(0.0080)**	(0.0418)		(0.0000)	(0.0066)*	(0.0393)
Education		-0.0000	0.0911	0.2922		-0.0000	0.0684	-0.5170
		(0.0000)	(0.1186)	(0.8076)		(0.0000)	(0.0982)	(0.6152)
U.S. Controls								
GDP_growth		0.0000	0.0267	0.0252		0.0000	-0.0130	-0.0095
		(0.0000)	(0.0094)***	(0.0192)		(0.0000)	(0.0078)*	(0.0157)
AAA-Treasury		-0.0000	-0.0356	-0.0760		0.0001	-0.0252	-0.0669
		(0.0000)*	(0.0231)	(0.0623)		(0.0001)	(0.0191)	(0.0496)
Current_consumer		0.0000	-0.0003	0.0248		-0.0000	-0.0024	-0.0120
		(0.0000)	(0.0013)	(0.0041)***		(0.0000)	(0.0010)**	(0.0030)***
Consumer_expect		-0.0000	0.0002	-0.0068		0.0000	0.0042	0.0176
		(0.0000)	(0.0013)	(0.0034)**		(0.0000)	(0.0011)***	(0.0028)***
S&P 500		0.0000	0.0001	-0.0007		-0.0000	-0.0001	-0.0005
		(0.0000)	(0.0000)***	(0.0002)***		(0.0000)	(0.0000)***	(0.0001)***
Real_earnings		-0.0000	-0.0023	0.0003		-0.0000	0.0001	0.0005
		(0.0000)*	(0.0006)***	(0.0018)		(0.0000)	(0.0005)	(0.0013)
CAPE		-0.0000	-0.0019	0.0191		0.0000	0.0093	0.0448
		(0.0000)	(0.0013)	(0.0051)***		(0.0000)	(0.0011)***	(0.0036)***
Constant	-0.9252	0.0017	10.0571	42.5373	-0.4737	-0.0004	-1.2282	-17.7512
	(0.0780)***	(0.0003)***	(0.7283)***	(7.2462)***	(0.0790)***	(0.0004)	(0.6033)**	(6.3393)***
MSA FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Year FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes

Obs.	7821	7821	7821	7821	7821	7821	7821	7821
MSA			335	335			335	335
Adj. R^2		0.25	0.67			0.18	0.79	
Wald Chi^2	149.29			2123.08	12.02			4066.42

Panel D) New Debt Issuance

Methodology:	Negative Binomial	OLS	OLS	IV
Dep. Variable:	New Debt	New Debt/Firms	New Debt/log(GDP)	New Debt
	(1)	(2)	(3)	(4)
log(Payroll)	-0.4252	-0.0012	-0.0027	-0.0020
	(0.1763)**	(0.0003)***	(0.0008)***	(0.0008)***
MSA Controls				
Startups		-0.0044	0.0053	-0.0071
		(0.0030)	(0.0085)	(0.0031)**
Exits		0.0000	0.0001	0.0000
		(0.0000)	(0.0001)	(0.0000)**
Establishment Entries		-0.0000	0.0000	-0.0000
		(0.0000)*	(0.0000)	(0.0000)
log(Regulations)		-0.0000	-0.0003	-0.0000
		(0.0000)	(0.0001)***	(0.0000)
Education		0.0000	0.0019	0.0002
		(0.0004)	(0.0012)	(0.0004)
U.S. Controls				
GDP_growth		0.0000	-0.0001	-0.0000
		(0.0000)	(0.0000)	(0.0000)
AAA-Treasury		0.0000	-0.0001	-0.0001

		(0.0000)	(0.0001)	(0.0001)
Current_consumer		-0.0000	-0.0000	-0.0000
		(0.0000)	(0.0000)***	(0.0000)
Consumer_expect		0.0000	0.0000	0.0000
		(0.0000)	(0.0000)***	(0.0000)**
S&P 500		0.0000	-0.0000	-0.0000
		(0.0000)	(0.0000)***	(0.0000)**
Real_earnings		0.0000	0.0000	0.0000
		(0.0000)	(0.0000)	(0.0000)
CAPE		-0.0000	0.0000	0.0000
		(0.0000)	(0.0000)	(0.0000)
Constant	21.5174	0.0153	0.0213	0.0183
	(73.0019)	(0.0028)***	(0.0089)**	(0.0080)**
MSA FE	No		Yes	Yes
Year FE	No		Yes	Yes
Obs.	7821	7821	7821	7821
MSA			335	335
Adj. R^2		0.72	0.32	
Wald Ch2	158.14			1742.69

Panel E) Labor Intensive Sectors and Payroll Costs

Dep. Variable:	List/log(GDP)		New/log(GDP)		Delist/log(GDP)	
Average Labor Intensity of Listed Firms:	High	Low	High	Low	High	Low

