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Three Essays on Financial Intermediary and Insider Trading

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THREE ESSAYS ON FINANCIAL INTERMEDIARY AND INSIDER TRADING

by

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ABSTRACT

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The dissertation explores several asset pricing and corporate finance related issues including mutual funds, insider trading and institutional investors. My first essay examines risk taking and performance of bond mutual funds. The second essay investigates insider trading, informativeness and price efficiency around the world. The third essay explores whether firms benefit from scale of their nearby institutions in terms of stock prices and corporate policies.

In the first essay, we investigates the risk exposures of bond mutual funds and how risk-taking behavior affects bond fund performance. Bond mutual funds often outperform their respective benchmark bond indexes, but underperform after adjusting for bond market risk factors. We show that risk-taking behavior helps to explain the different performances of bond funds with and without controlling for the risk factors. Results suggest that risk taking leads to higher returns relative to benchmarks in normal credit risk periods, but lower returns in high credit risk periods, and that risk taking is persistent and is primarily driven by poor long-term past performance. Finally, we also find weak evidence that risk-taking funds attempt to conceal their risky bets at mandatory disclosure. The results also indicate that fund investors typically do not differentiate the skill and risk components of fund performance in their investment decisions, thereby inducing bond funds to take risky bets and to affect flows of new money.

The second essay provides the first direct evidence on the impact of enforcing insider regulations on the informativeness of insider trades and stock price efficiency across 44 countries with varying levels

of insider trading regulations. Results suggest that insider purchases earn abnormal profits, especially in countries with active enforcement of insider trading regulations. Our study then evaluates the impact of insider trading regulation on stock price efficiency by examining insider trades around corporate earnings announcements. The results show that while insiders trade less before earnings announcements in countries with active enforcement, their stock prices react more to earnings news than those in countries without active enforcement. Overall, our results support the view that effective insider trading regulation promotes price efficiency. Without active enforcement, insider trading not only discourages market information acquisition and reduces stock price efficiency, but also renders insider trading itself less informative.

In the third essay, we study whether and how the geographic mismatch of investors and public firms affects corporate policies, firm valuation and firm performance. Both the U.S. money managing industry and public firms are clustered geographically, but there is considerable misalignment between the two. In this paper, we study whether and how the geographic mismatch between investors and public firms affects corporate financial policies, firm valuation, and firm performance. We measure the investor-firm misalignment at the state level based on the ratio of the aggregate asset under management (AUM) of institutions in a state to the total market capitalization of public firms in the same state (AM Ratio). We find that firm valuation is high when firms are located in states with high AM Ratios and the effects are stronger for firms with higher level of equity dependence. We show that a greater presence of local institutional investors mitigates the financial constraints of local firms. Firms in high AM Ratio states invest more but their investments are less dependent on internal cash flow. These firms are more likely to issue equity while local institutions hold more of the newly issued equity. The high firm valuation in the high AM Ratio states seems to be persistent, but can be affected by shocks to the money managing industry.

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Chapter 1

Risk Taking and Performance of Bond Mutual Funds

1.1 Introduction

> *Last year, 79% of intermediate-term bond funds – which hold a mix of government and corporate bonds maturing in five to 10 years – beat the comparable bond index. Over the past 12 months, investment-research firm Morningstar estimates, intermediate bond funds have surpassed the indexes against which they measure themselves by an average of 1.8 percentage points; long-term government bond funds have beaten their chosen benchmarks by 2.5 points.*
>
> Wall Street Journal, April 13, 2013.[1]

Can bond mutual funds easily beat their benchmarks? Extensive empirical evidence on mutual fund performance has suggested that bond fund managers, like their equity fund counterparts, are unable to outperform their benchmarks. However, the above quote from the *Wall Street Journal* indicates that many bond mutual funds do beat their benchmark indexes, at least for some specific time periods. While bond funds in the U.S. are about 60% as large as domestic equity funds,[2]

[1] "The Bond Market Can't Be This Easy to Beat – Can It?", *Wall Street Journal*, April 13, 2013

[2] As of 2013 year end, the total net asset value of bond funds was 22% of the $15 trillion worth of U.S. mutual fund assets, and that of equity funds was 38%. See Investment Company Fact Book, 2014.

there is relatively little research on bond fund risks and performance. The few studies that have examined bond fund performance find that, after controlling for bond market and economic risk factors, bond funds generally do not yield positive alphas. In this paper, we intend to fill this gap by examining the risk exposure of bond funds and how their different risk exposures affect performance.

Existing studies on bond funds examine fund performance by specifying and explicitly controlling for bond market risk factors. Blake, Elton, and Gruber (1993) find that on average, bond funds underperform their benchmarks after controlling for multiple bond risk factors (as proxied by bond indexes). Elton, Gruber, and Blake (1995) conclude that the magnitude of bond fund underperformance, after controlling for fundamental economic risk factors, is approximately equal to the fund expense ratio. Consistent with these two studies, Ferson, Henry, and Kisgen (2006) show that the risk-adjusted pre-expense excess return of bond funds is just enough to cover the expenses. Chen, Ferson, and Peters (2010) find that, even though bond funds exhibit some market timing ability, they still underperform after expenses. Employing fund holdings data, Cici and Gibson (2012) find no evidence of selection ability and weak evidence of timing ability in corporate bond funds.

Our study evaluates bond fund performance by assessing the risk exposure of bond funds relative to their benchmarks and then investigates the effects of risk exposure on fund performance. Each fund is classified based on its investment objective, and its performance is compared with that of a matched bond index (hereafter "index-adjusted performance") and is also evaluated in a multi-factor model (hereafter "risk-adjusted performance"). Using these two different performance measures allows us to assess how differences in risk exposures between bond funds and bond indexes affect fund performance. We further develop methodologies to evaluate risk taking by bond funds and to explore the determinants of their risk-taking decisions.

We start by examining the performance of bond funds relative to their index benchmarks and to a multi-factor model. Based on annual fund returns, our results indicate that a substantial number of bond funds outperform their respective matched benchmarks in different time periods over the full sample period of 1998 to 2013, and that most funds outperform their benchmarks after the 2008 financial crisis. Interestingly, index-adjusted performances of bond funds with different

investment objectives vary substantially over time and are negatively correlated with levels of credit market risks. Based on the multi-factor model, however, bond funds on average generate significantly negative risk-adjusted alphas. In comparison to their time-varying index-adjusted outperformances, risk-adjusted bond fund returns are fairly stable and are consistently negative. These findings suggest that bond mutual funds exhibit different risk characteristics from their matched bond indexes.

We next examine how the risk characteristics of bond funds differ from those of their benchmarks. We investigate the risk-adjusted performance of bond funds across normal and high credit risk periods. Results show that risk-adjusted performance differs substantially between normal and high credit risk periods, and that it is significantly lower during high risk periods. We then decompose the index-adjusted performance of bond funds into a risk component and a non-risk or skill component that is based on the risk-adjusted return from the multi-factor model. We exploit the financial crisis of 2008-2009 as a natural experiment to determine the contribution of each component to fund performance. Our analysis suggests that the return due to the risk component reverses, while the skill component remains stable, from the normal period to the crisis period. We rule out the explanations that bond style classification issues or time varying manager skills are responsible for the different performance results. Taken together, these results suggest that fund risk taking (i.e., funds have greater risk exposure than their bond index benchmarks) drives the differences between the index-adjusted and risk-adjusted performances.

Why do bond funds take excessive risks relative to their benchmarks? Several empirical studies on equity mutual funds have shown that, because mutual funds are often evaluated annually, those that have performed poorly in the early part of the year tend to invest in more risky assets in order to improve performance prior to year end. To examine such short-term risk-shifting behavior, we follow Brown, Harlow, and Starks (1996) and classify funds into winner and loser funds based on their performance during the early part of the year (over the six- or nine-month period). We then compare the frequency distribution of increasing risk between winner and loser funds based on fund return volatility and the risk component of fund returns in the later part of the year. Our findings suggest that loser funds are not more likely to increase their risk levels than winner funds, thereby indicating that short-term risk shifting is unlikely the main driver for the observed risk-taking

behavior of bond funds.

We consider another possibility that bond fund managers may decide to take greater risks and such risk-taking behavior could be more pronounced than observed in equity mutual funds.[3] Unlike equity fund risk taking, bond fund risk taking, in the form of increasing credit risk (lower credit quality) and/or increasing interest risk (longer maturity), can more reliably generate higher returns under normal market conditions. Competition pressure may motivate bond fund managers to assume greater risks compared with their benchmarks. In this case, longer-term poor performance may drive risk taking. To test this hypothesis, we examine the relation between fund risk taking and longer-term fund performance over two- to three-year periods. We find that funds that have performed poorly over longer periods in the past tend to take greater risks – these funds have higher returns in normal credit risk periods but lower returns during high credit risk periods.

Competition induced risk-taking behavior could also persist for longer periods and could permeate the bond fund industry. For example, if some funds perform better than others, because of either skills or risk taking, some poorly performing funds may decide to take greater risks in order to improve their relative performance. The increased competition pressure could subsequently induce more funds to take risks or to assume greater risk among funds that are already in a riskier position. Our earlier evidence and the above quote from the *Wall Street Journal* article imply that bond fund risk taking is likely to be pervasive. One possible explanation for why fund managers would assume greater risk taking behavior prior to yearend is to engender better performance and as a result, attract greater flows of new money.

If fund investors care only about raw performance (i.e., performance relative to a benchmark), such investment behavior can incentivize fund managers to take risk. We test this by analyzing fund flows in relation to risk-adjusted and index-adjusted fund performances. We find that investors respond positively to both risk-adjusted returns and benchmark-adjusted returns. In particular, bond fund raw returns are significantly positively related to subsequent fund flows even after controlling for the effects of risk-adjusted returns. These results suggest that bond fund investors may reward rather than penalize bond fund managers for taking risks if such behavior can help deliver higher returns.

[3]See Huang, Sialm and Zhang (2011) for studies on long-term risk shifting in equity mutual funds.

The rest of this paper is organized as follows. Section 2 describes the bond mutual fund sample and bond benchmarks used in the study. Section 3 presents empirical results on bond fund performance and risk taking. Section 4 explores potential causes of risk taking in bond mutual funds, while Section 5 examines the risk taking behavior of bond funds on flows of new money. Section 6 offers some concluding remarks.

1.2 Data

1.2.1 Bond Mutual Funds

The bond mutual fund data are from the CRSP Survivor-Bias Free U.S. Mutual Fund Database. We use the sample period from 1998 to 2013 since detailed classifications of bond funds by Lipper became available from 1998 onwards.[4] We form the initial broad sample of bond funds by including funds with CRSP objective codes of 'IC', 'IG' and 'I' but excluding municipal bond funds and mortgaged-backed bond funds.[5] Our bond fund classifications follow the Lipper objective codes, which are based on the investment objectives specified by the mutual funds. We classify bond funds into 10 investment objectives: three types of government bond funds (general, short maturity, and intermediate maturity funds), five types of corporate bond funds (short maturity, intermediate maturity, high quality, BBB-rated, and high yield funds), and two types of government and corporate bond funds (short maturity and intermediate maturity funds). Appendix A details the objective codes used to classify these funds.

Since the CRSP mutual fund dataset reports fund characteristics based on the fund class level instead of the fund level, we combine the different fund classes into a single fund using the CRSP mutual fund class code. Table 1.1 reports the number of funds in our sample for each fund style classification by year. The total number of bond funds is stable over the sample period and reaches its peak in 2000 and 2001. High yield corporate bonds constitute the largest proportion of the total

[4]We choose the shorter sample period in order to match more precisely bond funds with their index benchmarks based on the uniform Lipper classification. We also obtain very similar results based on a longer sample period of 1993 to 2003. Because the CRSP mutual fund database does not contain Lipper classification prior to 1998, for the 1993-1997 period in the sample, we convert Standard & Poor's Strategic Insight objective codes into Lipper objective codes. The results are available upon request.

[5]'IC', 'IG' and 'I' represent three broad categories of domestic bond funds: corporate bond funds, government bond funds and general bond funds.

number of funds, whereas short maturity government/corporate bonds form the least. Among the funds, intermediate maturity government/corporate bond funds experience dramatic increases from 1998 to 2013.

Table 1.2 reports the time series cross-sectional averages of monthly fund returns, expense ratios, and total net assets (TNA) by fund type. Mean bond fund returns range from 0.269% (short maturity government bond funds) to 0.484% per month (high yield corporate bond funds). With the lowest return among all funds in the sample, short maturity government bond funds also have the smallest standard deviation of returns (0.383%), with high yield corporate bond funds having the largest standard deviation of 2.507% per month. Expense ratios vary across the investment types and the average monthly expense ratio is 0.067% with high-yield bond funds having the highest expense ratio of 0.090%. Corporate bond funds generally are larger in terms of size compared with government bond funds. For example, the TNA of government bond funds is between \$545.66 millions to \$663.76 millions, compared to \$968.71-\$2,756.98 millions for corporate bond funds.

