Geographical Industry Exposure, Local Factors, and Asset Prices

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Abstract

We show that the industrial diversification of local markets matter for how the industry shocks affect the firms located in those areas. We propose a measure of industry exposure (IE) of local markets. We find that industry shocks have a significant effect on local factor prices such as wages and real estate returns in high IE areas, but they do not affect prices in low IE areas. The effect of industry shocks on local wages leads to endogenous risk sharing with labor, reducing the sensitivity of firm returns to industry shocks. Same industry shocks also influence real estate prices, increasing the sensitivity of firm returns to industry shocks for the firms that have long positions in corporate real estate, partially offsetting the earlier effect. We propose an equilibrium model that explains these empirical findings.

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Most work in the macro finance literature treats labor and capital markets as perfectly competitive and homogenous at the aggregate level. In reality, workers face frictions to switch areas (e.g., transaction costs in real estate, labor search frictions, family coordination issues, etc.) and a significant portion of physical capital is immobile, hence cannot be reallocated geographically (most notably, land and structures). These local factors account for a significant part of the economic output.[1] The frictions to factor flows imply that aggregate markets are in fact composed of a large number of segmented and heterogeneous local markets that can be quite different from scaled versions of aggregate markets. In this paper we argue that observable differences across local economies, in particular industrial diversification, help explain differences in risk sharing between labor and capital markets with important implications for asset pricing.

Industry shocks affect the local factor prices such as wages and real estate rents / prices through the firms from that industry operating in that market. A good shock leads to increased demand for labor and real estate such as office buildings, which also leads to higher wages and prices; a bad shock has the opposite effect. However, the magnitude of the effect is not uniform: Shocks to a particular industry should not matter much if the local area is well diversified. However, the effect will be bigger if the area is not well diversified and a few major industries drive the economy of the area.[2]

In this paper, we propose a new metric of geographic industry concentration, which we label "industry exposure" (IE) of local markets. We study how the industry exposure of areas affects the dynamics of wages and real estate prices in those markets, and the profits and returns of the firms located there. We find that the sensitivity of wages and real estate prices to industry shocks increases in areas with high industry exposure (higher concentration, less diversified). The greater sensitivity of wages to industry shocks in high IE areas leads to endogenous risk sharing between firms and employees in response to industry shocks. We also confirm that the gross profits of those firms in high IE areas are less sensitive to industry shocks than their

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[1] The estimates for the output share of labor range between 60% (Cooley and Prescott, 1995) to 75% (Imrohoroglu and Tuzel, 2012). The output share of land & structures is roughly 15% (Tuzel, 2010). The two local factors jointly claim more than 75% of economic output.

[2] Major industry shocks in less diversified areas are commonly viewed as the drivers of regional business and real estate cycles. Texas famously relied heavily on the oil industry prior to 1990s, and the oil price collapse in 1986 is blamed for the following Texas recession and real estate bust. The crises led Texas to diversify its economy in the following years (Yucel, 2005). Defense cutbacks in early 1990s were key in California and Massachusetts crashes.

counterparts in more diversified areas (lower IE).

Two competing channels are at work on the firm returns. On the one hand, greater risk sharing with employees would imply lower sensitivity of firm returns to industry shocks in high IE areas. On the other hand, real estate values are more sensitive to industry shocks in those areas. Since the firm value is partly derived from the value of its capital (including real estate), this mechanism would imply higher sensitivity of firm value to industry shocks in high IE areas. So, for the firms that hold real estate, the two channels have opposite effects on the relationship between industry shocks and firm returns. We confirm that the returns of firms that have few real estate holdings are indeed less sensitive to industry shocks in high IE areas, and that this relationship gets weaker as the real estate holdings of the firms increase.

In order to formalize these ideas, we develop a production-based equilibrium model with two types of local markets. In the first type, all firms are from the same industry, representing the high IE local markets. The second type of local market is fully diversified, featuring a large number of industries, representing the low IE markets. Both markets have a continuum of firms that use two factors of production, labor and land (immobile capital, real estate). Firms are ex-ante identical, and receive aggregate (economy-wide), industry-level, and firm-level productivity shocks. Wages, land prices, and firms' investment and hiring decisions are determined endogenously. The model generates the empirical patterns observed in the data: In the fully diversified markets (low IE), industry shocks are not relevant for the wages and real estate prices. However, in high IE markets, both wages and real estate prices respond strongly to industry shocks. On the other hand, due to endogenous risk sharing with labor, firm returns are less sensitive to industry shocks in areas with high industry exposure, and this is especially true for firms with relatively low land (real estate) capital.

In order to simplify the analysis, we assume that there is no factor mobility between different markets. Land is by definition immobile, yet, labor could be moving across markets in response to industry shocks. This, however, is an innocuous assumption. The basic spatial equilibrium models (Rosen, 1979; Roback, 1982) suggest that a shock to a local labor market is partially capitalized into housing prices and partially reflected in worker wages. Consistent with this view, we find that house prices are indeed sensitive to industry shocks in high IE areas. Therefore, inter-market labor mobility cannot fully absorb the effects of local shocks, leaving factor prices unchanged. Furthermore, at annual frequency job-related mobility is low. Kothari et al. (2012)

report that only 1.2% of homeowners and 7.4% of renters moved due to job-related reasons in 2005, and mobility declined further during the great recession. Moretti (2011) argues that in the short run, frictions in labor mobility and in housing supply may constrain the ability of workers and housing stock to fully adjust to shocks.

We view the location choice of the firms as exogeneous. Starting with Marshall (1890), there is a large urban economics literature that studies the causes and effects of agglomeration. Likewise, the issue of industrial clustering is well documented and studied in the literature. Most of the work in this area is geared towards understanding the differences in clustering across industries, rather than the individual firm's location decision within its industry.[3] Our focus in this project is the relative effect of location on the firm within its industry.

Our paper is related to the literature that studies how a firm's location affect the real and financial side of its business. Dougal et al. (2012) document that firms' investments are sensitive to the investments of other firms headquartered in the same area. Chaney, Sraer, and Thesmar (2012) study the effect of changes in the value of real estate portfolios of firms on the firm's investments. They calculate the change in the real estate values based on the changes in property prices in firms' headquarter locations. Our analysis suggests that the changes in real estate prices are strongly linked to the industry exposure of areas and shocks to local industries. Pirinky and Wang (2006) study the correlations between stock returns of firms headquartered in the same area, and find that their returns move together. Korniotis and Kumar (2012) document that local economic conditions are useful in predicting the returns of firms in that area.

Finally, our paper is closely related to the growing body of work in production based asset pricing literature, where asset returns are tied to the real side of the economy. Two papers that are most related to this project are Donangelo (2012) and Tuzel (2010). Donangelo (2012) studies the implications of labor mobility on asset pricing, and shows that the industries with more mobile labor force are riskier than the industries with less flexible workers. Labor flexibility creates additional operating leverage for the firm, increasing the firms' exposure to systematic risk. In this paper, we study the implications of labor mobility within local markets derived from the industry composition of areas. Tuzel (2010) studies the asset pricing implications of firm's capital composition. Firms that own more structures (real estate) are less flexible,

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[3] Recently, Almazan et al. (2007) present a model of firm's location choice in this category.

hence riskier, and earn higher risk premia. Our paper studies the implications of industrial diversification of local markets on the propagation of industry shocks to local real estate prices, and how that effects the firm's returns. We show that in high IE areas real estate holdings of firms may magnify the effects of industry shocks, hence add to the "risky real estate" argument in Tuzel (2010).[4]

The paper is organized as follows. Section 1 describes the data used in our empirical analysis and introduces our industry exposure (IE) measure. Section 2 presents our empirical results relating industry shocks and IE to wages, real estate returns, firm profits and returns. Section 3 presents our equilibrium model and quantitative results. Section 4 concludes.