	(1)	(2)	(3)	(4)	(5)	(6)
log(Payroll)	-1.7749	0.3500	-1.1597	-0.1852	0.0088	0.0889
	(0.5936)***	(0.2685)	(0.1168)***	(0.0382)***	(0.0380)	(0.0287)***
MSA Controls						
Startups	13.7856	2.3364	1.1027	-0.1812	0.2070	-0.1284
	(6.7263)**	(2.5636)	(1.3236)	(0.3651)	(0.4308)	(0.2745)
Exits	-0.2064	-0.0355	-0.0215	-0.0006	-0.0057	0.0002
	(0.0481)***	(0.0174)**	(0.0095)**	(0.0025)	(0.0031)*	(0.0019)
Establishment Entries	-0.1216	-0.0304	-0.0061	0.0023	-0.0058	-0.0016
	(0.0289)***	(0.0114)***	(0.0057)	(0.0016)	(0.0019)***	(0.0012)
log(Regulations)	0.1366	0.0440	0.0215	0.0099	0.0093	-0.0001
	(0.0707)*	(0.0305)	(0.0139)	(0.0043)**	(0.0045)**	(0.0033)
Education	2.4560	-0.1310	0.3661	-0.0400	0.0679	-0.0720
	(1.1442)**	(0.4015)	(0.2252)	(0.0572)	(0.0733)	(0.0430)*
U.S. Controls						
GDP_growth	0.4640	-0.2787	-0.0367	-0.0282	0.0371	0.0041
	(0.5795)	(0.1908)	(0.1140)	(0.0272)	(0.0371)	(0.0204)
AAA-Treasury	3.9742	-1.8710	-0.1580	-0.1663	0.2662	0.0276
	(3.3285)	(1.0807)*	(0.6550)	(0.1539)	(0.2132)	(0.1157)
Current_consumer	-0.0314	0.0029	-0.0025	0.0027	-0.0022	-0.0008
	(0.0580)	(0.0205)	(0.0114)	(0.0029)	(0.0037)	(0.0022)
Consumer_expect	0.0058	-0.0045	0.0028	-0.0009	-0.0009	0.0006
	(0.0416)	(0.0146)	(0.0082)	(0.0021)	(0.0027)	(0.0016)
S&P 500	-0.0007	0.0005	0.0004	0.0000	-0.0001	-0.0000
	(0.0023)	(0.0008)	(0.0004)	(0.0001)	(0.0001)	(0.0001)
Real_earnings	-0.0273	0.0100	0.0018	0.0007	-0.0018	-0.0001
	(0.0210)	(0.0069)	(0.0041)	(0.0010)	(0.0013)	(0.0007)
CAPE	0.3800	-0.1597	-0.0542	-0.0086	0.0275	0.0051

	(0.3668)	(0.1250)	(0.0722)	(0.0178)	(0.0235)	(0.0134)
Constant	10.1480	3.2396	12.9542	2.2119	-1.7084	-0.9266
	(12.1971)	(4.4099)	(2.4001)***	(0.6280)***	(0.7812)**	(0.4722)**
MSA FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	3911	3910	3911	3910	3911	3910
MSA	168	167	168	167	168	167
Adj. R^2	0.95	0.96	0.70	0.54	0.85	0.77

Table 4: Mergers Increase and Liquidations Decline as Payroll Costs Increase

Merger is an indicator variable with 1 meaning the company has merged with another, 0 otherwise. *Liquidation* is an indicator variable with 1 meaning the company has been liquidated, 0 otherwise. *Log(Payroll)* is the natural logarithm of the real average payroll for that MSA in 2015 dollars. *Reallocation rate* is the sum of number of jobs created and number of jobs destroyed divided by the total number of jobs in the MSA. *Startups* is the number of firms with age zero reported by the Census Bureau for each MSA-year divided by the beginning of the year number of firms in the MSA. *Establishment Exits* and *Establishment Entries* are the reductions and increases in the number of establishments per year by MSA. Log(regulation) is the intensity of regulations affecting the industries in that MSA. *Education* is the percentage of the survey population that has a high school diploma in that year for that MSA. *GDP_growth* is the annual percentage change in real per capita growth rate in GDP. *AAA-Treasury* is the spread between AAA-rated corporate bonds and treasury bills. *Current_consumer* captures what consumers feel about current economic condition and *Consumer_expect* indicates how the consumers feel about future economic conditions. *S&P 500* is the level of the index value at the end of the year. *Real_earnings* is the dollar value of real earnings by listed firms. *CAPE* is the cyclically adjusted PE ratio as provided by Robert Shiller. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level.