1.2.2 Bond Index Benchmarks

Most bond mutual funds use Barclays bond indexes as their benchmarks. We obtain these indexes from DataStream and compute their monthly returns. We select the following 10 Barclays bond indexes for bond mutual funds based on their respective investment objectives: Barclays U.S. aggregate government index, Barclays U.S. Treasury 1-3 year index, Barclays U.S. Treasury intermediate index, Barclays U.S. credit 1-3 year index, Barclays corporate intermediate index, Barclays corporate A+ index, Barclays U.S. aggregate corporate BAA index, Barclay U.S corporate high-yield index, Barclays government/credit 1-3 year index, and Barclays intermediate government/credit index. We also manually check the prospectus of each fund to verify that the above investment objectives of the funds are accurate. Furthermore, we compute the cross-correlation coefficients between bond funds of each type and the 10 benchmarks employed. The unreported correlation coefficient is the largest and statistically significant between the fund type and its comparable benchmark than between the fund type and the other benchmarks. Appendix A provides the link between each fund objective and the corresponding benchmark bond index.

1.2.3 Other Variables

We employ various bond risk variables in our empirical analysis. We use credit spreads as measures for credit risks to classify periods of high and normal credit risks. Monthly data are obtained from Federal Reserve's website's H.15 historical data. We compute both long-term and short-term credit spreads. The long-term credit spread is measured as the yield of AAA or BAA corporate bonds minus a 10-year Treasury bond yield. We take the difference between the yield of 3-month financial or non-financial commercial papers and a 3-month T-bill yield to construct the short-term credit spread. Figure 1.1 plots the time series of the yields of different debt securities. In addition, we construct several factors for the empirical analyses. Barclays U.S. aggregate index return (Agg) is the return of the aggregate bond market and captures the market-wide risk. The default premium (Def) is the difference in returns between the high-yield bond index and intermediate government index, the term premium ($Term$) is the return spread between the intermediate- and short-term government bond indexes, and the return on the S&P 500 stock index ($S\&P500$) is a proxy for equity market performance. These variables follow closely those employed in Elton, Gruber, and Blake (1995).

1.3 Bond Fund Performance and Risk Taking

In this section, we examine bond fund performance based on two different approaches. The first approach is widely employed in the mutual fund industry, popular press, and is emphasized by fund management companies, where bond fund returns are measured relative to their respective bond index benchmarks – the index-adjusted return. The second method is mainly adopted in academic research, where fund performance is evaluated while explicitly controlling for bond market risk factors – the risk-adjusted return. We compare fund performance based on the two metrics and then investigate whether different risk exposures between funds and their benchmarks are the plausible causes driving their performance differences.

1.3.1 Index-Adjusted Bond Fund Returns

Table 1.3 reports the difference between the equal-weighted fund return within each fund classification and its corresponding benchmark, as well as the percentage of bond funds that outperform their benchmarks by year. Panel A shows that bond fund performance after expenses relative to the benchmark is generally negative for the sample period, but the average negative performance is largely driven by the extremely low returns in 2008. For example, for the intermediate-maturity government/corporate bond funds that use the Barclays intermediate government/credit index as their benchmark, the average underperformance is 33.3 basis points, and their poor performance of -12.558% in 2008 can explain their overall underperformance over the entire sample period. For the post-2008 sample period, a majority of the funds have outperformed their respective benchmarks, and similar patterns are also observed during the few years prior to the 2008-2009 financial crisis. On average, about 48.59% of the funds in the intermediate-maturity government/corporate bond fund category have outperformed the benchmark based on post-expense returns. Again, this low average percentage of under performing funds (for example, 7.14% in 2007, 12.30% in 2008, and 6.67% in 1998) is mainly attributable to the extremely low percentages of outperforming funds in some few years of the sample period.

We observe similar patterns in other fund classification types, except high yield and BBB-rated corporate bond funds, the two bond types with the greatest credit risk. Consistent with the above-mentioned *Wall Street Journal* article, the intermediate government bond funds show outperformance of 1.279% after expenses in 2012. Similarly, the percentage of outperforming funds also has increased dramatically from 2009 onwards with many fund classifications having over 50% outperforming funds. Panel B provides the counterpart results with expenses added back to fund returns and hence, shows a greater percentage of outperforming funds. For example, 59.50% of the funds in the intermediate maturity government/corporate bond fund category have outperformed their benchmarks based on pre-expense returns. Overall, the evidence of outperformance in recent years is even more striking in Panel B for most fund categories.

In our analysis, we have also computed the return differences between actively managed funds and index funds in each category by year. Our untabulated results show that, except for several

major financial and debt crisis years, most classification types show positive (post-expense) return differences and the percentage of outperforming funds, especially corporate bond funds, is over 60%. Additionally, more funds outperform index funds and the outperformance is more prevalent and larger in terms of magnitude in recent years. The percentage of outperforming high-yield funds is nearly 100% since 2009.

The table also displays a significant variation in the relative performance of bond funds over the sample period. During major financial market downturns, most bond fund classifications, as well as their comparable benchmarks, exhibit significantly lower returns. Still, the relative performance of funds broadly covaries with bond market conditions. For example, the recent financial crisis contributes to the annual underperformance of intermediate-maturity government/corporate bond funds by -12.558%, but their relative performance rebounds in 2009 when the credit market conditions improve. The time variation of the relative performance of bond funds is not unique to the 2008-2009 financial crisis period.

In summary, the comparison of actively managed bond funds with their comparable benchmarks shows strong evidence of outperformance over the recent few years and of significant time variation in relative performance over the sample period. The results are consistent when returns are measured before as well as after expenses. In the next two subsections, we compare index-adjusted returns with risk-adjusted returns, and explore the causes for the different performance results.

1.3.2 Risk-Adjusted Bond Fund Returns

In this subsection, we evaluate bond fund performance based on standard multi-factor models that are commonly employed in the mutual fund performance evaluation literature. Blake, Elton, and Gruber (1993) adopt a six-factor model to measure bond fund performance. Elton, Gruber, and Blake (1995) add two fundamental economic variables to the six factors. Chen, Ferson, and Peters (2010) develop a model to measure bond fund market timing. We evaluate bond fund performance using the Elton, Gruber, and Blake (1995) multi-factor model. But given that our sample excludes government mortgage-backed securities funds, any mortgage-related factor and

fundamental variables would not be incorporated into our model below.

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_{1,i}(Agg_t - r_{f,t}) + \beta_{2,i}Def_t + \beta_{3,i}Term_t + \beta_{4,i}(SP500_t - r_{f,t}) + \epsilon_{i,t}, \qquad (1.1)$$

where $r_i - r_f$ is the return on a bond fund in excess of a risk free rate, r_f. The four risk factors are: (1) the Barclays U.S. aggregate index return (Agg), defined as the return of the aggregate bond market index and captures the market-wide risk; (2) the default premium (Def), defined as the difference in returns between the Barclays high-yield bond index and intermediate government index; (3) the term premium ($Term$), defined as the return spread between the intermediate- and short-term government bond indexes; and (4) the return on the S&P 500 stock index ($SP500$), a proxy for equity market performance.

Various prior studies on bond mutual fund performance, including Blake, Elton, and Gruber (1993), find that the bond market risk factors in model (1.1) are adequate to capture the varying risk exposures of bond funds across different investment objectives. In these studies, the multi-factor model is employed to control for fund risk exposures regardless of bond fund styles. Based on the model, the α in model (1.1) can be interpreted as the portion of the return that cannot be explained by these risk factors. We employ this multi-factor model to investigate risk-adjusted returns of bond funds in our sample.

Within each fund type, we first run time series regressions at the fund level for the entire sample period and then take the average of the α estimates. To ensure robustness of the results, we delete funds with less than 24 monthly observations from the regressions. Table 1.4 reports the average α's, along with the percentage of positive and negative α's, as well as coefficient estimates of the risk factors, from time-series fund-level regressions by fund type.

In Panel A, column 2 shows that the risk-adjusted returns, i.e., α's, are all significantly negative at conventional levels. The α value ranges from -0.018% per month for short-maturity government bond funds to -0.114% per month for BBB-rated corporate bond funds, or from -0.216% to -1.368% per annum. Within each fund category, more than half of the funds have significantly negative α's, and most of the α's are statistically significant at the 5% level. In comparison, only about two percent of the positive α's are statistically significant. Short-maturity government/corporate and

short-maturity government bond funds have the highest percentage of statistically significant and positive α's of 10.39%. Without considering the statistical significance level, the percentages of positive and negative α's exhibit a broadly similar pattern across different fund types.

Panel B reports similar results with fund expenses added back to fund returns. Risk-adjusted returns of short-maturity government bond funds and short-maturity corporate bond funds become positive and statistically significant. However, the risk-adjusted returns for the other classification types are all insignificant, varying from -0.043 % to 0.043% per month. The coefficients of risk factors are fairly stable across Panels A and B since expenses contribute largely to underperformance and have no bearing on the risk factors. These results from the larger, and more recent sample of bond funds are generally consistent with the findings reported in Elton, Gruber, and Blake (1995). The evidence seems to support the view that, "There is no evidence that managers, on average, can provide superior returns on the portfolios they manage, even if they provide their services free of cost" (Elton, Gruber, and Blake, page 1252).In addition, we also run regression of return difference between bond funds and benchmark indexes on four risk factors in the multi-factor model as shown in Appendix Table 1.2. In column 2, almost all the α's are significantly negative ranging from -0.107% to -0.011% indicating that bond fund risk-adjusted outperformance/underperformance against their benchmark indexes are indeed significantly negative. This evidence provides further support for our argument that bond funds after adjusting for risk factors do significantly underperform.

While Table 1.3 shows that bond funds exhibit substantial annual variations in index-adjusted returns, Table 1.4 indicates that risk-adjusted returns are significantly negative over the full sample period. To facilitate a direct comparison between index-adjusted returns with risk-adjusted returns, we run a 3-year rolling window regression at the fund level and compute the average α's for every year for each classification type. Table 1.5 reports the rolling-window results by year. Starting from 2001, all the bond fund categories exhibit significantly negative α's every year. The average of time-series rolling-window α's varies from -0.101% to -0.009% per month and is mostly statistically significant at the 1% level. The positive index-adjusted returns in recent years, as shown in Table 1.3, can also be explained by these risk factors and have become significantly negative, implying that after adjusting for risk factors, fund managers do not deliver abnormal returns during the recent

period. Compared with Table 1.3, risk-adjusted α's in Table 1.5 exhibit consistently negative values for every period starting from 2001 with few exceptions. The risk-adjusted returns do not show significant variations over the sample period and differ from the results based on index-adjusted returns.

Our above analysis indicates that the two different fund performance evaluation approaches yield drastically different results. If we measure bond fund performance relative to their benchmarks, many bond funds outperform their benchmarks even after fund expenses. Such outperformance exhibited by funds also varies over time and correlates with bond market conditions. However, if we evaluate bond fund performance based on the standard multi-factor model, bond funds show reliably negative risk-adjusted returns, and the negative risk-adjusted returns are largely stable and persist over the sample period. Clearly, the risk exposures of bond funds differ substantially from their benchmarks.

1.3.3 Risk Taking and Bond Fund Performance

Thus far, we have shown that index-adjusted and risk-adjusted fund returns differ vastly, possibly indicating that bond funds and their benchmarks have different risk exposures. A natural question that arises from the comparison is: Are these results due to bond fund classification errors, fund manager skills (including both security selection and market or risk timing skills), or systematic risk taking? In this subsection, we assess the robustness of our findings and explore the possible causes of the different risk exposures.

It is possible that Lipper bond fund classifications are not accurate enough to categorize bond fund investment objectives, or the Barclays indexes may not match perfectly with the fund investment objectives. In the former case, riskier funds within the Lipper classification may outperform the benchmark based on index-adjusted returns, but underperform after risk-adjustment. In the latter case, if the funds are typically riskier than the Barclays indexes because of a mismatch between the index and the bond fund's true benchmark, these funds may also outperform the index before risk-adjustment and underperform after risk-adjustment. We will leave the investigation of this issue to the next section, where we examine fund past performance and fund risk taking. We find that, in contrast to the fund misclassification explanation, funds that *underperform* their

benchmarks in the past tend to have greater subsequent risk exposures and higher returns relative to their benchmarks. Based on the evidence we have presented so far, fund misclassification or inaccuracies in benchmarking is unlikely to explain the magnitude of the return differences.