1 Data

The central focus of this paper is on the industry exposure (IE) of local economies. We calculate the IE measure as the Herfindahl index of industry shares in total employee compensation for each area every year, adjusted for the correlations between industry shocks. Specifically,

$$IE_{a,t} = \sum_i \sum_j \rho_{i,j} s_{i,t} s_{j,t}$$

for any pair of industries (i, j), where $\rho_{i,j}$ represents the correlation between the shocks to industry pair (i, j), and s_i represents the compensation share of industry i in the area a.

We classify the local markets by Metropolitan Statistical Areas (MSA). MSAs are geographic entities defined by the Office of Management and Budget that contain a core urban area of 50,000 or more population. MSAs consist of one or more counties and include the counties containing the core urban area, as well as any adjacent counties that have a high degree of social and economic integration (as measured by commuting to work) with the urban core.[5] We classify industries by three-digit NAICS codes.

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[4] The idea of industry shocks effecting real estate prices in highly concentrated areas is recognized in the financial services industry. In 2000 Moody's started to calculate and report "economic diversity score" for CMBS pools. A significant dimension of economic diversity is MSA-level diversity, which is closely related to our industry exposure measure. (Gordon et al., 1999)

[5] http://www.census.gov/population/metro/

Our main data source is Quarterly Census of Employment and Wages (QCEW) program by the Bureau of Labor Statistics. The data provides the wage, number of employees, and number of establishments for each industry in an MSA from 1990 to 2010. Cross sectional sums are also reported at the MSA and industry levels every year. We only include private sectors in our analysis. The data covers 365 unique MSAs and 92 industries. Due to disclosure restrictions followed by the BLS, not all industry/MSA data items are reported every year.[6] In order to have an accurate calculation of industry exposure for an MSA, we require the sum of the reported industry wages to be at least 90% of the total reported MSA wages in that year. Industry share $s_{i,t}$ is the ratio of each industry's wages in an MSA to the total reported MSA wages in year t.

Industry output is measured as the value added by industry from the Bureau of Economic Analysis. Data is annual and covers 1977-2010 period. Industry shock is the growth in the industry value added. Pairwise industry shock correlations $\rho_{i,j}$ are calculated in two stages. In order to remove the aggregate component of the shocks, first we compute the residuals from a regression of industry value added growth on aggregate GDP growth. Industry shock correlations are the pairwise correlations of these residuals.

We calculate and lag the IE of MSAs by 1 year to use in our empirical analysis. We have 2035 MSA x year observations with IE over the 1991-2010 period. Top panel in Table 1 reports some statistics for the most concentrated (highest IE) and the most diversified (lowest IE) MSAs to gain more perspective in IE. In 2010, Columbus, Indiana is the most concentrated MSA in our sample (IE = 0.24). The employment share of the biggest 3 industries is 64%, and the average pairwise correlation between all the industries in Columbus is about 10%. The industry share for the most diversified MSA, Casper, Wyoming, is 0.02. The share of the top 3 industries in Casper's employment is 30%, and the average pairwise correlation between Casper's industries is 7%. The last column reports the number of employees in the highest and the lowest IE areas in 2010. In the entire sample, there is a slight negative correlation between MSA IE and employment (average correlation = -0.13). The bottom panel in Table 1 tabulates the transition probabilities for an MSA moving from one IE quartile to another in consecutive years. Since the employment base of the MSAs does not change fast, IE is persistent; but it is

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[6] BLS withholds publication of unemployment insurance covered employment and wage data for any industry level when necessary to protect the identity of cooperating employers. See http://www.bls.gov/cew/cewover.htm for more information.

not fixed. The probability for the MSAs in the lowest and the highest IE quartiles to stay in those quartiles next year is 92%. Figure 1 plots the average IE for the MSAs sorted into four IE quartiles over the sample period. The figure demonstrates that the distribution of IE has remained relatively stable over time.

Housing returns are the changes in the house price indexes (HPI) from the Federal Housing Finance Agency (formerly known as OFHEO HPI). HPI data is available at quarterly frequency starting 1975. Commercial real estate returns are the total returns (income + appreciation) for all commercial property types from the National Council of Real Estate Investment Fiduciaries (NCREIF NPI). Data is available at quarterly frequency starting 1978.

Our data source for the unionization rate of industries is from www.unionstats.com, compiled by Barry Hirsch and David Macpherson from the Current Population Survey and updated annually. The database is described in Hirsch and Macpherson (2003).

Profitability for firm-level regressions is measured as Gross Profits (GP) / Sales (Sale) from Compustat. We apply standard filters to the Compustat data and exclude firms without positive sales (SALE) and assets (AT). Following Fama and French (1993), in order to avoid the survival bias in the data, we include firms in our sample after they have appeared in Compustat for two years. We compute several real estate ratios for the firms. Following Tuzel (2010), we measure the real estate holdings of the firms as the sum of buildings (FATB), land and improvements (FATP), capitalized leases (FATL) and construction in progress (FATC), which are all components of the gross PPE. We replace missing values with zero. For the first real estate ratio, we scale the real estate holdings with plant. property, and equipment (PPEGT). We also calculate an alternative real estate ratio, where we scale the real estate holdings with the number of employees (EMP).

Monthly stock returns are from the Center for Research in Security Prices (CRSP). Similar to Fama and French (1993), our sample includes firms with ordinary common equity as classified by CRSP, excluding ADRs, REITs, and units beneficial interest.

2 Empirical Analysis

In the first part of our empirical analysis, we study the effect of industry shocks on local prices; in particular, on wages and real estate prices, conditional on the industrial diversification (industry exposure, IE) of the local market. In the second part, we study the impact of the shocks on firm profits and returns.

2.1 Local Prices

Our first hypothesis is that shocks to an industry will effect the wages in an area more when the area is not well diversified; i.e., when the IE of the area is high. We test this hypothesis in Table 2. Specifically, in Panel A, we run pooled time series / cross sectional regressions of the form

$$\begin{aligned}\Delta wage_{ind,MSA,t} \quad &= \quad b_0 + b_1 shock_{ind,t} + b_2 shock_{ind,t} \times IE_{MSA,t-1} + b_3 IE_{MSA,t-1} \\ &\quad + \text{ Year Dummies } + \text{ MSA Dummies } + \text{Industry Dummies } + \epsilon_{ind,MSA,t}\end{aligned} \tag{1}$$

where $\Delta wage_{ind,MSA,t}$ is the (percent) change in wage per employee in each industry, MSA and year triplet; $shock_{ind,t}$ is the value added growth for that industry in that year; $IE_{MSA,t-1}$ is the dummy variable that takes the value of 1 if the lagged IE of that MSA is above the median (or in quartile 2,3 or 4) of all lagged IEs across MSAs in the sample. In column 1 we condition on IE being above median, in column 2 we partition IE more finely and consider IE quartiles. We expect to find a positive estimate for the interaction term, b_2. Consistent with our hypothesis, we find that the interaction term is positive and highly significant, whereas the coefficient for industry shock, b_1, is low and not statistically significant. The estimates in specification (1) imply a roughly 6 basis points increase in wages for a 1% increase in industry value added in MSAs with high industry exposure. Column 2 shows that shock x IE quartile dummy cross terms increase almost monotonically.