Dep. Variable:	Merger	Merger	Liquidation	Liquidation
Methodology:	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
log(Payroll)	0.2615	0.0487	-0.1158	-1.8476
	(0.000)***	(0.004)***	(0.001)***	(0.000)***
MSA Controls:				
Startups	-0.2380	-0.0647	0.2261	1.6359
	(0.574)	(0.901)	(0.527)	(0.001)***
Establishment Exits	-0.0020	-0.0025	-0.0077	-0.0119
	(0.499)	(0.416)	(0.002)***	(0.000)***
Establishment Entries	-0.0076	-0.0080	-0.0041	-0.0076
	(0.000)***	(0.000)***	(0.010)***	(0.000)***
log(Regulations)	-0.0004	-0.0019	0.0105	-0.0020
	(0.939)	(0.725)	(0.008)***	(0.708)
Education	0.0230	0.0248	0.0429	0.0581
	(0.740)	(0.721)	(0.463)	(0.394)
U.S. Controls				
GDP_growth	0.0106	0.0165	-0.0260	-0.0235
	(0.055)*	(0.153)	(0.000)***	(0.492)
AAA-Treasury	-0.0023	0.0167	-0.0311	0.1011
	(0.864)	(0.636)	(0.006)***	(0.598)
Current_consumer	-0.0025	-0.0027	0.0004	0.0126
	(0.001)***	(0.001)***	(0.513)	(0.005)***
Consumer_expect	0.0028	0.0027	0.0011	-0.0075
	(0.000)***	(0.001)***	(0.108)	(0.009)***
S&P 500	-0.0001	-0.0000	-0.0001	-0.0004
	(0.008)***	(0.706)	(0.000)***	(0.009)***
Real_earnings	-0.0004	-0.0007	0.0007	-0.0016
	(0.231)	(0.236)	(0.020)**	(0.204)
CAPE	0.0050	0.0041	0.0048	0.0572
	(0.000)***	(0.017)**	(0.000)***	(0.016)**
Constant	-2.6078	-0.3636	1.1457	18.3268
	(0.000)***	(0.925)	(0.001)***	(0.000)***
MSA FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Obs.	7821	7821	7821	7821
MSA	335	335	335	335
Adj. R^2	0.72		0.68	
Wald Chi^2		9510.55		17658.23

Table 5: Payroll Costs in the Locations of Acquisition Targets

Panel A) Summary Statistics

The following table summarizes the payroll cost characteristics of the targets of acquisition. Column (1) shows the ratio of all acquisitions that happen involving cross-MSA targets. Column (2) shows the proportion of acquirers located in high payroll cost locations (≥ Median Payroll) that are involved in cross-MSA acquisitions. Column (3) shows the proportion of acquirers located in low payroll cost locations (< Median Payroll) that are involved in cross-MSA acquisitions. Column (4) shows the difference and column (5) displays the t-test statistic. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level.

	Full Sample	≥ Median Payroll	< Median Payroll	(2) – (3)	t-stat
	(1)	(2)	(3)	(4)	(5)
Cross-MSA Target	0.8325	0.8771	0.7879	-0.0893	7.3822***

Panel B) Regression Analysis

Dependent variable *Cross-MSA Target* is the proportion of publicly traded targets that were acquired by acquirers not in the same MSA. *Log(TargetPayroll)* is the natural logarithm of the real average payroll in the MSA of the target in 2015 dollars. *Log(AcquirerPayroll)* is the natural logarithm of the real average payroll in the MSA of the acquirer in 2015 dollars. *Log(TargetPayroll) – Log(AcquirerPayroll)* is the difference between the two averages. *Startups* is the number of firms with age zero reported by the Census Bureau for each MSA-year divided by the beginning of the year number of firms in the MSA. *Establishment Exits* and *Establishment Entries* are the reductions and increases in the number of establishments per year by MSA. Log(regulation) is the intensity of regulations affecting the industries in that MSA. *Education* is the percentage of the survey population that has a high school diploma in that year for that MSA. *GDP_growth* is the annual percentage change in real per capita growth rate in GDP. *AAA-Treasury* is the spread between AAA-rated corporate bonds and treasury bills. *Current_consumer* captures what consumers feel about current economic condition and *Consumer_expect* indicates how the consumers feel about future economic conditions. *S&P 500* is the level of the index value at the end of the year. *Real_earnings* is the dollar value of real earnings by listed firms. *CAPE* is the cyclically adjusted PE ratio as provided by Robert Shiller. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level.

Dep. Variable	*Cross-MSA Target*	*Cross-MSA Target*	*Cross-MSA Target*	*Cross-MSA Target*
	(1)	(2)	(3)	(4)
log(TargetPayroll)	0.2947	0.3466		
	(0.0592)***	(0.0716)***		
log(TargetPayroll) – log(AcquirerPayroll)			0.3974	0.4489
			(0.0518)***	(0.0432)***
MSA Controls				
Startups		-3.2342	-2.5734	0.5325
		(1.4760)**	(1.4411)*	(1.7621)
Establishment Exits		0.0171	0.0102	-0.0059

		(0.0126)	(0.0123)	(0.0127)
Establishment Entries		-0.0053	0.0028	0.0035
		(0.0086)	(0.0090)	(0.0085)
log(Regulations)		-0.0080	0.0135	0.0328
		(0.0222)	(0.0217)	(0.0222)
Education		-0.1832	-0.1546	0.0568
		(0.3111)	(0.3206)	(0.2559)
U.S. Controls				
GDP_growth		0.0166	0.0243	0.0276
		(0.0186)		
AAA-Treasury		0.0120	0.0437	0.0262
		(0.0065)*	(0.0441)	
Current_consumer		-0.0004	-0.0007	-0.0017
		(0.0010)	(0.0010)	(0.0024)
Consumer_expect		0.0010	0.0006	0.0016
		(0.0006)	(0.0008)	(0.0025)
S&P 500		-0.0001	-0.0000	0.0000
		(0.0001)	(0.0000)	(0.0000)
Real_earnings		0.0006	0.0001	-0.0002
		(0.0012)	(0.0000)	(0.0000)
CAPE		0.0021	0.0009	-0.0008
		(0.0004)***	(0.0006)	(0.0025)
Constant	-2.3269	-2.7079	0.7535	0.4527
	(0.6345)***	(0.7816)***	(0.2305)***	(0.2942)
MSA FE	No	Yes	Yes	Yes
Year FE	No	Yes	Yes	Yes
Obs.	2,243	2,243	2,243	2,243
MSA				251
Adj. R^2	0.03	0.05	0.08	0.17

Table 6: Payroll Cost and Corporate Relocation

Panel A) Summary Statistics on Payroll Costs and Corporate Relocations

Log(Payroll) is the natural logarithm of the real average payroll for that MSA in 2015 dollars. The average of the log(Payroll) variable for the location from which the company is moving its headquarters is presented in column (1) and the location to which the company is moving its headquarters in column (2). Column (3) shows the difference and column (4) displays the t-test statistic. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level.