Another possible explanation is that bond fund manager skills, particularly time varying bond fund manager skills in either security selection, market timing, or both, could drive the different performance results. For example, Kacperczyk, Van Nieuwerburgh, and Veldkamp (2014) show that equity fund managers exhibit security selection skills in boom markets and market timing skills in recessions. Chen, Ferson, and Peters (2010) indeed find that bond fund managers exhibit some overall market-timing skills. However, market timing skills should help to improve fund performance during high-risk periods, which we do not observe across broad market swings. Similarly, security selection skills alone could contribute to the performance results with or without risk-adjustments, and are thus unlikely to explain the different performances of bond funds.

Does fund manager risk taking drive the performance results? To formally test this possibility and to contrast with the explanations based on fund manager skills, we examine the relation between fund risk exposure and fund performance across different risk periods. Our first test uses the relation between credit risk levels and bond returns to distinguish the possible explanations of manager skills and risk taking. We divide the full sample period into high and normal credit risk periods and assess fund returns and fund risk exposures under different market conditions. The intuition behind our test is straightforward. If fund manager skills drive the results, fund returns or fund risk exposures should not differ systematically across the different credit risk periods (based on security selection) or should improve fund performance during high credit risk periods (based on time-varying security selections or market timings). If, however, fund manager risk taking is responsible for the different risk exposures, then fund returns will be lower during the high credit risk periods after adjusting for average fund risk exposure through the sample period.

In the previous multi-factor model results, we have shown that bond funds yield significantly negative risk-adjusted returns over the full sample period. We now introduce a high credit risk indicator to differentiate risk-adjusted performance between normal and high credit risk periods. We measure credit risk as the difference between yields of corporate bonds and yields on treasury securities. Figure 1.1 presents the credit spread plot over time based on different debt instruments

and the patterns are largely consistent across the different debt securities. We construct the high credit risk indicator using the BAA and 10-year Treasury yield spread. The most recent 2007 financial downturn displays the highest credit spread. In our regression analysis, we set the high credit risk indicator to 1 if the credit spread of a specific month is above one standard deviation from the mean; otherwise, the credit risk indicator equals 0. This method provides us with the monthly high credit risk dummy variable.

In this subsection, we employ a variant of the multi-factor model regression (1.1) by adding the high credit risk indicator to the model. Table 1.6 presents the coefficients of the high credit risk indicator variable and the average α's, along with the percentages of positive and negative α's. The α intercept now captures the fund performance during a normal credit risk period. All fund types generate significantly negative risk-adjusted returns between -0.106% and -0.017% per month, indicating that funds significantly underperform their benchmarks during normal credit risk periods. Except for those of short and intermediate government bond funds, most coefficients of the high credit risk indicator are significantly negative, suggesting that fund returns are even lower during the high than the normal credit risk periods. The difference in the monthly return between the high credit and normal credit risk period fluctuates between -0.191% and -0.044% and is statistically significant at the 5% level. We obtain qualitatively similar results from regressions based on bond fund pre-expense returns, and based on different specifications of the high credit risk period. For example, we obtain similar results when we use 0.5 standard deviation from the mean to define the high credit risk indicator.[6]

The substantially lower returns during the high credit risk periods confirm the robustness of our earlier results on the different risk exposures of bond funds and their benchmarks. The evidence lends support for the risk-taking based explanations for the different risk exposures. When bond funds take greater risks than their benchmark, they may outperform their benchmarks based on raw returns during normal credit risk periods, but may underperform their benchmarks during high credit risk periods. During periods of high credit risk, funds are likely to underperform their benchmarks based on raw returns, and can significantly underperform after adjusting for average

[6]Because government bond funds may have different risk exposures than corporate bonds, we also separately examine the relation between fund performance and fund risk taking for government funds based on high and normal risk periods classified by term spread (10-year Treasury bond yield and 3-month T-bill yield); the results remain materially unaltered.

risk exposure.

Our second test exploits the recent financial crisis of 2007-2009 as a natural experiment to investigate how risk taking by bond funds contributes to bond fund performance. Based on Figure 1.1, the highest credit risk during the most recent financial crisis is from 2007:8 to 2009:7. To be consistent, we define equal-length of normal and high-credit risk periods from 2003:8 to 2005:7, 2005:8 to 2007:7, and 2007:8 to 2009:7, respectively. Because the significantly higher credit risk during the financial crisis is largely unexpected and the large jump in credit risk significantly affects the bond market, we can clearly identify risk taking and its effects on bond fund performance. To facilitate a comparison of fund risk-taking behavior between normal and high risk periods, we define two pre-crisis subperiods (2003:8 to 2005:7 and 2005:8 to 2007:7) and examine the differences between these two.

To implement the test, we decompose bond fund performance relative to a benchmark into a skill component ($Skill$) and a risk component ($Risk$). To do so, we run a time-series multi-factor model regression for each fund from the combined three sub-periods of 2003:8 to 2009:7. We define the α estimated from the whole period as the skill component of fund performance ($Skill$), as it captures the average risk-adjusted return over the three subperiods both before and during the financial crisis. We then compute index-adjusted returns for the two pre-crisis periods and the crisis period, and calculate the differences between index-adjusted returns and risk-adjusted returns (α). We designate the three different values for the three subperiods as the 'risk' components of fund performance ($Risk$).

If bond fund managers do not take excessive risks and the performance is only attributed to managers' skills, then the risk component of the performance or $Risk$ is the residual that is not explained by fund manager skills specified in the model. $Risk$ should be uncorrelated between the two contiguous periods or positively correlated if the model fails to fully capture fund manager skills. However, if part of the fund performance is attributed to risk taking, such risk-component performance is more likely to reverse from a normal to a high credit risk period since potential risks are realized during the high risk period. Consequently, the higher performance during the pre-crisis period could predict lower performance during the financial crisis period.

Table 1.7 reports the results based on the decomposition of fund risk and skill over the three

sub-periods. In Panel A, we sort all funds into three groups based a fund's *Risk* in the pre-crisis period (2005:8 to 2007:7).[7] We report the average values of *Risk* for the three groups of funds over the pre-crisis period (2005:8 to 2007:7) and the crisis period (2007:8 to 2009:7). Between the pre-crisis and crisis periods, *Risk* reverses for the majority of the classification types – funds with high *Risk* in the pre-crisis period tend to have low *Risk* during the crisis. In comparison, we also sort funds into three groups based on *Risk* in the first pre-crisis period (2003:8 to 2005:7) and report the average values of *Risk* for the three groups of funds during the second pre-crisis period (2005:8 to 2007:7). *Risk*, however, does not exhibit any reversal between the two pre-crisis periods.

A fund manager's *Skill* estimated over the full period should provide a more reliable gauge on fund manager skill . Thus, *Skill* is stable and is naturally persistent across the three subperiods. In order to assess the validity of our approach and the robustness of our earlier results, we also run the multi-factor regression for each fund for each of the three sub-periods and define the α estimated from each sub-period as the skill component of fund performance (*Skill*). *Skill* in Panel B, following the same format as in Panel A. The results show substantially different patterns from those reported in Panel A – *Skill* exhibits persistence rather than reversals. We also examine *Risk* results based on the α estimated over the three sub-periods and find qualitatively similar results.

Overall, the results based on fund performance surrounding the recent financial crisis offer direct support for the risk-taking hypothesis. Funds that have performed well due to greater risk exposure during the pre-crisis period performed poorly during the financial crisis. In contrast, the estimated fund manager skills do not show patterns of reversals across the sub-periods but exhibit some level of persistence.

To sum up, the results in this section suggest that bond funds differ systematically from their index benchmarks in their risk exposures. The difference in risk exposure helps to reconcile the different results in fund performance evaluation with and without controlling for bond market risk factors. The greater risk exposures exhibited by bond funds are not driven by fund classification errors, or driven by investment strategies associated with manager skills. The generally greater risk exposure in bond funds increases fund returns during normal credit risk periods and reduces fund returns during high credit risk periods. Such risk taking behavior helps to explain the time-series

[7] We find similar results if we use different cutoff points such as three equal-numbered groups.

variation in bond fund performance relative to their benchmarks.

1.4 What Drives Bond Fund Risk Taking?

In the previous section, we have found that on average, bond funds take greater risks than their benchmarks. In this section, we explore potential causes of such risk-taking behavior. We focus on the following questions: What drives bond fund risk taking, and why do some fund managers decide to deviate from their proper risk benchmarks?

1.4.1 Short-Term Risk Shifting in Bond Funds

Several studies on equity mutual funds (see, *e.g.*, Brown, Harlow, and Starks (1996), Chevalier and Ellison (1997)) provide evidence that, because mutual funds are often evaluated annually, poorly performing funds in the early part of the year may have an incentive to shift to higher risk assets in order to improve the performance within the year. This type of short-term risk-shifting behavior may not completely explain the evidence of risk taking we documented in the previous section, but the existence of such risk-shifting behavior can at least help us understand some of the motives behind bond fund risk taking.

To examine such short-term risk-shifting behavior within a calendar year, we follow Brown, Harlow, and Starks (1996) and classify funds into winner and loser funds based on their performance during the early part of the year (over the six- or nine-month period). We then compare the frequency distribution of increasing risk between winner and loser funds in the later part of the year. Within each fund style classification, we form three groups based on a fund's performance during the first M months of a year. For each fund j, the cumulative return, RTN, over month M is computed as:

$$RTN_{j,M} = \prod_{t=1}^{M}(1 + r_{j,t}) - 1, \tag{1.2}$$

where $r_{j,t}$ is the monthly return for fund j in month t. Within each classification type, we rank funds based on their RTNs and then divide them into into three groups. We define winners as the top ranking group and losers as the bottom ranking group. We select the first half of each year as

our performance evaluation period (i.e., $M = 6$).

For the volatility based test, we compute the ratio of volatility (RAR) based on fund return volatility before and after month M in order to examine changes in fund risk levels across the three performance groups. For each fund j at month M, RAR is calculated as:

$$RAR_{j,M} = \sqrt{\frac{\sum_{t=M+1}^{12}(r_{j,t} - \overline{r}_{j,12-M})^2}{(12-M)-1}} / \sqrt{\frac{\sum_{t=1}^{M}(r_{j,t} - \overline{r}_{j,M})^2}{(M-1)}} \tag{1.3}$$

RAR is the ratio of fund return standard deviation after month M relative to return standard deviation before month M in a given year. Without risk-shifting behavior, RAR will be close to 1 and similar for all the funds within each classification type. If poorly performing funds take greater risk during the second period of the year in order to catch up with other funds in the same classification type, RAR will be greater for these loser funds.

To examine the risk-shifting behavior of funds, we rank funds based on RAR, and within each style classification, we sort them into three groups. We define the top RAR group as high RAR and the bottom as low RAR. In the end, we will have a (RTN, RAR) pair for each fund and a 2x2 classification scheme based on performance and volatility ratio: High RTN, High RAR; High RTN, Low RAR; Low RTN, High RAR; and Low RTN, Low RAR. The null hypothesis is that, without systematic risk shifting, these two classification methods are independent; hence, the frequency of funds falling into one of the four categories is the same (i.e., 25%). We employ a chi-square statistic to test whether the frequencies are significantly different across the four categories.

Table 1.8 reports the results for the frequency distribution based on fund performance and volatility ratios in the first five columns of the results. Among all the bond fund style classifications, high-yield corporate bond funds and intermediate maturity corporate bond funds show significantly higher frequencies for Low RTN, High RAR and High RTN, Low RAR. This implies that for these two types of bond funds, loser funds shift to more risky assets so as to improve performance in the second half of the year. However, winner funds invest in safer assets in the second half of the year which results in decrease in RAR. The rest of the classification types is either insignificant or exhibit significantly lower frequencies for Low RTN, High RAR and High RTN, Low RAR.Such results suggest that, based on the fund return volatility measure, loser bond funds do not increase risk or

significantly decrease risk and winner bond funds do not decrease risk or significantly increase risk over the short-term horizon.

We further employ the performance decomposition methodology to directly assess changes in the risk component of fund performance during the calendar year. The fund performance attributable to skill is the risk-adjusted return (α) from the multi-factor model and that due to risk ($Risk$) is the difference between the index-adjusted return and risk-adjusted return. Hence, $Risk$ captures the portion of the return performance attributable to fund risk taking. The underlying arguments for this test are the same as those for the volatility-ratio tests in Brown, Harlow, and Starks (1996) and Busse (2001). If poorly performing funds take more risks to improve performance after month M, these funds' $Risk$'s ought to increase over the second part of the year. Thus, we can use $Risk$ to gauge the probability of funds shifting risk between the two periods.