An implicit assumption in our hypothesis is that labor markets are competitive and there are no major frictions to the adjustment of employment or wages. One clear impediment to this condition is the prevalence of labor unions in certain industries. In the context of wages, Kimbell and Mitchell (1982) report that labor contracts in unionized industries are characterized by multi year contracts with built-in inflation adjustments. Chen et al. (2011) argue that the presence of powerful unions substantially reduces firms' operating flexibility. In order to mitigate these potential concerns due to union involvement, we consider subsamples of unionized industries (where unionization rate exceeds 25%[7]), and non-unionized industries (remaining industries) separately. We expect our main findings to hold for non-unionized industries, but non necessarily for the unionized industries. We report the regression results for unionized industries in columns 3 and 4, and the non-unionized industries in columns 5 and 6. We find that excluding the highly unionized industries from our main sample strenghtens the results and slightly increases the magnitudes of the coefficients for the cross terms.

In our basic specification (Eq.1), we test whether the industry shocks have a more pronounced effect on wages in less diversified areas. However, we do not make an attempt to distinguish major industries that are especially important for the local economy from the ones that are relatively minor. In Panel B, we create subsamples of major and minor local industries based on location quotients of the industries in that area, which is defined as:

$$LQ_{ind,MSA,t} = \frac{\frac{emp_{ind,MSA,t}}{emp_{MSA,t}}}{\frac{emp_{ind,t}}{emp_{t}}}$$

Location quotient compares an industry's share of regional employment to its share of the entire economy. LQ>1 implies that the industry has a bigger share of employment in the MSA than it has for the entire economy, hence it is a relatively significant industry for the local economy.[8]

In panel B, we measure the sensitivity of industry wage growth to industry shocks for locally significant and insignificant industries in high and low IE areas. We expect to find higher sensitivity of wages to shocks in high IE areas, but especially so for the locally significant industries. Consistent with this hypothesis, we find that industry wage growth is sensitive to industry shocks only in high IE areas. Moreover, in high IE areas, the sensitivity of wages to shocks is roughly twice as large for the locally significant industries as it is for locally insignificant industries. 1% growth in industry value added leads to 6.3 bp (3.8 bp) growth in wages in the

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[7] Results are not sensitive to the 25% cutoff point, and are qualitatively similar for other cutoff points such as 20% or 30%.

[8] Location quotient is typically used to identify the "export" industries of the region.

major (minor) local industries.[9]

Overall, Table 2 demonstrates that local wages are more sensitive to industry shocks when the local markets are not diversified (have high IE). This implies that employees in high IE areas are more exposed to industry shocks than their counterparts in low IE areas. Due to inherent market incompleteness, shocks to labor income are not fully diversifiable. Even though we take the location choice of the employees exogeneous, in equilibrium, employees should be indifferent between locating to different areas, at least in the long run. To the extent that employees care about their labor income risk due to industry shocks, they should require to have higher wages in high IE areas. Table 3 investigates this hypothesis. We regress the level of wages (wage/employee) on IE dummies. Column 1 compares the wages in low IE and high IE areas and reports that wages in above-median IE areas are approximately $1,350 higher than the wages in others (in 1991 dollars), after controlling for the area, industry and year fixed effects. In column 2, we compare wages in the lowest IE quartile to quartiles 2 to 4. We find that wages rise monotonically as the industry exposure increases and all estimates are highly significant. Wages in the highest IE quartile MSAs are approximately $3,900 higher than their counterparts in the lowest IE quartile MSAs. In columns 3 to 6, we investigate wage differences for unionized and non-unionized industries. We find that wage levels are significantly higher in unionized industries, however, they are less sensitive to area IE (columns 3 and 4). Results for non-unionized industries (columns 5 and 6) mimic the results for the benchmark sample.

Besides wages, industry shocks should have an impact on real estate prices in high IE areas. Commercial real estate is a local input to the firms, hence good shocks would lead to increased demand for this type of assets. Since the supply of commercial real estate is inelastic in the short run, change in demand should have an impact on the prices. In diversified areas, shocks to different industries would cancel out, however, industry shocks would have an impact on prices in high IE areas. Industry shocks could also have an effect on house prices in high IE areas due to two separate channels. The first channel is due to increased demand for housing from households due to increasing wages in the area. The second channel is due to spillovers from the increasing commercial real estate prices since both types of real estate share a common input, land.

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[9] Alternatively, significant industries can be determined by just looking at industry shares in the area and comparing them to some benchmark, however, this measure is particularly influenced by the arbitrary boundaries between the industries. Identifying significant industries by industry share and sorting based on that yields qualitatively similar regression results.

In order to test the effect of industry shocks on real estate returns, similar to the regressions in Table 2, we run pooled time series / cross sectional regressions of the form

$$\begin{aligned} r^{re}_{MSA,t} &= b_0 + b_1 shock_{ind,t} + b_2 shock_{ind,t} \times IE_{MSA,t-1} + b_3 IE_{MSA,t-1} \\ &\quad + \text{ Year Dummies } + \text{ MSA Dummies } + \text{Industry Dummies } + \epsilon_{ind,MSA,t} \end{aligned} \qquad (2)$$

where $r^{re}_{MSA,t}$ represents the housing returns in columns 1 and 2 and commercial real estate returns in columns 3 and 4. We expect to find a positive estimate for the interaction term, b_2. Consistent with our hypothesis, we find that the interaction term is positive and highly significant.[10] The estimates in specifications 1 and 3 imply roughly 3 basis points increases in housing and commercial real estate returns for a 1% increase in industry value added in MSAs with high industry exposure (relative to a median IE area). Columns 2 and 4 show that shock x IE quartile dummy cross terms are all significant and increase monotonically for both the housing and the commercial real estate returns.

2.2 Firm Level Results

Section 2.1 demonstrates that industry shocks have a big impact on factor prices such as the wages and local real estate prices in the high IE areas, whereas there is no significant effect of shocks on these prices in low IE areas. Since wages and commercial real estate are major inputs to the firms, the differential effect of the shocks on the local input prices should be an additional channel for how the industry shocks affect the firms. We next study the effect of this mechanism on the profits and returns of the firms located in areas with different industry exposure.

The greater sensitivity of wages to industry shocks in high IE areas implies endogenous risk sharing between firms and employees in response to industry shocks, mitigating the effect of the shocks on the firms. We examine the effect of industry shocks on firm profits to test whether industry shocks have lesser effect on firm profits in high IE areas, possibly due to the increased

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[10] We find that the coefficient for industry shock, b_1, is slightly negative in all specifications. Due to the presence of fixed effects in the regression, b_1 measures the sensitivity of real estate returns to industry shocks in low IE areas relative to a median IE area. Removing the year fixed effect leads to positive b_1 estimates.

risk sharing with labor. We run pooled time series / cross sectional regressions of the form

$$\begin{aligned}\frac{\Delta GP_{firm,t}}{Sale_{firm,t-1}} &= b_0 + b_1 shock_{ind,t} + b_2 shock_{ind,t} \times IE_{MSA,t-1} + b_3 IE_{MSA,t-1} \\ &\quad + \text{ Year Dummies } + \text{ MSA Dummies } + \text{Industry Dummies } + \epsilon_{firm,t}\end{aligned} \tag{3}$$

where $\Delta GP_{firm,t}$ is the change in firm's gross profits, scaled by lagged sales, $Sale_{firm,t-1}$.[11] $shock_{ind,t}$ is the value added growth in the firm's industry, and $IE_{MSA,t-1}$ is the lagged IE of the MSA in which firm's headquarter is located. Table 5 tabulates the results. Consistent with the risk sharing idea, we find that the profits of firms are sensitive to industry shocks only in low IE areas, while there is no significant relationship between firm profits and industry shocks for the firms located in high IE areas.