	Headquarters from	Headquarters to	(1)-(2)	t-stat
	(1)	(2)	(3)	(4)
log(Payroll)	10.6566	10.6070	-0.0496	3.7122***

Panel B) Regression Analysis on Corporate Relocation

The dependent variables *RelocationFROM* and *RelocationTO* count the number of firms relocating their headquarters away from and to that location, respectively. *Log(Payroll)* is the natural logarithm of the real average payroll for that MSA in 2015 dollars. *Reallocation rate* is the sum of number of jobs created and number of jobs destroyed divided by the total number of jobs in the MSA. *Startups* is the number of firms with age zero reported by the Census Bureau for each MSA-year divided by the beginning of the year number of firms in the MSA. *Establishment Exits* and *Establishment Entries* are the reductions and increases in the number of establishments per year by MSA. Log(regulation) is the intensity of regulations affecting the industries in that MSA. *Education* is the percentage of the survey population that has a high school diploma in that year for that MSA. *GDP_growth* is the annual percentage change in real per capita growth rate in GDP. *AAA-Treasury* is the spread between AAA-rated corporate bonds and treasury bills. *Current_consumer* captures what consumers feel about current economic condition and *Consumer_expect* indicates how the consumers feel about future economic conditions. *S&P 500* is the level of the index value at the end of the year. *Real_earnings* is the dollar value of real earnings by listed firms. *CAPE* is the cyclically adjusted PE ratio as provided by Robert Shiller. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level.

Dep. Variable:	*RelocationFROM*	*RelocationFROM*	*RelocationTO*	*RelocationTO*
Methodology	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
log(Payroll)	2.0164	15.0898	-61.2463	-5.0953
	(0.8438)**	(4.1068)***	(27.6078)**	(1.5941)***
MSA Controls				
Startups	-17.4228	-3.3250	66.5477	67.8675
	(15.0812)	(17.4234)	(16.0474)***	(16.4981)***
Exits	0.2318	0.1963	-0.6829	-0.7157
	(0.1163)**	(0.1190)*	(0.1215)***	(0.1229)***
Establishment Entries	0.0634	0.0181	-0.2752	-0.3005
	(0.0718)	(0.0791)	(0.0565)***	(0.0578)***
log(Regulations)	0.0716	0.0804	0.0403	-0.0391
	(0.1748)	(0.2104)	(0.1893)	(0.1903)
Education	-13.1753	-15.5956	46.3734	42.6766
	(15.1725)	(56.3189)	(9.6922)***	(9.3846)***
U.S. Controls				
GDP_growth	-39.4559	-34.3649	0.9656	1.0511

	(97.7201)	(85.2145)	(0.1255)***	(0.1298)***
AAA-Treasury	-63.4306	-55.8207	0.4798	0.6756
	(75.8494)	(54.3608)	(0.2237)**	(0.2242)***
Current_consumer	3.8519	3.2520	-0.2706	-0.2803
	(26.7105)	(4.6159)	(0.0275)***	(0.0283)***
Consumer_expect	-3.9277	-3.3791	0.2178	0.2212
	(21.8250)	(9.4337)	(0.0168)***	(0.0172)***
S&P 500	-0.6346	-0.5579	0.0087	0.0097
	(5.8035)	(.6192)	(0.0008)***	(0.0008)***
Real_earnings	0.9867	0.8912	0.0102	0.0088
	(5.2791)	(4.0993)	(0.0051)**	(0.0052)*
CAPE	14.2425	12.4352	-0.3671	-0.3950
	(93.2306)	(66.9928)	(0.0285)***	(0.0296)***
Constant	3,082.2103	10,917.3014	677.8264	5,190.3526
	(1,759.1140)	(25,057.1281)	(321.3283)**	(2,889.7320)*
MSA FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Obs.	592	592	592	592
Wald Chi^2	293.16	283.70	300.69	287.60

Table 7: China Import Shock and Listed Firms

Difference-in-difference test involving China Permanent Normal Trade Relations (PNTR) status. US introduced the regulations giving China PNTR, as well as permanent lower tariff rates, in 2000 and approved it in 2001 instead of annual renewal of lower tariff rates. The sample is for the years 1991 to 2010 (both years included) and centered around 2001. The top 25 percentile of the MSAs that had high imports from low Payroll countries to total imports were identified for the year 1990 i.e. MSAs having more than 9.3534% imports from low Payroll countries are called the treated group. Propensity score matched, according to fraction of manufacturing employment to total employment, year, size, startups, exits, establishment entries, education, and log(regulations), to other MSAs to find the control group. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level.