The methodology of return-based risk-shifting test follows closely the volatility-ratio based test. Within each classification category, we first sort funds into three groups based on raw cumulative returns during the first M months of the year to obtain winner and loser funds. We next compute the risk component of fund performance for winner and loser funds using risk-adjusted returns from the rolling-window multi-factor regressions over the previous three-year period. We compute the risk component of fund performance for winner and loser funds in the two periods of the year: before and after month M based on the index-adjusted returns and risk-adjusted returns. We sort winner and loser funds into three risk groups based on the risk component of fund performance during the first M months of the year, with the top-ranking funds defined as "High $Risk^1$" and the bottom ranking funds as "Low $Risk^1$". Similarly, we rank fund risks for the second part of the year and obtain funds with high ("High $Risk^2$") and low risks ("Low $Risk^2$"). This method also generates a 2x2 frequency table with the ($Risk^1$, $Risk^2$) pair.

If poorly performing bond funds take risk to improve performance, we expect to observe significantly higher than 25% frequency for Low $Risk^1$/High $Risk^2$ for these funds. Again, we employ a chi-square test to investigate the frequency of winning and losing funds in the high/low risk-taking category in the first M months moving into a high/low risk-taking category in the remaining 12-M months of the year. Unlike the volatility-ratio based test, the return-based test allows us to examine fund risk-shifting over a shorter window in the second part of the year. Table 1.8 reports two

evaluation periods based on the first 6- and 9-months of a calendar year, respectively: (6, 6) and (9, 3). In both panels of the table, we find significantly lower than 25% frequency for loser funds to move from Low $Risk^1$ to High $Risk^2$, or for winner funds to move from High $Risk^1$ to Low $Risk^2$. In fact, low risk loser funds tend to stay in the low risk category in the second period and high risk winner funds tend to stay in the high risk category in the second period. The results indicate that winner and loser bond funds do not move to different risk categories in the second part of the year.

To sum up, the results from both the standard volatility-ratio and return-based tests provide no evidence that bond funds systematically shift risks during the year based on prior six- to nine-month performance of the year. Unlike equity funds, bond funds do not seem to shift risks frequently over a short term.

1.4.2 Long-term Performance and Bond Fund Risk Taking

We now consider the possibility that bond fund managers may decide to take greater risks over time and that such risk-taking behavior could be more persistent than observed in equity mutual funds. Unlike equity fund risk taking, bond fund risk taking, in the form of increasing credit risk (lower credit quality) and/or increasing interest risk (longer maturity), can more reliably generate higher returns in normal market conditions. Competition pressure may motivate bond fund managers to take greater risks to outperform their benchmarks. In this case, longer term poor performance may induce bond funds to assume greater risk. To test this hypothesis, we examine the relation between fund performance over a longer time period of two to three years and fund risk taking in the subsequent period.

To measure fund risk-taking, we again employ the risk component of fund performance defined by the difference between the index-adjusted return and risk-adjusted return. We estimate risk-adjusted returns (α's) based on the rolling-window multi-factor regressions and then compute the risk component of fund performance for each month. Our main variable of interest is fund performance (index-adjusted return) over the past N-year period ($N = 2, 3$), and we intend to examine how fund performance over a longer period relates to fund risk taking.

We have shown previously that risk taking can have distinctive impacts on fund performance

during high and normal risk periods. Risk taking can lead to higher returns during normal credit risk periods, but leads to lower returns during high credit risk periods when such high risks are realized. In order to identify and sharpen the test on the relation between fund past performance and fund risk taking, we examine the relation separately for the high and normal risk periods. Examining the results from the two different credit risk periods will further reinforce our evidence that it is not driven by model specifications.

In our empirical analysis, if the Baa-Treasury spread is above 0.5 standard deviation from the mean in a given month, we classify that month as a high credit risk month. We use the Fama-MacBeth (1973) methodology and run the cross-sectional regression month by month, but compute the mean and t-value for normal credit risk periods and high credit risk periods, separately.

The cross-sectional regression is specified as follows,

$$\begin{aligned} Risk_{i,t} &= \beta_{1,i} + \beta_{2,i} Past\ Performance_{t-1} + \beta_{3,i} Exp_{t-1} + \beta_{4,i} Flow\ Rate_{t-1} \\ &\quad + \beta_{5,i} Log Family\ TNA_{t-1} + \beta_{6,i} Bond\ TNA/Family\ TNA_{t-1} + \beta_{7,i} LogAge_{t-1} \\ &\quad + \beta_{8,i} LogTNA_{t-1} + \epsilon_{i,t} \end{aligned} \tag{1.4}$$

where $Risk$ is the risk component of fund performance and is defined as the difference between the monthly index-adjusted return and its past N-year multi-factor model α, $Past\ Performance$ is the cumulative past performance relative to a benchmark (index-adjusted return), Exp is the ratio of a bond fund's operating expenses borne by shareholders to the total investment value and is expressed in percentage, $Flow\ Rate$ is the ratio of fund flow at t to its total net asset value (TNA) at $t-1$, Age is the number of years since the first formation date of a fund, $Family\ TNA$ is defined as the total TNA of all the funds within a mutual fund management firm, and $Bond\ TNA/Family\ TNA$ is the ratio of total TNA of the bond funds to the total TNA of all the mutual funds managed by an investment firm. The cross-sectional regressions also control for unreported fund style effects.

Table 1.9 reports Fama-MacBeth regression results. To ensure robustness of our results, we measure fund risk taking based on α's from 2-year and 3-year rolling-window regressions. The measurement period of past fund performance corresponds to the estimation period of α. We compute mean values of the estimation coefficients and their associated t-values for the normal

credit risk period and high credit risk period, separately. As shown in the table, past performance is significantly negatively related to the risk-component performance in both panels for normal credit risk periods, indicating that underperforming funds tend to take more risks. For high risk periods, past performance is positively and significantly related to fund risk taking, suggesting a different outcome from risk taking. Thus, underperformance induces funds to take greater risks, but such a strategy would result in lower returns especially in periods when credit risks are high. Our evidence is consistent across two assessment periods of α.

The results show a positive relation between fund flow and *Risk*; the coefficient of flowrate is consistently positive across all periods, but it is at least marginally significant in normal credit risk periods. In addition, bond funds in larger fund families tend to take more risks than their counterparts from smaller families. The larger the proportion of bond funds in a fund family, the more risk bond funds will take during normal risk periods. Government bond funds may have different risk exposures than corporate bond funds. For example, interest rate risk can be particularly important for this type of funds. We also separately examine the relation between fund performance and risk taking for government funds across high and normal risk periods, determined by term spreads (10-year Treasury bond yield and 3-month T-bill yield), and the results remain qualitatively similar.

Overall, this section provides evidence on the relation between long-term fund performance and fund risk taking. It is likely that bond fund managers may decide to increase fund risk exposures when fund performance lags their peers. Huang, Sialm, and Zhang (2011) find some evidence that poorly performing equity funds tend to increase risks over time. However, unlike equity fund risk taking, bond fund risk taking can have a more direct and reliable impact on bond fund performance. Competition pressure may motivate bond fund managers to take greater risks not only to beat their benchmarks, but also to outperform their peers. Hence, risk taking by some funds could improve the performance ranking of these funds and may motivate other funds to take risks as well. Consequently, the competition induced risk taking in bond funds could persist for longer periods and could permeate the bond fund industry.

1.4.3 Risk Taking and the Performance-Flow Relation

Existing research has documented that equity mutual fund investors chase past performance. These studies document an asymmetric flow-performance relation in that mutual fund investors tend to invest in funds with superior performance but not to adequately penalize poor performers (Chevalier and Ellison, 1997; Sirri and Tufano, 1998; Huang, Wei, and Yan, 2007; Ferreira et al., 2012). This asymmetric flow-performance relation can spur mutual funds to strategically alter risk levels to attract large new money flows (e.g., Brown, Harlow, and Starks, 1996; Chevalier and Ellison, 1997; and Koski and Pontiff, 1999; Goetzmann et al., 2007; Huang, Sialm, and Zheng, 2008). Berk and van Binsbergen (2015) show, however, that investors are unable to observe manager skills, mutual fund investors select funds mainly based on the funds' realized performance.

In this subsection, we evaluate whether fund managers take greater risks in order to improve performance and to attract flows of new money. If investors make their investment decisions based on a fund's raw performance (i.e., performance relative to a benchmark) rather than managerial skill (or risk-adjusted return), then their investment behavior could induce fund managers to make risky bets. We investigate whether risk-adjusted fund returns or raw bond fund performances influence the investment decisions of fund investors.

To examine the performance and fund flow relation for bond funds, we conduct Fama-Macbeth (1973) cross-sectional regressions to estimate the sensitivity of fund flows to risk-adjusted returns and raw returns of bond mutual funds, while controlling for fund characteristics such fund age and TNA. The model specification is as follows.

$$\begin{aligned} Flow\ Rate_{i,t} &= \beta_{1,i} + \beta_{2,i} Alpha_{t-1} + \beta_{3,i}(Raw_{t-1} - Bench_{t-1}) + \beta_{4,i} Exp_{t-1} + \beta_{5,i} LogAge_{t-1} \\ &\quad + \beta_{6,i} LogTNA_{t-1} + \epsilon_{i,t}. \end{aligned} \tag{1.5}$$

In (1.5), a bond fund's flow rate is computed by dividing the quarterly (yearly) flows by the beginning-of-quarter (year) TNA, where the quarterly (yearly) flow is defined as the sum of monthly flows within the quarter (year).[8] *Alpha* is obtained from the monthly 3-year rolling window multi-

[8]Each fund's flow is computed in the following manner. $Flow_{i,t} = TNA_{i,t} - TNA_{i,t-1} \times (1 + r_{i,t})$. Note that any assets acquired by a fund through mergers with other funds are excluded from the flow.

factor model regression, and $Raw_{t-1} - Bench_{t-1}$ is measured as a fund's monthly rolling window return difference relative to its benchmark. Both monthly *Alpha* and $(Raw - Bench)$ are accumulated on a quarterly or yearly basis to obtain their quarterly or yearly equivalents. We estimate regression model (1.5) for varying flow rates and return performances measured over three months, six months, and twelve months. Table 1.10 highlights only estimates of β_2 and β_3 coefficients together with their t-values.

The results suggest that investors respond positively to both risk-adjusted returns and raw returns. In particular, raw returns of bond funds are significantly positively related to subsequent fund flows, even after controlling for the effects of risk-adjusted returns, *Alpha*. The β_2 and β_3 coefficients are mostly positive and statistically significant for fund flows measured over a three-month and a six-month horizons, but their levels of statistical significance reduce when the flows are measured over a one-year horizon. Our evidence suggests that bond fund investors seem to reward rather than penalize risk-taking bond fund managers if such risk-taking behavior can help deliver higher returns.

1.5 Conclusion

Mutual fund companies and news media tend to report bond fund performance in comparison to bond index benchmarks. Based on this comparison, the performance of U.S. bond mutual funds has been impressive for the longer time period from 1998 to 2013 and especially after the financial crisis of 2008-2009. In this study, we examine risk exposures of bond mutual funds and how their risk exposures affect their performance. Using bond fund information from the CRSP survivor-bias-free U.S. mutual fund database, we show that bond funds typically outperform their investment-objective matched benchmarks at different times of our full sample period. Their return performance correlates negatively with the level of credit market risk. However, bond funds generate significantly negative risk-adjusted returns, which are substantially stable over time. The different performance results suggest that bond funds exhibit different risk characteristics from those of their benchmarks.

We show that the different performance results are due to risk taking rather than different risk

exposures caused by fund style misclassification or by time-varying manager skills. We disentangle the effects of manager skill and risk-taking on fund performance by decomposing fund performance into risk and skill components and exploit the 2008 financial crisis as a natural experiment to evaluate their relative contributions to fund performance. We find evidence of return reversals associated with the risk component, while the skill component remains fairly stable, between normal and high credit risk periods.

We examine the causes of bond fund risk taking. Fund risk taking seems to be persistent within a calendar year, indicating that short-term risk shifting may not account for the observed risk-taking behavior of bond funds. We argue that bond funds that have experienced poor performance over longer periods might have more incentives to take risks. Specifically, bond funds facing intense competition pressure may choose to elevate their risk exposures by increasing credit or interest rate risks of their bond holdings that could help engender greater returns. Consistent with this argument, we find that funds that have performed poorly over the past two or three-year periods take greater risks. Finally, we test whether bond funds take more risks in order to improve performance and to attract new fund flows. Our results suggest that fund flows are sensitive to bond fund raw returns, even after controlling for the effects of risk-adjusted fund returns. This evidence suggests that bond fund investors have little ability to distinguish bond fund managers who are skilful in selecting better performing bonds from those who take greater risks to help deliver higher returns.