While the risk sharing mechanism leads to lower profit sensitivity in high IE areas, both the risk sharing, and the real estate channels are potentially relevant for the firm returns. Like the profits, risk sharing with labor would lead to lower return sensitivity to shocks for firms in high IE areas. At the same time, real estate values are more sensitive to industry shocks in those areas. Since the firm value is partly derived from the value of its capital, including corporate real estate, this mechanism would imply higher sensitivity of firm returns to industry shocks in high IE areas. So, for the firms that own real estate, the two channels have opposite effects on the relationship between industry shocks and firm returns.[12]

In order to examine the effect of industry shocks on firm returns, we run pooled time series / cross sectional regressions of the form

$$\begin{aligned}r^e_{firm,t} &= b_0 + b_1 shock_{ind,t} + b_2 shock_{ind,t} \times IE_{MSA,t-1} + b_3 IE_{MSA,t-1} \\ &\quad + \text{ Year Dummies } + \text{ MSA Dummies } + \text{Industry Dummies } + \epsilon_{firm,t}\end{aligned} \tag{4}$$

where $r^e_{firm,t}$ is the excess firm return. Rather than running the regression on the entire sample

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[11] In these regressions we focus on gross profits (sale - COGS), rather than net income), which only subtracts direct production costs (including labor costs) from sales. In Section 2.1 we show that real estate prices are more sensitive to industry shocks in high IE areas. As the firm moves from gross profits to net income, firm's income is contaminated with real estate related income and expenses, as well as other expenses such as SG&A and R&D (Novy Marx, 2012). Since our goal in this exercise is testing the risk sharing hypothesis, we use gross profits as our profit variable.

[12] For firms that do not own but lease real estate, leasing will create an an additional risk sharing mechanism between the firm and their lessors (assuming that market rent changes will be reflected to their leases, which would be true if they are signing a new lease aggreement). The effect would be similar to the labor effect.

of firms, in order to tease out the effects of the labor and real estate channels, we create subsamples based on the real estate exposure of the firms. The idea is that firms with low exposure to real estate should not be affected by the real estate channel, so, their returns should be less sensitive to industry shocks in high IE areas. As the real estate exposure of the firms increase, we expect this mechanism to get weaker, or even reverse for the firms with highest real estate exposure.

Table 6-A reports the results for firms sorted on the real estate ratio (RER) as in Tuzel (2010). RER measures the real estate holdings of firms, scaled by the total PPE of the firms. Panel A sorts the firms into subsamples within the entire sample, whereas Panel B creates the subsamples sorting firms within the industry.[13] Therefore, Panel A subsamples measure absolute real estate exposure, and Panel B subsamples measure relative real estate exposure for the firms.[14] We find that, in the lowest RER quartile, the returns of the firms located in low IE areas are highly sensitive to industry shocks (1% shock leads to almost 1% additional return), whereas the firms in high IE areas have slightly negative net sensitivity to shocks as the cross term more than cancels out the effect of the industry shock.[15] As the real estate holdings of the firms increase, the sensitivity of returns to shocks decline in magnitude, but remain significant in low IE areas. The cross term however, gets much smaller, and loses its significance for the highest RER subsample, implying that the labor and real estate channels get equally important and cancel out for this subsample. The results are both qualitatively and quantitatively similar in both panels of Table 6-A, so the results are robust to sorting firms within the industry or the entire sample.

As an additional robustness check, Table 6-B tabulates the results for subsamples sorted on an alternative measure of real estate holdings, which scales the real estate holdings of the firm with the number of employees of the firm (RE/EMP). This ratio attempts to quantify

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[13] In Tables 6-A and 6-B, all firms in our Compustat sample with valid real estate ratios are sorted into subsamples before the Compustat sample is merged with returns from CRSP. This leads to variations in the sizes of the subsamples after the return data is merged. Furthermore, all firms with zero real estate holdings are placed in the lowest real estate quartile. Since the number of firms with zero real estate often exceeds 1/4th of the sample, quartile 1 typically has more than 1/4, and quartile 2 typically has less than 1/4 of all the firms in the sample.

[14] Sorting based on RER within the industry may help identify firms that have short positions in real estate. If a firm has few real estate holdings and operates in an industry that typically holds more real estate, this firm is most likely leasing substantial amount of real estate and has negative exposure to real estate.

[15] Most firms in the lowest RER quartile have zero real estate holdings. Since virtually all firms need some real estate to operate, these firms are most likely leasing substantial amounts of real estate, hence essentially have negative real estate exposure.

the relative importance of the real estate versus the labor channel for the firm. We find that the results are robust to sorting on RE/EMP, both within the entire sample and within the industry.[16]

Overall, our results confirm our hypothesis that industry shocks have differential effects on the firms based on the industrial diversification of the area, and the real estate exposure of the firms. Among the firms with low real estate exposure, returns of firms in low IE areas covary strongly with industry shocks, whereas the ones in high IE areas do not, due to offsetting effects in labor costs. For firms with high real estate exposure, changes in labor costs and real estate prices offset each other in high IE areas, hence there is no differential location effect on returns.

3 Model

3.1 Firms

There are many firms that produce a homogeneous good using labor and land. These firms are subject to aggregate, industry and firm level productivity shocks.

The production function for firm i is given by:

$$\begin{aligned} Y_{ijt} &= F(A_t, N_{jt}, Z_{it}, L_{it}, S_{it}) \\ &= A_t I_{jt} Z_{it} L_{it}^{\alpha_l} S_{it}^{\alpha_s}. \end{aligned}$$

L_{it} denotes the labor used in production by firm i during period t. S_{it} denotes the beginning of period t land holdings (real estate) of firm i. Labor and land shares in the firm's production function are given by α_l and α_r where $\alpha_l + \alpha_r \in (0, 1)$. Aggregate productivity is denoted by $a_t = \log(A_t)$. a_t has a stationary and monotone Markov transition function, given by $p_a(a_{t+1}|a_t)$, as follows:

$$a_{t+1} = \rho_a a_t + \varepsilon_{t+1}^a \tag{5}$$

where $\varepsilon_{t+1}^a \sim$ i.i.d. $\mathrm{N}(0, \sigma_a^2)$. Industry productivity is denoted by $n_{jt} = \log(N_{jt})$. n_t has a

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[16] In untabulated results we calculate the real estate holdings as the sum of two biggest real estate categories, buildings and capital leases, and get qualitatively and quantitatively very similar results.

stationary and monotone Markov transition function, given by $p_n\left(n_{j,t+1}|n_{j,t}\right)$, as follows:

$$n_{j,t+1} = \rho_n n_{jt} + \varepsilon^n_{j,t+1} \tag{6}$$

where $\varepsilon^n_{t+1} \sim$ i.i.d. $\mathrm{N}\big(0, \sigma^2_n\big)$. The firm productivity, $z_{it} = \log(Z_{it})$, has a stationary and monotone Markov transition function, denoted by $p_{z_i}(z_{i,t+1}|z_{it})$, as follows:

$$z_{i,t+1} = \rho_z z_{it} + \varepsilon^z_{i,t+1} \tag{7}$$

where $\varepsilon^z_{i,t+1} \sim$ i.i.d. $\mathrm{N}\big(0, \sigma^2_z\big)$. $\varepsilon^z_{i,t+1}$ and $\varepsilon^z_{j,t+1}$ are uncorrelated for any pair of firms (i, j) with $i \neq j$, and $\varepsilon^n_{i,t+1}$ and $\varepsilon^n_{j,t+1}$ are uncorrelated for any pair of industries (i, j) with $i \neq j$.