	1991 to 2000			2001 to 2010			
	Control (1)	Treated (2)	(2)-(1) (3)	Control (4)	Treated (5)	(5)-(4) (6)	(6)-(3) (7)
Non-Manufacturing List	6.014	5.879	-0.135	4.039	19.692	15.653***	15.788**
Non-Manufacturing List/log(GDP)	0.648	0.631	-0.017	0.419	2.055	1.636***	1.653**
Non-Manufacturing List/Firms	0.012	0.009	-0.003	0.007	0.011	0.004***	0.007*
Non-Manufacturing New	1.666	1.472	-0.194	1.445	3.373	1.928**	2.122***
Non-Manufacturing New/log(GDP)	0.037	0.046	0.009	0.003	0.041	0.038***	0.029*
Non-Manufacturing New/Firms	0.032	0.027	-0.005	0.009	0.023	0.014**	0.019**
Non-Manufacturing Delist	0.251	0.278	0.027	1.148	0.137	-1.011***	-1.038**
Non-Manufacturing Delist/log(GDP)	0.023	0.028	0.005	0.085	0.014	-0.071***	-0.076***
Non-Manufacturing Delist/Firms	0.004	0.003	-0.001	0.005	0.002	-0.003**	-0.002*

Table 8: Payroll and Reallocation Rates

List, New, and Delist are numbers of listed, newly listed, and delisted firms, respectively. *Log(Payroll)* is the natural logarithm of the real average payroll for that MSA in 2015 dollars. *Reallocation rate* is the sum of number of jobs created and number of jobs destroyed divided by the total number of jobs in the MSA. *Startups* is the number of firms with age zero reported by the Census Bureau for each MSA-year divided by the beginning of the year number of firms in the MSA. *Establishment Exits* and *Establishment Entries* are the reductions and increases in the number of establishments per year by MSA. Log(regulation) is the intensity of regulations affecting the industries in that MSA. *Education* is the percentage of the survey population that has a high school diploma in that year for that MSA. *GDP_growth* is the annual percentage change in real per capita growth rate in GDP. *AAA-Treasury* is the spread between AAA-rated corporate bonds and treasury bills. *Current_consumer* captures what consumers feel about current economic condition and *Consumer_expect* indicates how the consumers feel about future economic conditions. *S&P 500* is the level of the index value at the end of the year. *Real_earnings* is the dollar value of real earnings by listed firms. *CAPE* is the cyclically adjusted PE ratio as provided by Robert Shiller. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level.

Methodology:	OLS	OLS	IV	3-Stage IV	3-Stage IV	3-Stage IV
Dep. Variable:	Reallocation rate	Reallocation rate	Reallocation rate	List	New	Delist
	(1)	(2)	(3)	(4)	(5)	(7)
log(Payroll)	-0.6286	-5.2014	-18.5309			
	(0.3089)**	(0.5469)***	(5.0666)***			
Reallocation rate				-0.0131	-0.1267	0.0152
				(0.0037)***	(0.0179)***	(0.0144)
MSA Controls:						
Startups		-44.2782	-33.4270	5.9610	6.2152	8.3804
		(5.8329)***	(7.1543)***	(0.7780)***	(3.7372)*	(2.9390)***
Exits		0.5353	0.5026	-0.0282	-0.0345	0.0008
		(0.0409)***	(0.0429)***	(0.0058)***	(0.0284)	(0.0214)
Establishment Entries		0.7482	0.7212	-0.0140	0.0357	0.0329
		(0.0257)***	(0.0277)***	(0.0046)***	(0.0227)	(0.0171)*
log(Regulations)		0.2138	0.1177	0.0358	0.0436	0.0651
		(0.0645)***	(0.0743)	(0.0096)***	(0.0433)	(0.0398)
Education		2.9567	3.0737	0.2678	0.6640	-0.7447
		(0.9541)***	(0.9600)***	(0.1531)*	(0.8356)	(0.6103)
U.S. Controls:						
GDP_growth		-0.1730	0.1963	-0.0038	-0.0066	-0.0071
		(0.0757)**	(0.1590)	(0.0041)	(0.0200)	(0.0159)
AAA-Treasury		-0.1524	1.0402	-0.0633	-0.1358	-0.0174
		(0.1857)	(0.4878)**	(0.0125)***	(0.0613)**	(0.0481)
Current_consumer		-0.0458	-0.0617	0.0002	0.0367	-0.0101
		(0.0101)***	(0.0118)***	(0.0009)	(0.0046)***	(0.0032)***
Consumer_expect		0.0172	0.0129	0.0040	-0.0194	0.0152
		(0.0107)	(0.0109)	(0.0008)***	(0.0040)***	(0.0030)***
S&P 500		-0.0010	0.0010	-0.0002	-0.0014	-0.0003
		(0.0003)***	(0.0008)	(0.0000)***	(0.0001)***	(0.0001)***
Real_earnings		-0.0381	-0.0546	-0.0018	-0.0029	-0.0002
		(0.0047)***	(0.0078)***	(0.0004)***	(0.0019)	(0.0014)
CAPE		0.1192	0.0632	0.0186	0.0481	0.0421
		(0.0105)***	(0.0237)***	(0.0010)***	(0.0055)***	(0.0038)***