Figure 1.1
Credit Spreads Across Time

This figure presents credit spreads measured using four methods across the sample period of 1998 to 2013. We construct both long-term and short-term credit spreads. AAAdif is measured as the yield difference between AAA corporate bonds and 10-year Treasury constant maturities. BAAdif is measured as the yield difference between BAA corporate bonds and 10-year Treasury constant maturities. We take the difference between the yield of 3-month financial or nonfinancial commercial paper and 3-month T-bill rate to construct Findif or Nonfindif.

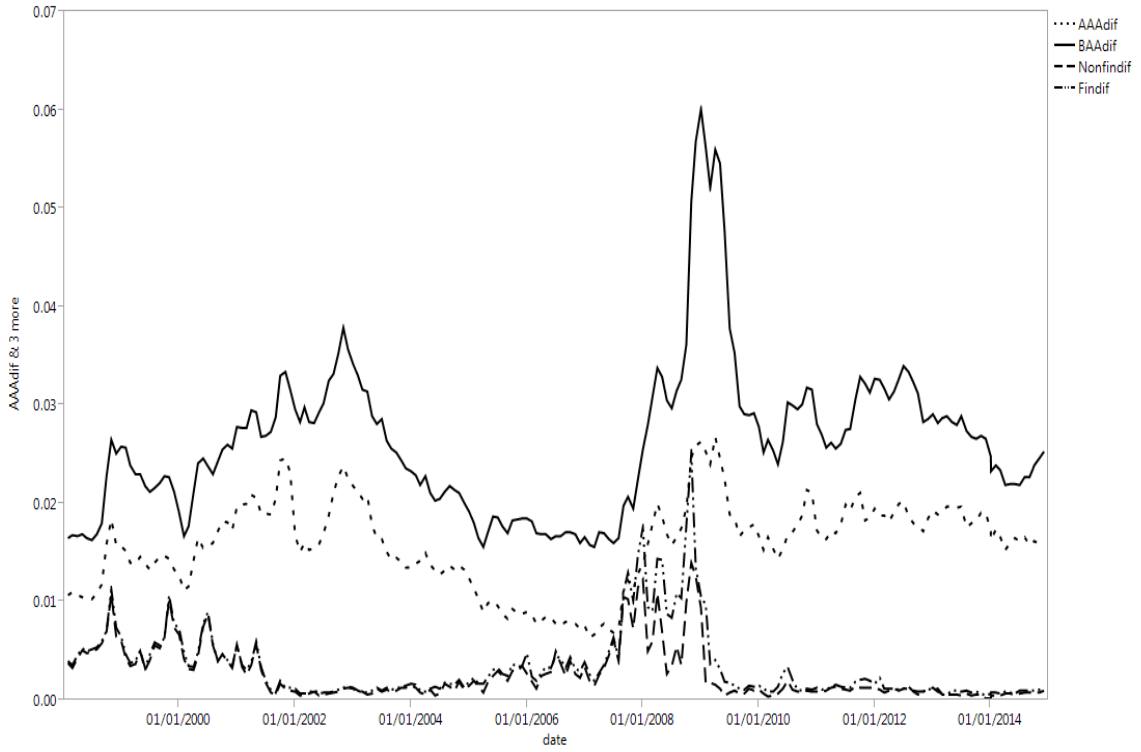

Table 1.1

Types of Bond Mutual Funds by Year

This table shows the number of funds within each classification category at the end of each year from 1998 to 2013. We use the CRSP objective code, Strategic Insight objective code, and Lipper objective code to classify funds into 10 types, which are further grouped into three broad categories, namely government bond funds (general, short maturity, and intermediate maturity funds), corporate bond funds (short maturity, intermediate maturity, high quality, BBB-rated, and high yield funds), and government/corporate bond funds (short and intermediate maturity funds).

		Government Bond Funds			Corporate Bond Funds					Gov/Corp Bond Funds	
Year	Total Number	General	Short Maturity	Intermed. Maturity	Short Maturity	Intermed. Maturity	High Quality	BBB Rated	High Yield	Short Maturity	Intermed. Maturity
1998	822	82	62	87	98	146	84	58	134	10	61
1999	867	82	63	88	98	149	90	60	145	15	77
2000	930	84	67	91	101	152	94	67	157	21	96
2001	904	79	64	81	95	140	94	75	154	22	100
2002	887	69	61	76	86	132	94	77	153	33	106
2003	853	64	59	70	81	124	89	76	148	36	106
2004	855	62	58	69	80	117	83	76	150	49	111
2005	835	62	58	66	78	110	78	70	150	52	111
2006	792	57	54	58	74	103	67	68	147	53	111
2007	816	57	49	57	73	99	61	71	156	56	137
2008	794	55	50	56	71	97	57	68	150	54	136
2009	773	55	45	52	70	92	53	63	147	54	142
2010	761	57	45	50	68	92	51	62	144	51	141
2011	774	55	45	50	64	92	48	65	153	49	153
2012	735	51	41	49	63	87	45	62	146	46	145
2013	700	48	39	45	61	84	44	60	143	41	135

Table 1.2
Summary Statistics of Bond Mutual Funds by Fund Type

This table reports the monthly mean, standard deviation, minimum, and maximum values for the fund return, expense and total net assets value under management (TNA) of bond funds within each classification. Return is the month-end total return per fund share; expense is the ratio of a fund's operating expenses borne by shareholders to the fund's TNA and is expressed in percentage, and TNA is shown in millions of dollars. All definitions of funds are contained in Appendix Table A1. For each reported measure, we first equal weight the measure across funds within a type in each month and then take an average of the equal-weighted measure across the whole sample period of 1993 to 2013.

	Return (%)				Expense (%)				TNA ($ Millions)			
Bond Type	Mean	Std Dev	Min	Max	Mean	Std Dev	Min	Max	Mean	Std Dev	Min	Max
Government Bond Funds												
General	0.396	1.423	-4.592	5.519	0.076	0.006	0.066	0.085	663.76	188.05	338.58	969.04
Short Maturity	0.269	0.383	-0.826	1.338	0.056	0.006	0.046	0.065	545.66	291.75	198.73	1113.31
Intermediate Maturity	0.355	0.824	-2.730	2.557	0.065	0.006	0.053	0.076	619.45	528.49	177.79	2041.46
Corporate Bond Funds												
Short Maturity	0.333	0.620	-2.255	1.932	0.058	0.003	0.053	0.063	1283.39	802.24	308.57	3085.51
Intermediate Maturity	0.423	1.009	-3.626	3.578	0.056	0.004	0.050	0.062	2756.98	1982.79	478.76	6976.09
High Quality	0.416	1.131	-4.638	3.660	0.066	0.003	0.060	0.072	1320.24	862.22	382.38	3016.11
BBB Rated	0.448	1.304	-5.929	4.987	0.074	0.005	0.065	0.082	711.93	406.24	334.48	1611.81
High Yield	0.484	2.507	-14.975	8.992	0.090	0.006	0.079	0.099	968.71	386.35	511.94	1986.17
Gov/Corp Bond Funds												
Short Maturity	0.294	0.562	-2.481	1.560	0.057	0.006	0.045	0.068	379.72	261.61	93.88	999.88
Intermediate Maturity	0.394	1.089	-5.289	3.530	0.075	0.011	0.064	0.102	924.90	682.32	272.54	2686.10

Table 1.3
Performance of Bond Funds Relative to their Comparable Benchmarks by Year

This table reports bond fund performance measured relative to their benchmark indexes along with the percentage of outperforming funds for each year from 1998 to 2013. Panel A presents the net return performance of bond funds measured after deducting expenses, and Panel B displays gross return performance measured before expenses. The return difference (Diff) is computed as the difference in one-year buy and hold returns between each classification type and its benchmark index, and * denotes a significant difference at the 5% level. In each category, the total number of funds that outperform their comparable benchmarks (Outperf) and Diff are expressed in percentage.

	Government Bond Funds						Corporate Bond Funds										Gov/Corp Bond Funds			
	General		Short Maturity		Intermed. Maturity		Short Maturity		Intermed. Maturity		High Quality		BBB Rated		High Yield		Short Maturity		Intermed. Maturity	
Year	Diff(%)	Out-perf(%)	Diff(%)	Out-perf(%)	Diff(%)	Out-funds(%)	Diff(%)	Out-perf(%)	Diff(%)	Out-perf(%)	Diff(%)	Out-perf(%)	Diff(%)	Out-perf(%)	Diff(%)	Out-perf(%)	Diff(%)	Out-perf(%)	Diff(%)	Out-perf(%)
Panel A: Returns Measured after Expenses																				
1998	-0.859*	25.00	-0.750*	17.74	-1.193*	14.12	-0.588*	20.41	-0.762*	37.76	-1.227*	16.25	-1.177*	37.50	-2.004*	37.61	-0.470	42.86	-4.763*	6.67
1999	-1.355*	30.49	-0.649*	25.40	-1.013*	27.59	-1.603*	10.20	-1.234*	14.38	0.166	55.29	0.858*	50.00	2.306*	69.63	-1.287*	25.00	0.773*	50.00
2000	-0.386	22.37	-0.421*	30.51	-0.110	46.34	0.156	58.06	0.635*	72.46	-0.110	54.55	1.034*	73.21	-1.472*	39.85	0.145	46.67	-3.922*	31.94
2001	-1.056*	22.06	-1.475*	1.72	-0.941*	14.86	-1.845*	4.65	-1.968*	3.85	-2.101*	7.06	-2.045*	9.84	-2.930*	29.41	-1.620*	5.26	-2.262*	11.36
2002	-0.939*	24.19	-0.601*	33.33	-0.391*	47.83	-1.615*	29.63	-1.558*	21.95	-2.583*	9.52	-0.737*	46.38	0.213	57.14	-1.074*	22.73	-1.916*	16.09
2003	-0.739*	24.19	-0.447*	29.31	-0.067	36.76	-0.800*	15.19	-2.299*	9.40	-0.789*	27.50	-3.755*	15.49	-4.356*	18.12	0.129	45.45	3.102*	57.45
2004	0.147	38.33	0.077	61.40	0.306*	55.38	0.384*	57.14	-0.316*	34.55	-0.279*	26.67	-1.155*	17.65	-0.948*	22.30	0.583*	63.89	1.887*	85.26
2005	0.064	22.22	0.023	44.44	-0.038	43.86	-0.369*	21.62	0.683*	89.32	-0.123	31.82	1.123*	90.48	-0.054	47.89	0.016	43.18	0.384*	71.57
2006	-0.755*	30.77	0.078	44.90	0.213*	74.55	-0.255	15.07	-0.236*	24.49	-0.054	32.20	0.387*	45.00	-1.557*	15.38	0.244*	54.35	1.023*	67.33
2007	-1.143*	28.30	-1.736*	8.16	-2.354*	7.27	-0.814*	23.94	0.641*	73.40	-0.375	50.00	0.419	70.15	-0.482	57.86	-2.759*	1.89	-2.826*	7.14
2008	-1.395	28.85	-3.424*	15.56	-5.356*	9.62	-3.039*	40.00	2.810*	70.33	-4.239*	42.59	3.944*	59.68	-0.281	60.00	-12.565*	4.00	-12.558*	12.30
2009	0.888	71.15	2.519*	86.36	5.011*	94.00	-0.970	33.82	-5.487*	10.11	1.863*	44.00	-10.278*	16.95	-8.977*	11.28	6.487*	91.49	9.526*	90.91
2010	1.089*	60.00	0.076	44.19	-0.372	34.69	0.731*	54.69	-0.549*	33.71	0.203	46.67	-1.074*	33.33	-0.768*	28.47	1.817*	77.78	2.226*	82.54
2011	3.138*	41.18	-0.071	45.00	-1.020*	36.73	0.782*	61.90	0.967*	75.29	-0.469	17.78	-1.714*	11.86	-2.037*	17.65	0.297	50.00	-0.857	51.11
2012	0.989*	67.35	0.781*	69.23	1.279*	78.26	0.558*	55.74	-1.893*	21.18	-0.764*	31.82	-1.541*	35.00	-1.022*	28.47	2.919*	95.12	4.198*	88.89
2013	-3.182*	37.50	-0.601*	7.69	-0.546	35.71	-0.453	15.00	-1.432*	16.25	0.393	57.14	-0.301	50.85	-0.600*	33.81	0.291	50.00	0.656*	46.92
All	-0.343	35.87	-0.414	35.31	-0.412	41.10	-0.609*	32.32	-0.750	38.03	-0.656*	34.43	-1.001	41.46	-1.561*	35.93	-0.428	44.98	-0.333	48.59

Table 1.3 - Continued
Performance of Bond Funds Relative to their Comparable Benchmarks by Year