Local labor markets are competitive and labor is free to move between firms in the same area; therefore, the marginal product of labor is equalized among firms in the same area. Hiring decisions are made after firms observe the productivity shocks and labor is adjusted freely; hence, for each firm, marginal product of labor equals the wage rate:

$$\begin{aligned} F_{L_{it}} &= F_L(A_t, N_{jt}, Z_{it}, L_{it}, S_{it}) \\ &= W_t \end{aligned}$$

where W_t is the wage that clears the local labor market at time t.

Purchases and sales of land are subject to quadratic adjustment costs given by g_{it}:

$$g\left(S_{it+1}, S_{it}\right) = \frac{1}{2}\eta \frac{\left(S_{i,t+1} - S_{it}\right)^2}{S_{it}} \tag{8}$$

with $\eta > 0$.

Firms are equity financed. Dividends to shareholders are equal to:

$$D_{ijt} = Y_{ijt} - W_t L_{it} - P_t\left(S_{i,t+1} - S_{it}\right) - g_{it} \tag{9}$$

where P_t is the land price that clears the local land market at time t. At each date t, firms choose $\{S_{i,t+1}, L_{i,t}\}$ to maximize the net present value of their expected dividend stream, which is the firm value:

$$V_{it} = \max_{\{I_{i,t+k}, L_{i,t+k}\}} E_t \left[\sum_{k=0}^{\infty} M_{t,t+k} D_{i,t+k} \right], \tag{10}$$

subject to (Eq.5-8), where $M_{t,t+k}$ is the stochastic discount factor between time t and $t+k$. V_{it} is the cum-dividend value of the firm.

The first order conditions for the firm's optimization problem leads to the pricing equation:

$$1 = \int \int M_{t,t+1} R^S_{i,t+1} p_{z_i}(z_{i,t+1}|z_{it}) p_a(a_{t+1}|a_t) d_{z_i} d_a \tag{11}$$

where the returns to land investment are given by:

$$R^S_{i,t+1} = \frac{F_{S_{i,t+1}} + q_{i,t+1} + \frac{1}{2}\eta \left(\frac{S_{i,t+1} - S_{it}}{S_{it}} \right)^2}{q_{it}} \tag{12}$$

and where

$$F_{S_{it}} = F_S(A_t, N_{jt}, Z_{it}, L_{it}, S_{it}).$$

Tobin's q, value of a newly purchased unit of land, is:

$$q_{it} = P_t + \eta \left(\frac{S_{i,t+1} - S_{it}}{S_{it}} \right). \tag{13}$$

The pricing equation (Eq.11) establishes a link between the marginal cost and benefit of investing in land. The term in the denominator of the right hand side of the equation, q_{it}, measures the marginal cost of investing. The terms in the numerator represent the discounted marginal benefit of investing. The firm optimally chooses $S_{i,t+1}$ such that the marginal cost of investing equals the discounted marginal benefit.

The returns to the firm are defined as:[17]

$$R^F_{i,t+1} = \frac{V_{i,t+1}}{V_{it} - D_{it}}. \tag{14}$$

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[17] We do not assume constant returns to scale in the production function; i.e.,$\alpha_l + \alpha_k \in (0,1)$. In the presence of constant returns to scale, firm return would be equivalent to the returns to land investment R^S_{t+1}. With decreasing returns to scale, firm returns diverge from the land investment returns.

3.2 Local Markets

Firms have access to the local labor and land markets. All land is owned and utilized by the local firms, and all labor is employed by these firms. All local markets have a large number of firms operating in that area, and are endowed with the same large number of employees and amount of land. We assume that labor is not mobile between local labor markets.

There is heterogeneity in the industry composition of local markets. We assume that some areas are fully diversified (have low industry exposure, or low IE) and have a large number of industries, whereas other areas are exposed to a single industry (have high industry exposure, or high IE).

In equilibrium, local labor and land markets clear. In fully diversified local markets (low IE), firm level and industry productivity shocks are diversified away, but aggregate productivity shocks, A_t, are important determinants of equilibrium wages and land prices. In single industry areas, firm level productivity shocks are diversified away, but both aggregate and industry productivity shocks, A_t and N_t, influence equilibrium wage and land prices.

3.3 The Stochastic Discount Factor

Since the purpose of our model is to examine the cross sectional variation across firms in different areas, we use a framework with exogenous pricing kernel. Following Berk, Green, and Naik (1999), Zhang (2005), Gomes and Schmid (2010) and Jones and Tuzel (2012), we directly parameterize the pricing kernel without explicitly modeling the consumer's problem. The pricing kernel is given by:

$$\log M_{t+1} = \log \beta - \gamma_0 \epsilon^a_{t+1}$$

where β and $\gamma_0 > 0$ are constant parameters. M_{t+1}, the stochastic discount factor from time t to $t+1$, is driven by ϵ^a_{t+1}, the shock to the aggregate productivity process in period $t+1$.

3.4 Quantitative Results

Solving our model generates firms' land investment and hiring decisions as functions of the state variables, which are the current wages, W_t, and land prices, P_t, the aggregate, industry level and firm level productivity and the current land holdings of the firm. Since the stochastic discount factor is specified exogenously, the solution does not require economy wide aggregation. However, local land prices and wages are determined endogenously, therefore, the solution requires aggregation at the local market level. We solve for the equilibrium prices and allocations recursively using the approximate aggregation idea of Krusell and Smith (1998).

The presence of heterogeneous local markets in the economy allows us to study the effect of industry shocks on factor prices (wages and real estate returns) and firm returns in high and low IE areas. We demonstrate that the industry shocks have an effect on wages and real estate returns in high IE areas, whereas they have no effect on factor prices in the low IE areas. We also show that industry shocks are strongly related to firm returns in low IE areas, and the effect is smaller in high IE areas. Our simulations of the model economy confirm that the difference between the sensitivity of returns to industry shocks in low and high IE areas is bigger for the firms with relatively less land holdings.

Panel A of Table 7 presents the parameters used in the simulations of the model economy. The model is not calibrated to match any benchmark results. Following Cooley and Prescott (1995), the labor share α_l is set to 0.6. The share of land α_s is set to 0.2. The time discount factor β is set to 0.99, and the price of risk parameter γ_0 is set to 3.2. The persistence and the conditional volatility of the aggregate productivity process, ρ_a and σ_a, are set to 0.95 and 0.007, respectively, which are consistent with the quarterly parameters used in Cooley and Prescott (1995). The persistence and the conditional volatility of the industry productivity process, ρ_n and σ_n, are set to 0.95 and 0.005; the persistence and the conditional volatility of the firm productivity process, ρ_z and σ_z, are set to 0.95 and 0.01 respectively. I set the adjustment cost parameters for for changing the land holdings, η to 2.

Panel B of Table 7 tabulates the results of regressions presented in section 2.1 using simulated data from the model. The wage growth regression follows from Eq.1, and the land return regression is described in Eq.2. Both regressions generate positive estimates for the interaction term (Industry shock × IE dummy), qualitatively matching the empirical results presented in

Tables 2 and 4. Panel C of Table 7 presents the results of the firm return regressions described in Eq.4 for subsamples of firms with lower and higher land holdings as measured by Land / Employee. We confirm that firm returns are positively related to industry shocks, and the sensitivity of firm returns to industry shocks is lower in high IE areas, consistent with the idea of endogenous risk sharing with labor in high IE areas. Both subsamples produce negative estimates for the interaction term (Industry shock × IE dummy), however, the estimates are lower for the high land holdings subsample due to the land price channel being more effective for this group of firms.