Constant	33.1777	71.5265	212.0774	4.6186	2.7168	1.3551
	(3.2532)***	(5.8590)***	(53.4339)***	(0.1709)***	(0.7352)***	(0.5848)**
MSA FE	No	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	Yes	Yes	Yes	Yes
Obs.	7821	7821	7821	7821	7821	7821
MSA		335	335	335	335	335
Adj. R^2	0.01	0.79	0.58	.	.	
Wald Chi^2			1.15e+06	26206.83	561.80	2486.08

Table 9: Robustness: MSA's with Concentration of Large Firms vs. Small Firms

List, New, and Delist are numbers of listed, newly listed, and delisted firms, respectively. *Log(Payroll)* is the natural logarithm of the real average payroll for that MSA in 2015 dollars. *Reallocation rate* is the sum of number of jobs created and number of jobs destroyed divided by the total number of jobs in the MSA. *Startups* is the number of firms with age zero reported by the Census Bureau for each MSA-year divided by the beginning of the year number of firms in the MSA. *Establishment Exits* and *Establishment Entries* are the reductions and increases in the number of establishments per year by MSA. Log(regulation) is the intensity of regulations affecting the industries in that MSA. *Education* is the percentage of the survey population that has a high school diploma in that year for that MSA. *GDP_growth* is the annual percentage change in real per capita growth rate in GDP. *AAA-Treasury* is the spread between AAA-rated corporate bonds and treasury bills. *Current_consumer* captures what consumers feel about current economic condition and *Consumer_expect* indicates how the consumers feel about future economic conditions. *S&P 500* is the level of the index value at the end of the year. *Real_earnings* is the dollar value of real earnings by listed firms. *CAPE* is the cyclically adjusted PE ratio as provided by Robert Shiller. ~~Firms is the number of firms within an MSA.~~ Log(GDP) is the natural logarithms of the real GDP. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level.

Dep. Variable:	List/log(GDP)		New/log(GDP)		Delist/log(GDP)	
Number of Employees:	High	Low	High	Low	High	Low
	(1)	(2)	(3)	(4)	(5)	(6)
log(Payroll)	-2.1990	0.1961	-1.5348	0.0154	0.0031	0.1653
	(0.6791)***	(0.0547)***	(0.1341)***	(0.0153)	(0.0137)	(0.0454)***
MSA Controls						
Startups	20.6719	1.3766	0.2814	-0.0545	0.8548	-0.2496
	(8.4438)**	(0.4858)***	(1.6669)	(0.1358)	(0.5645)	(0.1219)**
Exits	-0.3202	-0.0066	-0.0256	-0.0000	-0.0102	0.0007
	(0.0601)***	(0.0033)**	(0.0119)**	(0.0009)	(0.0040)**	(0.0008)
Establishment Entries	-0.1969	-0.0056	-0.0099	0.0004	-0.0088	0.0006
	(0.0367)***	(0.0022)**	(0.0073)	(0.0006)	(0.0025)***	(0.0005)
log(Regulations)	0.1444	-0.0071	0.0255	-0.0001	0.0147	-0.0001
	(0.1158)	(0.0051)	(0.0229)	(0.0014)	(0.0077)*	(0.0013)
Education	2.6268	0.1270	0.2629	-0.0269	0.0407	-0.0221
	(1.1142)**	(0.0954)	(0.2200)	(0.0267)	(0.0745)	(0.0239)
U.S. Controls						
GDP_growth	-0.0205	-0.0123	-0.0494	0.0002	0.0254	-0.0017
	(0.5280)	(0.0482)	(0.1042)	(0.0135)	(0.0353)	(0.0121)
AAA-Treasury	0.1231	-0.0867	-0.3545	0.0005	0.1846	-0.0061
	(2.9987)	(0.2745)	(0.5920)	(0.0767)	(0.2005)	(0.0689)
Current_consumer	-0.0393	-0.0025	-0.0043	-0.0001	-0.0022	0.0001

	(0.0553)	(0.0050)	(0.0109)	(0.0014)	(0.0037)	(0.0012)
Consumer_expect	-0.0169	-0.0006	0.0008	0.0001	-0.0010	0.0002
	(0.0392)	(0.0036)	(0.0077)	(0.0010)	(0.0026)	(0.0009)
S&P 500	0.0016	0.0002	0.0006	0.0000	-0.0001	-0.0000
	(0.0022)	(0.0002)	(0.0004)	(0.0001)	(0.0001)	(0.0000)
Real_earnings	-0.0017	0.0011	0.0030	0.0000	-0.0011	-0.0000
	(0.0189)	(0.0017)	(0.0037)	(0.0005)	(0.0013)	(0.0004)
CAPE	-0.0715	-0.0228	-0.0756	-0.0003	0.0207	0.0008
	(0.3380)	(0.0311)	(0.0667)	(0.0087)	(0.0226)	(0.0078)
Constant	31.5289	-1.1554	18.0922	-0.1389	-2.0299	-0.0102
	(11.7527)***	(1.0408)	(2.3201)***	(0.2910)	(0.7856)***	(0.2611)
MSA FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	3911	3910	3911	3910	3911	3910
MSA	168	167	168	167	168	167
Adj. R^2	0.95	0.70	0.68	0.12	0.84	0.74