	Government Bond Funds						Corporate Bond Funds										Gov/Corp Bond Funds			
	General		Short Maturity		Intermed. Maturity		Short Maturity		Intermed. Maturity		High Quality		BBB Rated		High Yield		Short Maturity		Intermed. Maturity	
Year	Diff(%)	Out-perf(%)	Diff(%)	Out-perf(%)	Diff(%)	Out-funds(%)	Diff(%)	Out-perf(%)	Diff(%)	Out-perf(%)	Diff(%)	Out-perf(%)	Diff(%)	Out-perf(%)	Diff(%)	Out-perf(%)	Diff(%)	Out-perf(%)	Diff(%)	Out-perf(%)
Panel B: Returns Measured before Expenses																				
1998	0.094	37.50	-0.036	46.77	-0.308*	44.71	0.145	55.10	-0.037	62.94	-0.415*	37.50	-0.247	58.33	-0.889*	47.71	0.646	14.29	-3.466*	13.33
1999	-0.397	57.32	0.109	60.32	-0.130	41.38	-0.872*	21.43	-0.520*	31.51	0.965*	77.65	1.765*	68.97	3.485*	81.48	-0.742	33.33	1.939*	58.06
2000	0.573*	44.74	0.332*	67.80	0.743*	70.73	0.862*	81.72	1.279*	81.16	0.685*	71.59	1.964*	80.36	-0.323	48.12	0.802*	66.67	-3.164*	37.50
2001	-0.080	61.76	-0.723*	17.24	-0.076	52.70	-1.113*	11.63	-1.256*	14.62	-1.260*	14.12	-1.047*	26.23	-1.854*	39.71	-0.945*	42.11	-1.340*	22.73
2002	0.037	40.32	0.075	61.40	0.407*	69.57	-0.887*	40.74	-0.845*	45.53	-1.719*	19.05	0.234	65.22	1.366*	67.67	-0.327	40.91	-0.977*	33.33
2003	0.262*	67.74	0.275*	60.34	0.745*	86.76	-0.078	34.18	-1.577*	11.97	0.060	45.00	-2.717*	19.72	-3.225*	22.46	0.975*	75.76	4.074*	75.53
2004	1.135*	83.33	0.788*	91.23	1.104*	86.15	1.098*	90.91	0.398*	70.91	0.549*	74.67	-0.195	32.35	0.195	51.80	1.436*	97.22	2.799*	92.63
2005	1.018*	77.78	0.736*	92.59	0.754*	82.46	0.328*	78.38	1.363*	98.06	0.649*	81.82	2.043*	98.41	1.014*	77.46	0.828*	90.91	1.273*	92.16
2006	0.206	71.15	0.732*	95.92	0.997*	96.36	0.422*	79.45	0.428*	74.49	0.756*	86.44	1.302*	90.00	-0.460*	37.76	0.944*	97.83	1.878*	100.00
2007	-0.271	32.08	-1.105*	16.33	-1.613*	9.09	-0.135	50.70	1.298*	87.23	0.419	71.43	1.251*	77.61	0.556	86.43	-2.109*	7.55	-2.089*	14.29
2008	-0.547	30.77	-2.800*	26.67	-4.640*	13.46	-2.367*	45.71	3.532*	72.53	-3.471*	50.00	4.835*	62.90	0.669	65.00	-11.923*	6.00	-11.128*	14.75
2009	1.734	73.08	3.131*	93.18	5.744*	94.00	-0.292	41.18	-4.835*	14.61	2.653*	54.00	-9.526*	22.03	-8.016*	14.29	7.140*	93.62	10.335*	92.56
2010	2.086*	80.00	0.680*	74.42	0.343	53.06	1.406*	62.50	0.036	48.31	0.988*	62.22	-0.248	45.00	0.225	52.55	2.459*	88.89	2.964*	85.71
2011	4.400*	41.18	0.511*	75.00	-0.327	46.94	1.442*	84.13	1.600*	78.82	0.258	33.33	-0.928	15.25	-1.055*	44.85	0.923*	70.45	-0.051	62.22
2012	1.867*	85.71	1.350*	100.00	1.963*	93.48	1.213*	63.93	-1.322*	24.71	-0.031	43.18	-0.750	45.00	-0.054	50.00	3.327*	92.68	4.885*	91.85
2013	-2.513*	54.17	-0.047	35.90	0.095	52.38	0.185	35.00	-0.880*	22.50	1.117*	78.57	0.482	66.10	0.372*	57.55	0.913*	77.50	1.374*	65.38
All	0.600	58.66	0.251	63.44	0.363	62.08	0.085	54.79	-0.084	52.49	0.138	56.29	-0.111	54.59	-0.499	52.80	0.272	62.23	0.582	59.50

Table 1.4
Results from Multi-Factor Regression Models

This table summarizes results from the OLS regression of a fund's excess return $(r - r_f)$ against the excess return of the aggregate bond fund index $(Agg - r_f)$, default spread (Def), term spread $(Term)$, and excess return of SP500 $(SP500 - r_f)$,

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_{1,i}(Agg_t - r_{f,t}) + \beta_{2,i}Def_t + \beta_{3,i}Term_t + \beta_{4,i}(SP500_t - r_{f,t}) + \epsilon_{i,t},$$

for the sample period of 1998 to 2013. Agg proxies for the average returns of the aggregate bond market and captures the marketwide risk, Def is the difference in returns between the high-yield index and intermediate government index, $Term$ is the return spread between the intermediate term and short term government bond indexes. Only funds that have at least 24 observations in the sample period are included in the analysis. For each bond type, the table shows the cross-sectional average of α (Alpha) estimate with its associated t-value and the percentages of positive/negative Alphas with the percentage of significant Alphas at the 5% level shown in parentheses. It also reports cross-sectional averages of beta coefficient estimates with their associated t-values. Panel A presents results for net returns measured after expenses, and Panel B shows their gross returns counterparts.

	Estimates of Alphas											
Bond Type	Mean	t-value	% of Pos α	% of Neg α	β_1	t-value	β_2	t-value	β_3	t-value	β_4	t-value
Panel A: Returns Measured after Expenses												
Government Bond Funds												
General	-0.090	-6.96	12.75 (1.96)	87.25 (39.22)	0.933	13.68	-0.040	-3.13	0.645	4.25	-0.020	-3.94
Short Maturity	-0.018	-2.73	42.86 (10.39)	57.14 (19.48)	0.433	18.78	-0.032	-8.59	-0.282	-7.07	-0.003	-2.81
Intermediate Maturity	-0.050	-5.89	21.43 (2.04)	78.57 (34.69)	0.728	24.90	-0.028	-3.60	0.164	2.34	0.005	0.67
Corporate Bond Funds												
Short Maturity	-0.022	-3.49	39.42 (4.81)	60.58 (17.31)	0.591	6.00	0.048	2.24	-0.023	-0.06	0.013	1.02
Intermediate Maturity	-0.061	-8.57	18.18 (1.21)	81.82 (38.79)	1.031	37.95	0.068	9.56	-0.123	-2.64	0.004	1.36
High Quality	-0.085	-10.86	6.90 (0.00)	93.10 (54.31)	1.128	27.35	0.076	9.36	-0.062	-0.94	0.001	0.35
BBB Rated	-0.114	-10.00	11.01 (0.00)	88.99 (44.04)	1.408	16.96	0.147	9.18	-0.470	-3.62	0.021	2.20
High Yield	-0.063	-3.43	45.64 (9.54)	54.36 (13.28)	0.465	11.84	0.768	53.17	0.258	2.92	0.054	9.18
Gov/Corp Bond Funds												
Short Maturity	-0.034	-1.49	44.16 (10.39)	55.84 (16.88)	0.524	13.34	0.049	5.35	-0.354	-4.45	0.009	1.34
Intermediate Maturity	-0.074	-4.31	28.88 (6.90)	71.12 (26.72)	0.979	25.05	0.156	11.87	-0.212	-2.77	0.031	7.13
Panel B: Returns Measured before Expenses												
Government Bond Funds												
General	-0.015	-1.17	50.50 (14.85)	49.50 (1.98)	0.953	14.35	-0.043	-3.50	0.636	4.16	-0.020	-3.91
Short Maturity	0.043	8.93	87.01 (54.55)	12.99 (1.30)	0.437	19.13	-0.033	-8.64	-0.294	-7.25	-0.003	-2.40
Intermediate Maturity	0.030	3.88	73.47 (36.73)	26.53 (2.04)	0.726	24.06	-0.023	-1.97	0.196	2.55	0.001	0.36
Corporate Bond Funds												
Short Maturity	0.038	6.65	85.58 (34.62)	14.42 (1.92)	0.593	6.00	0.048	2.23	-0.026	-0.07	0.013	1.02
Intermediate Maturity	-0.002	-0.30	59.39 (13.33)	40.61 (6.67)	1.032	36.49	0.069	9.75	-0.122	-2.59	0.004	1.35
High Quality	-0.020	-2.37	41.38 (7.76)	58.62 (9.48)	1.127	26.65	0.077	9.49	-0.057	-0.84	0.000	0.22
BBB Rated	-0.043	-3.73	37.96 (4.63)	62.04 (9.26)	1.411	16.82	0.144	9.08	-0.476	-3.67	0.022	2.27
High Yield	0.018	0.76	68.75 (27.92)	31.25 (5.42)	0.458	12.31	0.773	51.70	0.278	3.39	0.052	9.61
Gov/Corp Bond Funds												
Short Maturity	0.024	1.04	74.03 (33.77)	25.97 (3.90)	0.515	12.98	0.051	5.67	-0.337	-4.10	0.009	1.44
Intermediate Maturity	-0.008	-0.45	56.28 (16.88)	43.72 (6.93)	0.999	24.77	0.155	12.00	-0.214	-2.78	0.030	7.38

Table 1.5

Alphas from Rolling-Window Multi-Factor Regression Models

This table summarizes results from three-year monthly rolling window OLS regressions of a fund's excess return ($r - r_f$) against the excess return of aggregate bond fund index ($Agg - r_f$), default spread (Def), term spread ($Term$), and excess return of SP500 ($SP500 - r_f$),

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_{1,i}(Agg_t - r_{f,t}) + \beta_{2,i}Def_t + \beta_{3,i}Term_t + \beta_{4,i}(SP500_t - r_{f,t}) + \epsilon_{i,t},$$

for the sample period of 1998 to 2013. Agg proxies for the average returns of the aggregate bond market and captures the marketwide risk, Def is the difference in returns between high-yield index and intermediate government index, $Term$ is the return spread between intermediate term government bond index and short term government bond index. Only funds that have at least 24 observations in the sample period are included in the analysis. For each bond type, the table shows the cross-sectional average of α (Alpha) estimates with its associated t-value by year.

	Government Bond Funds						Corporate Bond Funds										Gov/Corp Bond Funds			
	General		Short Maturity		Intermed. Maturity		Short Maturity		Intermed. Maturity		High Quality		BBB Rated		High Yield		Short Maturity		Intermed. Maturity	
Year	Alpha	t-value	Alpha	t-value	Alpha	t-value	Alpha	t-value	Alpha	t-value	Alpha	t-value	Alpha	t-value	Alpha	t-value	Alpha	t-value	Alpha	t-value
2001	-0.077	-21.27	-0.025	-11.86	-0.053	-47.66	0.008	4.36	-0.045	-23.36	-0.070	-36.71	-0.078	-11.51	-0.106	-18.26	0.018	5.69	-0.091	-8.45
2002	-0.056	-14.07	-0.028	-24.34	-0.056	-38.76	-0.017	-5.01	-0.055	-17.08	-0.067	-50.30	-0.094	-12.06	-0.124	-12.26	0.003	1.68	-0.050	-10.93
2003	-0.148	-16.49	-0.001	-0.23	-0.045	-10.18	-0.001	-0.09	-0.054	-11.50	-0.075	-15.05	-0.084	-5.54	-0.095	-3.74	0.032	4.75	-0.018	-1.10
2004	-0.160	-28.56	0.017	5.30	-0.026	-17.39	0.007	1.42	-0.046	-24.23	-0.073	-35.83	-0.069	-15.99	0.084	10.90	0.050	14.97	0.027	11.49
2005	-0.068	-25.39	-0.028	-5.30	-0.045	-10.81	-0.030	-20.74	-0.045	-18.80	-0.055	-16.03	-0.066	-15.67	0.041	2.73	0.012	2.23	0.013	3.24
2006	-0.043	-19.25	-0.072	-90.14	-0.077	-59.13	-0.054	-40.52	-0.040	-99.58	-0.034	-27.95	-0.054	-57.14	-0.049	-7.12	-0.035	-19.88	-0.024	-13.86
2007	-0.029	-18.07	-0.067	-20.15	-0.064	-30.22	-0.058	-26.66	-0.038	-54.70	-0.035	-22.40	-0.046	-15.28	-0.067	-25.59	-0.053	-46.47	-0.034	-17.82
2008	-0.060	-17.87	-0.018	-5.23	-0.033	-10.71	-0.048	-5.12	-0.055	-7.84	-0.103	-10.33	-0.081	-6.93	-0.034	-11.62	-0.086	-6.73	-0.091	-7.30
2009	-0.074	-31.70	0.000	-0.03	-0.014	-2.20	-0.085	-13.13	-0.090	-17.85	-0.181	-52.46	-0.186	-45.18	-0.087	-14.68	-0.181	-36.50	-0.193	-48.74
2010	-0.103	-9.20	0.050	9.96	0.049	11.95	-0.034	-3.85	-0.046	-8.49	-0.165	-58.54	-0.190	-32.53	-0.010	-0.54	-0.079	-3.43	-0.128	-6.62
2011	-0.138	-13.26	0.064	8.69	0.066	10.80	0.036	3.21	-0.004	-0.61	-0.093	-7.51	-0.158	-23.96	0.099	8.95	0.073	5.93	-0.027	-3.55
2012	0.069	10.90	-0.010	-3.51	-0.007	-2.09	-0.036	-11.77	-0.046	-8.46	-0.066	-10.72	-0.140	-13.16	-0.040	-3.13	0.006	2.22	-0.083	-21.76
2013	0.090	15.33	-0.008	-3.11	-0.016	-3.25	-0.004	-2.33	-0.025	-8.71	-0.034	-9.95	-0.079	-15.42	-0.030	-7.88	0.032	11.86	-0.054	-12.15