4 Conclusion

We show that the industrial diversification of local markets matter for how the industry shocks affect the firms located in those areas. We calculate the industry exposure (IE) of local markets as the Herfindahl index of industry shares in total employee compensation for each metropolitan statistical area, adjusted for the correlations between industry shocks. Industry shocks have a significant effect on local factor prices such as wages and real estate returns in high IE areas, but they do not affect factor prices in low IE areas. These local factors account for more than 75% of the economic output produced in the area, so fluctuations in their prices are relevant for the firms in the area. Effect of industry shocks on wages in high IE areas generates endogenous risk sharing between the firm and its employees, hence lowers the effect of industry shocks on firm's performance. In addition to wages, in high IE areas, industry shocks also affect local real estate prices as the demand for these assets changes in response to shocks. Since firms have different exposures to real estate, the implication of this real estate channel for firms depends on the firms' exposure to real estate. The real estate channel increases the sensitivity of the firms with high real estate exposure (long position in real estate) to industry shocks in high IE areas, offsetting the effect of the labor channel.

We develop a theoretical model with two types of local markets (high and low IE). Each market features a continuum of firms that use labor and land (real estate) in their production. Land and labor markets clear within each market. The model generates patterns similar to our main empirical results. Specifically, we confirm that land and labor prices are sensitive to industry shocks in high IE areas. The endogenous risk sharing with labor reduces the sensitivity of firm returns to industry shocks in high IE areas, and these results are stronger for firms with low real estate exposure.

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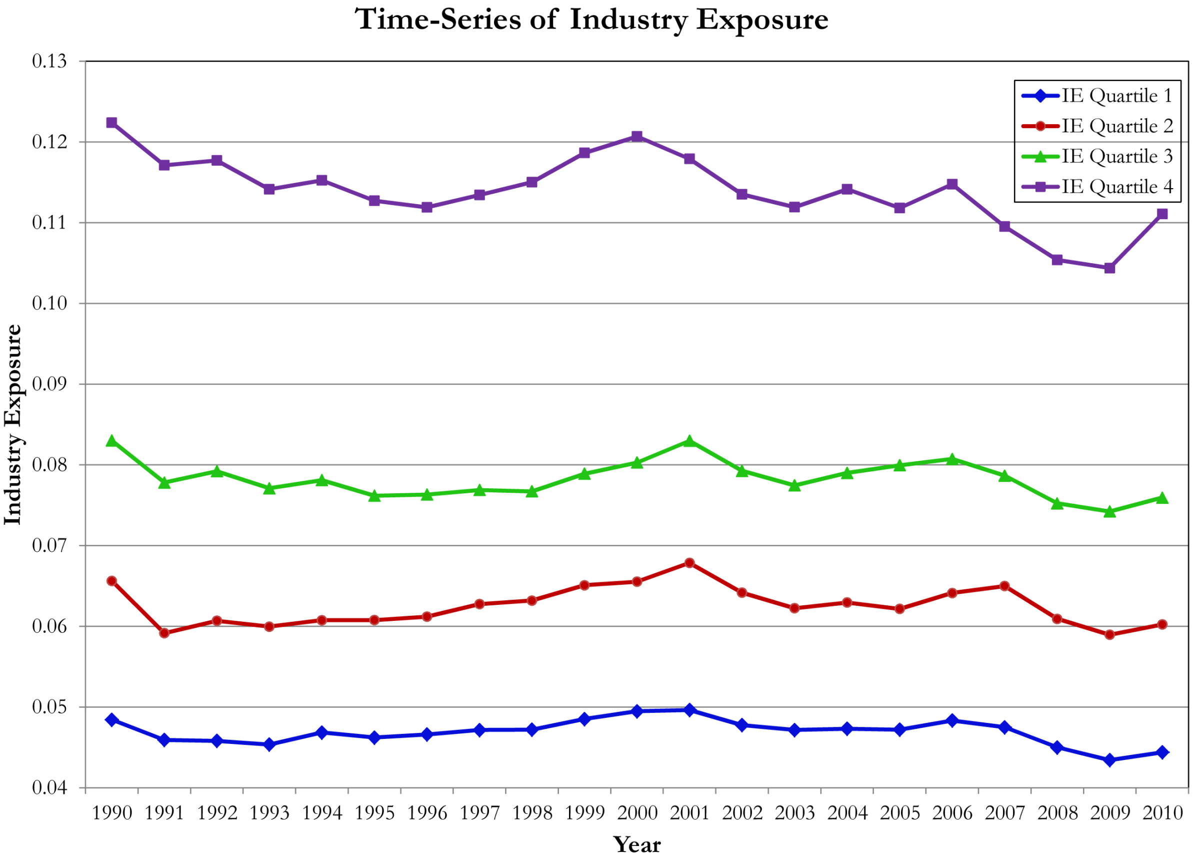

Figure 1: **Time-Series of Industry Exposure (*IE*).** The figure illustrates the average industry exposure *IE*) for the MSAs sorted into four *IE* quartiles over the 1990 - 2010 period.

Table 1
Summary Statistics for Industry Exposure Measure (*IE*)

This table shows the summary statistics related to the industry exposure (*IE*) measure. Our data for calculating the *IE* measure are from the Quarterly Census of Employment and Wages (QCEW) program by the Bureau of Labor Statistics. The data provides the wage, number of employees, and number of establishments at the metropolitan statistical area (MSA), industry (NAICS 3-digit), and year level. We only include private sectors in our analysis. The data covers 365 unique MSAs and 92 industries from 1990 to 2010. In order to calculate the *IE*, we require the sum of the reported industry wages to be at least 90% of the total reported MSA wages in that year. We calculate the *IE* measure as the Herfindahl index of industry shares in total employee compensation for each MSA every year, adjusted for the correlations between industry shocks. We calculate the industry correlations as the pairwise correlations of the residuals from the industry value added growth rates (industry shocks), regressed on aggregate GDP growth, over 1978-2010. Panel A reports the top 5 and bottom 5 MSAs ranked by *IE* in 2010, together with their *IE*s, employment share of the top 3 industries (Top3 Share), average pairwise correlation between all the industries in the MSA (Ind. Corr.), and the top industry in the area. Emp. (Rank) reports the number of employees in 2010 for the MSA and the employment rank among the 365 MSAs in our sample. Panel B tabulates the transition probabilities of an MSA moving from one *IE* quartile to another in consecutive years.