Table 10: Housing Supply Lawsuits

The state level data for housing supply lawsuits is from Ganong and Shoag (2017). We use the data for the year 1980 for exogeneity. The median value of housing supply lawsuits is used to separate the sample into two equal halves. The sample with higher housing supply lawsuits is called High, while the sample with lower housing supply lawsuits is called Low. List, New, and Delist are numbers of listed, newly listed, and delisted firms, respectively. *Log(Payroll)* is the natural logarithm of the real average payroll for that MSA in 2015 dollars. *Startups* is the number of firms with age zero reported by the Census Bureau for each MSA-year divided by the beginning of the year number of firms in the MSA. *Establishment Exits* and *Establishment Entries* are the reductions and increases in the number of establishments per year by MSA. *Log(regulation)* is the intensity of regulations affecting the industries in that MSA. *Education* is the percentage of the survey population that has a high school diploma in that year for that MSA. *GDP_growth* is the annual percentage change in real per capita growth rate in GDP. *AAA-Treasury* is the spread between AAA-rated corporate bonds and treasury bills. *Current_consumer* captures what consumers feel about current economic condition and *Consumer_expect* indicates how the consumers feel about future economic conditions. *S&P 500* is the level of the index value at the end of the year. *Real_earnings* is the dollar value of real earnings by listed firms. *CAPE* is the cyclically adjusted PE ratio as provided by Robert Shiller. Firms is the number of firms within an MSA. *Log(GDP)* is the natural logarithms of the real GDP. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level.

Panel A) Housing Supply Regulations and Increased Payroll Costs

Housing Supply Lawsuits	High	Low	(1)-(2)	t-stat
	(1)	(2)	(3)	(4)
log(Payroll)	10.5632	10.4581	0.1050***	28.4535

Panel B) Housing Supply Regulations and Declining Lists

Dep. Variable:	List/log(GDP)	List/log(GDP)	New/log(GDP)	New/log(GDP)	Delist/log(GDP)	Delist/log(GDP)
Housing Supply Lawsuits	High	Low	High	Low	High	Low
	(1)	(2)	(3)	(4)	(5)	(6)
log(Payroll)	-0.0006	-0.0000	-1.3529	-0.0635	0.1116	0.0695
	(0.0001)***	(0.0002)	(0.1111)***	(0.0643)	(0.0569)*	(0.0914)
MSA Controls:						
Startups	0.0053	0.0016	-0.5147	1.3339	-0.1443	-0.6316
	(0.0016)***	(0.0019)	(1.2129)	(0.7481)*	(0.6617)	(0.9982)
Establishment Exits	-0.0000	-0.0000	-0.0146	-0.0106	-0.0030	-0.0106
	(0.0000)*	(0.0000)	(0.0076)*	(0.0060)*	(0.0053)	(0.0062)*
Establishment Entries	-0.0000	-0.0000	-0.0053	0.0002	-0.0058	-0.0129
	(0.0000)**	(0.0000)***	(0.0053)	(0.0030)	(0.0026)**	(0.0044)***
log(Regulations)	-0.0000	-0.0000	0.0310	0.0069	0.0061	0.0200
	(0.0000)	(0.0000)	(0.0148)**	(0.0065)	(0.0058)	(0.0122)*
Education	0.0001	0.0006	0.0973	0.1862	0.1094	0.0421
	(0.0003)	(0.0003)**	(0.2024)	(0.1047)*	(0.0926)	(0.1666)
U.S. Controls:						
GDP_growth	-0.0000	-0.0000	0.0306	0.0166	-0.0055	-0.0175

	(0.0000)	(0.0000)	(0.0163)*	(0.0082)**	(0.0072)	(0.0134)
AAA-Treasury	-0.0001	-0.0001	-0.0604	-0.0180	0.0097	-0.0513
	(0.0001)**	(0.0001)**	(0.0399)	(0.0202)	(0.0179)	(0.0329)
Current_consumer	0.0000	-0.0000	0.0006	-0.0007	-0.0010	-0.0036
	(0.0000)	(0.0000)	(0.0022)	(0.0011)	(0.0010)	(0.0018)**
Consumer_expect	0.0000	0.0000	-0.0009	0.0012	0.0023	0.0058
	(0.0000)**	(0.0000)**	(0.0023)	(0.0012)	(0.0010)**	(0.0019)***
S&P 500	-0.0000	-0.0000	0.0001	0.0001	-0.0001	-0.0001
	(0.0000)***	(0.0000)***	(0.0001)*	(0.0000)*	(0.0000)***	(0.0000)**
Real_earnings	-0.0000	-0.0000	-0.0031	-0.0011	0.0005	-0.0003
	(0.0000)	(0.0000)	(0.0010)***	(0.0005)**	(0.0004)	(0.0008)
CAPE	0.0000	0.0000	-0.0001	-0.0029	0.0060	0.0117
	(0.0000)***	(0.0000)***	(0.0022)	(0.0012)**	(0.0010)***	(0.0018)***
Constant	0.0074	0.0010	14.5604	4.8131	-1.2493	-0.6054
	(0.0016)***	(0.0018)	(1.1942)***	(0.6849)***	(0.6058)**	(0.9828)
MSA FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	3911	3910	3911	3910	3911	3910
MSA	168	167	168	167	168	167
Adj. R^2	0.81	0.78	0.68	0.63	0.80	0.71