Table 1.6

Multi-Factor Regression Models with High Credit Risk Indicator

This table summarizes results from the OLS regression of a fund's excess return $(r - r_f)$ against the excess return of aggregate bond fund index $(Agg - r_f)$, default spread (Def), term spread $(Term)$, excess return of SP500 $(SP500 - r_f)$, and high credit risk indicator$(HRisk)$,

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_{1,i}(Agg_t - r_{f,t}) + \beta_{2,i}Def_t + \beta_{3,i}Term_t + \beta_{4,i}(SP500_t - r_{f,t}) + \beta_{5,i}HRisk_t + \epsilon_{i,t},$$

for the sample period of 1998 to 2013. Agg proxies for the average returns of the aggregate bond market and captures the marketwide risk, Def is the difference in returns between the high-yield index and intermediate government index, $Term$ is the return spread between intermediate term and short term government bond indexes. Credit risk is measured as the yield spread between BAA corporate bonds minus 10-year Treasury constant maturities. High credit risk indicator is 1 if the credit risk of the month is greater than one standard deviation above the mean and 0 otherwise. Only funds that have at least 24 observations in the sample period are included in the analysis. For each bond type, the table shows the cross-sectional average of α (Alpha) estimate with its associated t-value and the percentages of positive/negative Alpha estimates with those significant at the 5% level shown in parentheses. It also reports cross-sectional average of the high credit indicator coefficient with its associated t-value and the percentages of positive/negative high credit indicator estimates with those significant at the 5% level shown in parentheses.

	Estimates of Alphas				Estimates of High Credit Risk Indicator			
Bond Type	Mean	t-value	% of Pos α	% of Neg α	Mean	t-value	% of Pos β_5	% of Neg β_5
Government Bond Funds								
General	-0.085	-7.09	11.76 (0.00)	88.24 (39.22)	-0.064	-1.84	38.24 (6.86)	36.27 (3.92)
Short Maturity	-0.020	-3.25	41.56 (3.90)	58.44 (19.48)	0.032	2.12	58.44 (20.78)	19.48 (3.90)
Intermediate Maturity	-0.051	-6.38	18.37 (0.00)	81.63 (35.71)	0.005	0.19	53.06 (14.29)	25.51 (4.08)
Corporate Bond Funds								
Short Maturity	-0.018	-3.37	39.42 (3.85)	60.58 (14.42)	-0.044	-1.70	40.38 (5.77)	40.38 (7.69)
Intermediate Maturity	-0.057	-8.34	16.97 (1.21)	83.03 (35.15)	-0.076	-2.82	33.94 (6.67)	44.85 (14.55)
High Quality	-0.078	-10.99	7.76 (0.00)	92.24 (50.00)	-0.107	-3.08	32.76 (3.45)	47.41 (14.66)
BBB Rated	-0.106	-9.97	8.26 (0.00)	91.74 (43.12)	-0.110	-3.50	30.28 (4.59)	52.29 (13.76)
High Yield	-0.045	-2.99	50.21 (10.37)	49.79 (12.45)	-0.191	-2.82	27.39 (3.32)	47.30 (8.30)
Gov/Corp Bond Funds								
Short Maturity	-0.017	-1.13	48.05 (6.49)	51.95 (14.29)	-0.161	-1.69	42.86 (9.09)	36.36 (14.29)
Intermediate Maturity	-0.056	-3.65	30.17 (5.6)	69.83 (25.00)	-0.122	-2.81	33.19 (7.76)	38.79 (12.07)

Table 1.7

Bond Fund Risk- and Skill-Component Performance of Bond Funds Across Credit Risk Periods

This table evaluates bond fund risk- and skill-component performances (in %) across subperiods. The skill-component performance is defined as the alpha obtained from a multi-factor regression for the subperiod of 2003:8-2005:7, 2005:8-2007:7, or 2007:8-2009:7. The first two subperiods dictate normal credit risk periods, whereas the third is the high credit risk period. The risk-component performance is defined as the difference between the raw relative return and alpha. In Panel A (Panel B), we rank all the funds within each bond style into three groups based on the risk-component (skill-component) performance of the first subperiod (i.e., 2003:8-2005:7). We next compute the average of their risk-component (skill-component) performance for the subsequent subperiod (i.e., 2005:8-2007:7). We repeat the procedure for the next subperiod. The table also reports the difference in risk-component (skill-component) returns between pre-ranking and post-ranking periods and between best- and worst-performing funds.

Table 1.7-Continued
Bond Fund Risk- and Skill-Component Performance of Bond Funds Across Credit Risk Periods

Panel A: Risk-Component Performance of Funds by Style

		Pre-Normal and Post-Normal Credit Risk Periods				Pre-Normal and Post-High Credit Risk Periods			
		Pre: 2003:08-2005:07		Post: 2005:08-2007:07		Pre: 2005:08-2007:07		Post: 2007:8-2009:7	
Bond Type	Performance	*Risk*	t-value	*Risk*	t-value	*Risk*	t-value	*Risk*	t-value
Government Bond Funds									
General	Low	-0.113	-7.73	-0.025	-0.75	-0.165	-7.27	0.302	2.39
	2	0.019	2.50	-0.010	-1.03	-0.032	-8.08	-0.020	-0.94
	High	0.451	5.83	-0.076	-1.95	0.087	6.49	-0.299	-4.29
	High-Low	0.564	7.17	-0.051	-0.99	0.252	9.78	-0.602	-4.27
Short Maturity	Low	-0.029	-7.50	-0.029	-4.99	-0.058	-9.68	-0.017	-0.59
	2	0.029	5.34	-0.005	-0.63	-0.013	-3.88	-0.039	-2.69
	High	0.195	8.63	0.053	0.81	0.119	4.56	-0.495	-5.72
	High-Low	0.224	9.78	0.082	1.24	0.176	6.61	-0.478	-5.26
Intermediate Maturity	Low	-0.054	-5.38	-0.023	-3.86	-0.092	-4.08	-0.007	-0.21
	2	0.081	9.26	-0.002	-0.22	-0.019	-5.80	-0.072	-3.55
	High	0.248	16.42	0.049	1.87	0.101	4.27	-0.354	-3.38
	High-Low	0.301	16.66	0.071	2.67	0.193	5.90	-0.348	-3.17
Corporate Bond Funds									
Short Maturity	Low	-0.028	-6.00	-0.023	-1.84	-0.059	-5.32	0.086	3.91
	2	0.086	9.17	0.014	1.85	0.019	4.36	-0.038	-2.31
	High	0.336	11.36	0.180	4.79	0.206	6.01	-0.537	-5.21
	High-Low	0.363	12.15	0.203	5.13	0.266	7.36	-0.623	-5.91
Intermediate Maturity	Low	-0.075	-5.54	0.024	1.47	-0.051	-5.17	0.253	6.28
	2	0.072	11.05	0.041	4.72	0.053	10.36	0.044	2.35
	High	0.241	12.68	0.125	5.49	0.197	11.40	-0.184	-3.70
	High-Low	0.317	13.53	0.102	3.62	0.248	12.46	-0.436	-6.83
High Quality	Low	-0.091	-3.94	0.020	0.97	0.002	0.15	0.191	6.39
	2	0.055	7.23	0.069	6.16	0.096	13.88	0.005	0.18
	High	0.372	6.67	0.256	6.44	0.301	7.53	-0.365	-2.87
	High-Low	0.463	7.45	0.236	5.17	0.300	7.24	-0.556	-4.26
BBB Rated	Low	-0.230	-13.64	0.092	3.70	-0.027	-1.06	0.008	0.15
	2	0.031	1.80	0.146	8.14	0.139	15.76	0.068	1.44
	High	0.331	10.04	0.257	6.18	0.335	17.09	-0.326	-4.79
	High-Low	0.561	15.14	0.165	3.40	0.362	11.36	-0.334	-3.84
High Yield	Low	-0.279	-11.10	-0.023	-0.94	-0.108	-9.14	-0.050	-1.27
	2	-0.076	-13.46	0.018	2.41	0.010	2.65	-0.184	-10.85
	High	0.258	2.33	0.219	2.12	0.427	3.37	-0.879	-3.73
	High-Low	0.537	4.72	0.242	2.28	0.535	4.21	-0.830	-3.47
Gov/Corp Bond Funds									
Short Maturity	Low	-0.044	-5.74	-0.009	-0.74	-0.096	-3.74	-0.059	-2.99
	2	0.106	9.54	0.043	3.54	0.038	4.17	-0.207	-6.15
	High	0.512	2.20	0.415	1.70	0.460	2.18	-1.208	-2.32
	High-Low	0.556	2.39	0.425	1.73	0.556	2.62	-1.150	-2.21
Intermediate Maturity	Low	0.041	3.13	0.027	1.59	-0.268	-3.39	0.020	0.88
	2	0.197	21.15	0.043	2.91	0.035	6.15	-0.105	-4.72
	High	0.707	3.86	0.314	1.64	0.415	2.83	-0.851	-2.35
	High-Low	0.666	3.63	0.287	1.49	0.683	4.05	-0.871	-2.35

Table 1.7-Continued
Bond Fund Risk- and Skill-Component Performance of Bond Funds Across Credit Risk Periods