Rank	MSA Name	*IE*	Top3 Share	Ind.Corr.	Top Industry	Emp. (Rank)
			Most Concentrated MSAs in 2010			
1	Columbus, IN	0.243	64.06%	0.108	Machinery Manuf.	34940 (314)
2	Washington-Arl.-Alex., DC etc.	0.189	45.50%	0.049	Scien. Tech.	2181458 (5)
3	Elkhart-Goshen, IN	0.146	39.45%	0.075	Transportation Manuf.	91587 (164)
4	Jacksonville, NC	0.142	28.05%	0.118	Food Serv.	32176 (328)
5	Atlantic City, NJ	0.135	45.15%	0.083	Accomodation	111884 (142)
			Most Diversified MSAs in 2010			
1	Casper, WY	0.022	30.20%	0.068	Support Mining	32183 (327)
2	Bakersfield, CA	0.022	19.96%	0.046	Scien. Tech.	210695 (81)
3	Grand Junction, CO	0.031	26.80%	0.055	Support Mining	48047 (252)
4	Greeley, CO	0.032	17.43%	0.057	Trade Contr.	64596 (205)
5	Reading, PA	0.036	20.63%	0.076	Ambul. Health	138988 (119)

Panel B. Transition Probability Matrix of *IE* Quartiles

	Next Year			
Current Year	Quartile 1	Quartile 2	Quartile 3	Quartile 4
Quartile 1	92.11%	8.15%	0.25%	0.00%
Quartile 2	7.89%	81.39%	10.38%	0.00%
Quartile 3	0.00%	10.47%	82.15%	8.05%
Quartile 4	0.00%	0.00%	7.22%	91.95%

Table 2
Industry Shocks and Local Wage Growth

Panel A reports the effect of an industry shock on the industry wage growth in an MSA, conditional on the industry exposure of the MSA. Measurement of *IE* is described in Table 1. The *IE* above median dummy is assigned to half of the MSAs based on the values of lagged IEs. *IE* quartile dummies are constructed similarly, based on quartile breakpoints. Unionized industry subsample is composed of industries with higher than 25% unionization rate in the prior year. The remaining industries are placed in the nonunionized subsample. Industry shock is the growth in industry value added. Panel B reports the sensitivity of industry wage growth in an MSA to the corresponding industry shock for subsamples based on *IE* and industry significance. Significance of each industry in an MSA is determined based on the location quotient, LQ, defined as employment share of industry i in MSA j / employment share of industry i in the aggregate economy. $LQ > 1$ is considered to be significant. High / low *IE* subsamples are determined based on the *IE* Above Median Dummy. Regression sample period is 1991-2010. All regressions include year, industry and MSA fixed effects. Standard errors are in the parentheses. *, **, and *** represent significance level of 10%, 5%, and 1%, respectively.

Panel A. Panel Regression

	Dependent Variable: Industry Wage Growth (MSA)					
	All		Unionized		Non-unionized	
	(1)	(2)	(3)	(4)	(5)	(6)
Industry Shock	0.009	−0.003	0.094***	0.083**	0.021*	−0.007
	(0.010)	(0.014)	(0.030)	(0.041)	(0.012)	(0.016)
IE Above Median	−0.003		0.005		−0.003	
	(0.002)		(0.009)		(0.003)	
Industry Shock × *IE* Above Median	0.049***		−0.047		0.055***	
	(0.014)		(0.047)		(0.017)	
IE Quartile 2		−0.004		0.014		−0.007**
		(0.003)		(0.011)		(0.003)
IE Quartile 3		−0.006*		0.012		−0.007**
		(0.003)		(0.013)		(0.004)
IE Quartile 4		−0.003		0.004		−0.003
		(0.004)		(0.016)		(0.004)
Industry Shock × *IE* Quartile 2		0.021		−0.035		0.071***
		(0.019)		(0.060)		(0.023)
Industry Shock × *IE* Quartile 3		0.069***		−0.015		0.098***
		(0.020)		(0.063)		(0.023)
Industry Shock × *IE* Quartile 4		0.045**		0.012		0.052**
		(0.020)		(0.076)		(0.024)
Constant	0.049***	0.051***	0.030*	0.035*	0.059***	0.061***
	(0.005)	(0.006)	(0.018)	(0.019)	(0.006)	(0.007)
Observations	137397	128009	10685	9975	109295	101472
Adjusted R^2	0.012	0.013	0.012	0.013	0.013	0.014

Panel B. Subsamples by *IE* and Industry Significance

	Dependent Variable: Industry Wage Growth (MSA)					
	High *IE*			Low *IE*		
	All Industries	Significant	Insignifact	All Industries	Significant	Insignificant
Industry Shock	0.058***	0.063***	0.038**	0.008	0.017	−0.006
	(0.012)	(0.015)	(0.015)	(0.011)	(0.014)	(0.013)
Constant	0.050***	0.032***	0.071***	0.039***	0.037***	0.052***
	(0.008)	(0.009)	(0.010)	(0.008)	(0.009)	(0.010)
Observations	66094	25252	39896	71303	27351	42403
Adjusted R^2	0.013	0.033	0.022	0.013	0.034	0.025

Table 3
Industry Exposure and Local Wage Levels

This table reports the average wage per employee levels conditional on the industry exposure of the MSA. Measurement of *IE* is described in Table 1. The *IE* above median dummy is assigned to half of the MSAs based on the values of lagged IEs. *IE* quartile dummies are constructed similarly, based on quartile breakpoints. Unionized industry subsample is composed of industries with higher than 25% unionization rate in the prior year. The remaining industries are placed in the nonunionized subsample. All regressions include year, industry and MSA fixed effects. Regression sample period is 1991-2010. Standard errors are in the parentheses. *, **, and *** represent significance level of 10%, 5%, and 1%, respectively.

	Dependent Variable: Industry Wage per Employee					
	All		Unionized		Non-unionized	
	(1)	(2)	(3)	(4)	(5)	(6)
IE Above Median	1352.730***		588.847		1312.074***	
	(121.880)		(388.763)		(129.696)	
IE Quartile2		1627.970***		862.911*		1644.437***
		(153.335)		(485.295)		(161.928)
IE Quartile3		2762.352***		1100.604*		2782.043***
		(188.951)		(598.830)		(200.419)
IE Quartile4		3884.268***		2486.767***		3880.015***
		(224.421)		(717.849)		(238.377)
Constant	7335.325***	6002.375***	17837.482***	17019.959***	9306.135***	7845.159***
	(306.680)	(332.773)	(817.327)	(883.280)	(340.949)	(368.488)
Observations	140580	130831	11093	10331	111627	103522
Adjusted R^2	0.650	0.651	0.729	0.733	0.667	0.668

Table 4
Industry Shocks and Local Real Estate Returns

The table reports the effect of an industry shock on the real estate returns in the MSA, conditional on the industry exposure of the MSA. Measurement of *IE* is described in Table 1. The *IE* above median dummy is assigned to half of the MSAs based on the values of lagged IEs. *IE* quartile dummies are constructed similarly, based on quartile breakpoints. Housing returns are the annual changes in the FHFA house price indexes in each MSA. Commercial real esatte returns are the total annual returns to all property types in each MSA, from NCREIF. Industry shock is the growth in industry value added. Regression sample period is 1991-2010. All regressions include year, industry and MSA fixed effects. Standard errors are in the parentheses. *, **, and *** represent significance level of 10%, 5%, and 1%, respectively.