Table 11: Robustness: Residential Land Use Regulations

The MSA level data for housing supply regulations is from Wharton Residential Land Use Regulation Index (WRLURI) for the year 2008. The median value of WRLURI is used to separate the sample into two equal halves. The sample with higher WRLURI is called High, while the sample with lower WRLURI is called Low. List, New, and Delist are numbers of listed, newly listed, and delisted firms, respectively. *Log(Payroll)* is the natural logarithm of the real average payroll for that MSA in 2015 dollars. *Startups* is the number of firms with age zero reported by the Census Bureau for each MSA-year divided by the beginning of the year number of firms in the MSA. *Establishment Exits* and *Establishment Entries* are the reductions and increases in the number of establishments per year by MSA. Log(regulation) is the intensity of regulations affecting the industries in that MSA. *Education* is the percentage of the survey population that has a high school diploma in that year for that MSA. *GDP_growth* is the annual percentage change in real per capita growth rate in GDP. *AAA-Treasury* is the spread between AAA-rated corporate bonds and treasury bills. *Current_consumer* captures what consumers feel about current economic condition and *Consumer_expect* indicates how the consumers feel about future economic conditions. *S&P 500* is the level of the index value at the end of the year. *Real_earnings* is the dollar value of real earnings by listed firms. *CAPE* is the cyclically adjusted PE ratio as provided by Robert Shiller. Firms is the number of firms within an MSA. Log(GDP) is the natural logarithms of the real GDP. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level.

Dep. Variable:	List/log(GDP)	List/log(GDP)	New/log(GDP)	New/log(GDP)	Delist/log(GDP)	Delist/log(GDP)
Housing Supply Regulations	High	Low	High	Low	High	Low
	(1)	(2)	(3)	(4)	(5)	(6)
log(Payroll)	-0.0005	-0.0002	-1.3234	-0.0129	0.1793	0.1036
	(0.0002)***	(0.0001)	(0.1130)***	(0.0591)	(0.0526)***	(0.0931)
MSA Controls:						
Startups	0.0000	0.0079	1.1796	0.2894	0.2811	-0.3475
	(0.0019)	(0.0015)***	(1.2729)	(0.6310)	(0.5617)	(1.0486)
Establishment Exits	0.0000	-0.0000	-0.0203	-0.0075	-0.0057	-0.0104
	(0.0000)	(0.0000)**	(0.0081)**	(0.0049)	(0.0043)	(0.0067)
Establishment Entries	-0.0000	-0.0000	-0.0126	0.0005	-0.0059	-0.0132
	(0.0000)***	(0.0000)**	(0.0056)**	(0.0026)	(0.0024)**	(0.0046)***
log(Regulations)	-0.0000	0.0000	0.0245	0.0129	0.0036	0.0245
	(0.0000)**	(0.0000)	(0.0160)	(0.0056)**	(0.0050)	(0.0132)*
Education	0.0006	-0.0000	0.1709	-0.2040	-0.1717	0.1844
	(0.0003)*	(0.0002)	(0.1991)	(0.1000)**	(0.0890)*	(0.1640)
U.S. Controls:						
GDP_growth	0.0000	-0.0000	0.0328	0.0117	-0.0029	-0.0198
	(0.0000)	(0.0000)	(0.0173)*	(0.0072)	(0.0064)	(0.0143)
AAA-Treasury	-0.0001	-0.0001	-0.0573	-0.0295	-0.0024	-0.0363
	(0.0001)	(0.0000)**	(0.0422)	(0.0177)*	(0.0158)	(0.0348)
Current_consumer	-0.0000	0.0000	0.0013	-0.0009	-0.0017	-0.0027
	(0.0000)	(0.0000)	(0.0023)	(0.0010)	(0.0009)**	(0.0019)
Consumer_expect	0.0000	0.0000	-0.0018	0.0017	0.0026	0.0054
	(0.0000)*	(0.0000)**	(0.0024)	(0.0010)*	(0.0009)***	(0.0020)***
S&P 500	-0.0000	-0.0000	0.0001	0.0000	-0.0001	-0.0001
	(0.0000)**	(0.0000)***	(0.0001)*	(0.0000)	(0.0000)***	(0.0001)***
Real_earnings	-0.0000	0.0000	-0.0032	-0.0010	0.0001	0.0000
	(0.0000)	(0.0000)	(0.0011)***	(0.0004)**	(0.0004)	(0.0009)

CAPE	0.0000	0.0000	-0.0003	-0.0022	0.0045	0.0132
	(0.0000)***	(0.0000)***	(0.0024)	(0.0010)**	(0.0009)***	(0.0019)***
Constant	0.0068	0.0025	14.2603	4.5262	-0.6599	-1.1803
	(0.0019)***	(0.0015)*	(1.2266)***	(0.6226)***	(0.5542)	(1.0105)
MSA FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	3911	3910	3911	3910	3911	3910
MSA	168	167	168	167	168	167
Adj. R^2	0.83	0.77	0.69	0.58	0.80	0.70