	Housing Returns		Commercial Real Estate Returns	
	(1)	(2)	(3)	(4)
Industry Shock	-0.019^{***}	-0.035^{***}	-0.022^{***}	-0.036^{***}
	(0.003)	(0.004)	(0.004)	(0.007)
IE Above Median Dummy	-0.000		0.001	
	(0.001)		(0.001)	
Industry Shock × *IE* Above Median Dummy	0.046^{***}		0.057^{***}	
	(0.004)		(0.007)	
IE Quartile 2		-0.013^{***}		-0.008^{***}
		(0.001)		(0.002)
IE Quartile 3		-0.010^{***}		-0.006^{**}
		(0.001)		(0.002)
IE Quartile 4		-0.005^{***}		-0.011^{***}
		(0.001)		(0.003)
Industry Shock × *IE* Quartile 2		0.043^{***}		0.030^{***}
		(0.006)		(0.009)
Industry Shock × *IE* Quartile 3		0.057^{***}		0.065^{***}
		(0.006)		(0.009)
Industry Shock × *IE* Quartile 4		0.059^{***}		0.075^{***}
		(0.006)		(0.011)
Constant	0.020^{***}	0.037^{***}	0.083^{***}	0.093^{***}
	(0.002)	(0.002)	(0.003)	(0.003)
Observations	136175	126654	35103	32162
Adjusted R^2	0.554	0.555	0.793	0.785

Table 5
Industry Shocks and Firm Profits

The table reports the effect of an industry shock on the gross profits of the firms located in the MSA, conditional on the industry exposure of the MSA. Measurement of *IE* is described in Table 1. The *IE* above median dummy is assigned to half of the MSAs based on the values of lagged IEs. Industry shock is the growth in industry value added. Firm profitability is defined as the change of gross profit scaled by lagged sales. Regression sample period is 1991-2010. All regressions include year, industry and MSA fixed effects. Standard errors are in the parentheses. *, **, and *** represent significance level of 10%, 5%, and 1%, respectively.

	Dependent Variable: Firm Profitability		
	All MSAs	High *IE* MSA	Low *IE* MSA
Industry Shock	0.258***	0.066	0.239***
	(0.063)	(0.109)	(0.057)
IE Above Median Dummy	0.031*		
	(0.019)		
Industry Shock × *IE* Above Median Dummy	−0.205**		
	(0.104)		
Constant	−0.016	−0.108	0.021
	(0.086)	(0.198)	(0.092)
Observations	42867	14594	28273
Adjusted R^2	0.004	0.001	0.007

Table 6-A
Industry Shocks and Firm Returns for RER sorted Subsamples

The table reports the effect of an industry shock on the returns of the firms located in an MSA, conditional on the industry exposure of the MSA. Subsamples are sorted based on RER, defined as RER = (buildings + capital leases + land + construction) / PPE. Panel A sorts the firms within the entire sample, Panel B sorts within each industry. Measurement of *IE* is described in Table 1. The *IE* above median dummy is assigned to half of the MSAs based on the values of lagged IEs. Industry shock is the growth in industry value added. Regression sample period is 1991-2010. All regressions include year, industry and MSA fixed effects. Standard errors are in the parentheses. *, **, and *** represent significance level of 10%, 5%, and 1%, respectively.

Panel A. Subsamples by RER Quartiles

	Dependent Variable: Monthly Excess Stock Returns			
	RER Q1	RER Q2	RER Q3	RER Q4
Industry Shock	0.917***	0.932***	0.563***	0.355**
	(0.106)	(0.166)	(0.117)	(0.148)
IE Above Median	0.097**	−0.024	−0.049	−0.046
	(0.043)	(0.050)	(0.035)	(0.033)
Industry Shock × *IE* Above Median	−1.097***	−0.539**	−0.468**	0.038
	(0.230)	(0.272)	(0.187)	(0.219)
Constant	0.277*	1.827**	0.343**	0.432***
	(0.167)	(0.877)	(0.172)	(0.113)
Observations	76308	68583	95617	100458
Adjusted R^2	0.011	0.016	0.015	0.014

Panel B. Subsamples by RER Quartiles (within Industry)

	Dependent Variable: Monthly Excess Stock Returns			
	RER Q1	RER Q2	RER Q3	RER Q4
Industry Shock	0.788***	1.212***	0.612***	0.326**
	(0.103)	(0.165)	(0.137)	(0.131)
IE Above Median	0.063*	−0.055	−0.031	−0.059*
	(0.037)	(0.045)	(0.038)	(0.036)
Industry Shock × *IE* Above Median	−0.990***	−0.809***	−0.413*	−0.023
	(0.207)	(0.265)	(0.223)	(0.201)
Constant	0.303*	0.152	0.348**	0.447***
	(0.157)	(0.227)	(0.159)	(0.165)
Observations	99722	69130	86120	85994
Adjusted R^2	0.012	0.017	0.013	0.014

Table 6-B
Industry Shocks and Firm Returns for RE/EMP sorted Subsamples

The table reports the effect of an industry shock on the returns of the firms located in an MSA, conditional on the industry exposure of the MSA. Subsamples are sorted based on RE/EMP, defined as (buildings + capital leases + land + construction) / Employment. Panel A sorts the firms within the entire sample, Panel B sorts within each industry. Measurement of *IE* is described in Table 1. The *IE* above median dummy is assigned to half of the MSAs based on the values of lagged IEs. Industry shock is the growth in industry value added. Regression sample period is 1991-2010. All regressions include year, industry and MSA fixed effects. Standard errors are in the parentheses. *, **, and *** represent significance level of 10%, 5%, and 1%, respectively.

Panel A. Subsamples by RE/EMP Quartiles

	Dependent Variable: Monthly Excess Stock Return			
	RE/EMP Q1	RE/EMP Q2	RE/EMP Q3	RE/EMP Q4
Industry Shock	0.813***	0.942***	0.706***	0.326***
	(0.089)	(0.195)	(0.129)	(0.121)
IE Above Median	0.071**	−0.070	0.019	−0.090***
	(0.031)	(0.058)	(0.035)	(0.032)
Industry Shock × *IE* Above Median	−0.998***	−0.503	−0.464**	−0.217
	(0.182)	(0.337)	(0.199)	(0.187)
Constant	0.269*	−1.599*	0.488***	0.352***
	(0.138)	(0.860)	(0.156)	(0.123)
Observations	109456	50036	105354	105911
Adjusted R^2	0.012	0.016	0.014	0.016

Panel B. Subsamples by RE/EMP Quartiles (within Industry)

	Dependent Variable: Monthly Excess Stock Return			
	RE/EMP Q1	RE/EMP Q2	RE/EMP Q3	RE/EMP Q4
Industry Shock	0.787***	0.745***	0.663***	0.548***
	(0.088)	(0.164)	(0.134)	(0.137)
IE Above Median	0.051*	−0.057	−0.030	−0.040
	(0.029)	(0.046)	(0.038)	(0.037)
Industry Shock × *IE* Above Median	−0.968***	−0.396	−0.541**	−0.263
	(0.173)	(0.260)	(0.219)	(0.211)
Constant	0.292**	0.371*	0.209	0.470*
	(0.137)	(0.198)	(0.164)	(0.248)
Observations	131262	67534	83939	88022
Adjusted R^2	0.012	0.014	0.015	0.014

Table 7
Model Results

Panel A: Model Parameter Values

Parameter	Description	Value
α_s	Land share	0.2
α_l	Labor share	0.6
β	Discount factor	0.99
γ_0	Price of risk parameter	3.2
η	Adjustment cost parameter	2
ρ_a	Persistence of aggregate productivity	0.95
σ_a	Conditional volatility of aggregate productivity	0.007
ρ_n	Persistence of industry productivity	0.95
σ_n	Conditional volatility of industry productivity	0.005
ρ_z	Persistence of firm productivity	0.95
σ_z	Conditional volatility of firm productivity	0.01

Panel B: Factor Price Regressions

Dependent variable:	Wage growth	Land returns
Industry Shock	-0.0001	0.0009
Industry Shock x IE dummy	0.0294	0.1874
IE dummy	-0.0000	-0.0004

Panel C: Firm Return Regressions

	Low Land/Emp	High Land/Emp
Industry Shock	0.4339	0.3956
Industry Shock x IE dummy	-0.2420	-0.2181
IE dummy	-0.0003	0.0001