Panel B: Skill-Component Performance of Funds by Style								
		Pre-Normal and Post-Normal Credit Risk Periods				Pre-Normal and Post-High Credit Risk Periods			
		Pre: 2003:08-2005:07		Post: 2005:08-2007:07		Pre: 2005:08-2007:07		Post: 2007:8-2009:7	
Bond Type	Performance	*Risk*	t-value	*Risk*	t-value	*Risk*	t-value	*Risk*	t-value
Government Bond Funds									
General	Low	-0.157	-6.67	-0.082	-4.43	-0.148	-9.98	-0.213	-1.79
	2	-0.014	-2.31	-0.056	-6.36	-0.053	-12.72	-0.016	-0.40
	High	0.256	5.46	-0.028	-1.27	0.018	2.72	-0.100	-1.64
	High-Low	0.413	7.87	0.055	1.92	0.166	10.24	0.113	0.84
Short Maturity	Low	-0.158	-12.65	-0.088	-3.92	-0.083	-9.75	-0.052	-0.35
	2	-0.096	-18.96	-0.042	-10.86	-0.043	-15.35	0.093	3.77
	High	0.001	0.11	-0.018	-2.04	-0.007	-2.30	-0.014	-0.24
	High-Low	0.159	10.04	0.071	2.93	0.077	8.51	0.038	0.24
Intermediate Maturity	Low	-0.153	-25.75	-0.064	-7.74	-0.098	-8.74	-0.008	-0.09
	2	-0.085	-15.83	-0.054	-9.14	-0.047	-15.74	0.086	5.37
	High	0.010	0.98	-0.015	-2.11	-0.003	-0.66	-0.021	-0.35
	High-Low	0.163	13.45	0.050	4.57	0.095	8.00	-0.013	-0.12
Corporate Bond Funds									
Short Maturity	Low	-0.143	-34.73	-0.048	-6.98	-0.077	-13.54	-0.085	-1.61
	2	-0.090	-26.01	-0.035	-7.01	-0.033	-16.68	-0.167	-3.03
	High	-0.012	-1.37	0.005	0.25	0.027	1.70	-0.066	-0.89
	High-Low	0.130	13.13	0.053	2.65	0.105	5.94	0.019	0.20
Intermediate Maturity	Low	-0.132	-11.14	-0.063	-7.83	-0.083	-16.11	-0.216	-3.42
	2	-0.038	-10.06	-0.027	-5.71	-0.025	-10.96	-0.113	-3.97
	High	0.057	10.00	-0.003	-0.28	0.029	4.60	0.015	0.22
	High-Low	0.189	14.38	0.061	4.82	0.112	13.83	0.231	2.48
High Quality	Low	-0.104	-16.24	-0.056	-8.33	-0.094	-9.62	-0.301	-2.51
	2	-0.033	-7.45	-0.050	-7.83	-0.041	-12.16	-0.264	-4.60
	High	0.100	4.00	-0.011	-1.64	0.013	1.09	-0.310	-2.41
	High-Low	0.204	7.88	0.045	4.75	0.107	6.89	-0.009	-0.05
BBB Rated	Low	-0.187	-6.75	-0.098	-10.05	-0.119	-36.57	-0.246	-3.69
	2	-0.054	-7.91	-0.009	-0.48	-0.042	-7.51	-0.296	-4.45
	High	0.047	4.31	0.017	0.52	0.160	3.63	-0.256	-2.08
	High-Low	0.234	7.86	0.115	3.43	0.279	5.97	-0.010	-0.07
High Yield	Low	-0.274	-22.92	-0.063	-3.02	-0.141	-20.52	-0.172	-1.68
	2	-0.123	-21.98	-0.025	-1.78	-0.023	-4.19	-0.042	-1.75
	High	0.088	1.89	0.017	0.75	0.170	5.95	-0.065	-0.78
	High-Low	0.362	7.56	0.080	2.60	0.310	10.58	0.107	0.81
Gov/Corp Bond Funds									
Short Maturity	Low	-0.138	-14.62	-0.058	-6.48	-0.088	-13.21	-0.223	-1.28
	2	-0.053	-4.41	-0.036	-4.17	-0.036	-11.01	-0.092	-2.10
	High	0.087	3.58	0.019	0.86	0.030	2.86	-0.090	-2.22
	High-Low	0.225	8.65	0.078	3.19	0.117	9.50	0.133	0.74
Intermediate Maturity	Low	-0.147	-12.21	-0.036	-2.01	-0.106	-5.54	-0.211	-2.85
	2	-0.038	-9.16	-0.015	-1.55	-0.020	-5.30	-0.133	-4.08
	High	0.088	5.39	0.035	1.34	0.127	7.37	-0.123	-1.91
	High-Low	0.235	11.57	0.071	2.25	0.234	9.07	0.088	0.90

Table 1.8

Bond Fund Short-Term Performance and Risk

This table presents results of 2x2 classification of frequency distribution for two ranking-order variables and their associated p-value. In the first panel, we use first M-month cumulative returns (RTN) and risk adjustment ratio (RAR) to form high and low ranking groups separately. In this way, we will have four pairs: (high RTN, low RAR), (high RTN, high RAR), (low RTN, low RAR) and (low RTN, high RAR). RAR is defined as the ratio of standard deviation of bond fund M-month returns and (12-M)-month returns. In the rest panel, we first sort funds into winner and loser funds based on their first M-month cumulative returns (RTN). And among the winner and loser funds, we further form high and low ranking groups based on their first M-month risk component performance and (12-M)-month risk component performance. We will form four pairs: (high $Risk^1$, low $Risk^2$), (high $Risk^1$, high $Risk^2$), (low $Risk^1$, low $Risk^2$) and (low $Risk^1$, high $Risk^2$), where $Risk$=Index-adjusted return $-$ α. Thus, the 2x2 classification scheme is based on (RAR, RTN) or ($Risk^1$, $Risk^2$). Then we perform a Chi-square to test whether the frequency of falling into either one of the four categories is 25%.

	Volatility Measure (6,6)					Risk Component Return (6,6)					Risk Component Return (9,3)				
	Low RTN		High RTN			Low $Risk^1$		High $Risk^1$			Low $Risk^1$		High $Risk^1$		
	RAR		RAR			$Risk^2$		$Risk^2$			$Risk^2$		$Risk^2$		
Bond Type	Low	High	Low	High	P-value	Low	High	Low	High	P-value	Low	High	Low	High	P-value
Government Bond Funds															
General	29.55	19.09	21.59	29.77	<.0001	23.08	24.04	27.88	25.00	0.5894	33.18	14.29	15.21	37.33	<.0001
Short Maturity	25.21	22.71	24.10	27.98	0.2299	28.65	19.10	19.10	33.15	0.0018	29.89	16.30	19.57	34.24	0.0001
Intermediate Maturity	28.31	22.25	22.02	27.42	0.0157	30.63	19.37	19.82	30.18	0.0013	34.60	14.22	14.69	36.49	<.0001
Corporate Bond Funds															
Short Maturity	24.81	24.44	27.04	23.70	0.4988	31.49	18.34	19.03	31.14	<.0001	38.93	15.36	8.93	36.79	<.0001
Intermediate Maturity	23.98	25.69	28.57	21.76	0.0189	36.83	16.67	14.25	32.26	<.0001	34.46	18.65	15.03	31.87	<.0001
High Quality	25.58	25.37	24.95	24.10	0.8868	30.77	17.65	18.55	33.03	<.0001	31.22	15.84	16.74	36.20	<.0001
BBB Rated	22.99	26.90	25.98	24.14	0.2302	30.58	18.93	18.45	32.04	0.0003	35.71	15.71	12.86	35.71	<.0001
High Yield	22.73	26.68	28.66	21.94	0.0007	35.93	15.15	15.15	33.77	<.0001	34.92	14.97	15.40	34.71	<.0001
Gov/Corp Bond Funds															
Short Maturity	24.18	26.64	25.00	24.18	0.6114	33.64	15.89	14.02	36.45	<.0001	35.71	9.18	5.10	50.00	<.0001
Intermediate Maturity	24.62	23.92	29.09	22.38	0.1200	31.72	18.62	14.83	34.83	<.0001	37.70	15.08	11.48	35.74	<.0001

Table 1.9

Bond Fund Long-Term Performance and Risk

This table summarizes the results from Fama-Macbeth (1973) cross-sectional regressions of the risk-component performance (*Risk*) against the past N-year cumulative performance, expenses, flow rate, family TNA, Bond TNA/Family TNA, fund age and TNA, while controlling for classification fixed effects,

$$\begin{aligned} Risk_{i,t} &= \beta_{1,i} + \beta_{2,i} Past\ Performance_{t-1} + \beta_{3,i} Exp_{t-1} + \beta_{4,i} Flow\ Rate_{t-1} + \beta_{5,i} Log Family\ TNA_{t-1} \\ &\quad + \beta_{6,i} Bond\ TNA/Family\ TNA_{t-1} + \beta_{7,i} Log Age_{t-1} + \beta_{8,i} Log TNA_{t-1} + \epsilon_{i,t} \end{aligned}$$

from the sample period of 1998 to 2013. *Risk* is defined as the difference between the monthly relative fund performance and the *Alpha* obtained from the past 2-year or 3-year multi-factor regression, $Past\ Performance$ is the cumulative past performance in excess of the benchmark return and its measurement period corresponds with the assessment period for the 2-year or 3-year *Alpha*, *Exp* is the ratio of a bond fund's operating expenses to the total investment value and is expressed in percentage, TNA is a fund's total net asset under management, $Flow\ Rate$ is the ratio of fund flow between time $t-1$ and t to its TNA at time $t-1$, *Age* is the number of years since the first formation date of the fund, $Family\ TNA$ is defined as the total TNA of all funds, including the specific fund, under management by the investment firm, and $Bond\ TNA/Family\ TNA$ is the ratio of a fund's total TNA to the total TNA of all the mutual funds managed by its management firm. We use the difference between BAA bonds and U.S. Treasuries as a measure of credit spreads, and a high risk period is defined as the monthly credit spread that is greater than 0.5 standard deviation above the mean credit spread. Cross-sectional averages of the above regression coefficients with associated t-values for 2-year and 3-year *Alpha* measurements are reported, respectively.

	Risk Performance based on 3-Year Alphas				Risk Performance based on 2-Year Alphas			
	Risk Period				Risk Period			
	High		Normal		High		Normal	
Variable	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Intercept	0.000	-0.06	-0.001	-4.86	0.000	-0.11	-0.001	-3.15
Past Performance	0.021	3.00	-0.006	-1.91	0.021	2.09	-0.011	-2.57
Expenses	0.078	0.09	0.521	2.53	-0.100	-0.12	0.127	0.61
Flowrate	0.096	0.67	0.124	1.99	0.145	1.05	0.083	1.63
Family TNA	0.006	0.62	0.013	4.42	0.008	0.88	0.010	3.38
Bond TNA/Family TNA	-0.113	-1.02	0.093	3.41	-0.043	-0.41	0.071	2.71
Age	-0.012	-0.68	0.006	1.26	-0.020	-1.20	-0.002	-0.42
TNA	-0.014	-0.95	-0.001	-0.26	-0.007	-0.47	-0.002	-0.62

Table 1.10
Bond Fund Skill, Risk, and Flows

This table summarizes results from Fama-Macbeth (1973) regressions of a fund's flow rate against alpha, return difference, expense, fund age, and TNA,

$$Flow\ Rate_{i,t} = \beta_{1,i} + \beta_{2,i} Alpha_{t-1} + \beta_{3,i}(Raw_{t-1} - Bench_{t-1}) + \beta_{4,i} Exp_{t-1} + \beta_{5,i} LogAge_{t-1} + \beta_{6,i} LogTNA_{t-1} + \epsilon_{i,t},$$

for the sample period of 1998 to 2013. *Flow* is computed as $TNA_{i,t} - TNA_{i,t-1} \times (1 + r_{i,t})$. Monthly flows are aggregated on a quarterly (annually) basis and then divided by the beginning-of-quarter (year) TNA to obtain a flow rate. *Alpha* is obtained from the past monthly 3-year rolling window multi-factor model regression. $(Raw - Bench)$ is the monthly average of a fund's 3-year rolling window return difference relative to its benchmark. Monthly *Alpha* and $(Raw - Bench)$ are accumulated on a quarterly or yearly basis. *Exp* is the ratio of a bond fund's operating expenses to the total investment value and is expressed in percentage, *Age* is the number of years since the first formation date of the fund, and *TNA* is a fund's total net asset under management. The table shows only the cross-sectional average of β_2 and β_3 coefficients with associated t-values by fund style.

	3-Month Fund Flows				6-Month Fund Flows				1-Year Fund Flows			
Bond Type	β_2	t-value	β_3	t-value	β_2	t-value	β_3	t-value	β_2	t-value	β_3	t-value
Government Bond Funds												
General	0.475	0.34	7.763	5.18	0.893	0.66	8.038	4.80	0.440	0.12	7.027	2.77
Short Maturity	2.911	3.26	2.106	3.74	3.782	2.37	1.278	1.02	3.534	1.77	0.472	0.43
Intermediate Maturity	1.567	1.65	3.290	4.07	0.505	0.41	4.207	3.43	-0.045	-0.02	3.248	2.30
Corporate Bond Funds												
Short Maturity	7.656	5.36	1.504	1.34	5.978	3.22	2.914	1.69	3.220	1.41	4.505	1.91
Intermediate Maturity	1.816	1.77	6.753	6.04	1.397	0.87	7.175	4.07	3.399	2.11	4.923	2.78
High Quality	4.701	0.86	6.820	1.20	3.895	0.53	7.800	0.97	-8.964	-0.55	17.484	1.14
BBB Rated	2.452	0.78	0.954	0.37	6.870	1.62	-3.633	-1.02	11.723	1.36	-9.874	-1.17
High Yield	0.310	0.12	2.950	1.06	-0.143	-0.07	0.711	0.25	0.167	0.09	1.506	0.48
Gov/Corp Bond Funds												
Short Maturity	10.138	1.14	10.650	1.50	2.407	0.24	12.269	2.35	-7.839	-0.89	12.432	1.66
Intermediate Maturity	2.084	1.31	5.220	3.93	2.632	1.55	4.982	3.82	3.475	2.23	4.122	2.25

Appendix Table 1.1
Bond Fund Classifications

This table provides the detailed codes used in classifying each fund type and its matched benchmark index. First, we form the initial broad sample by including funds with Lipper objective code IC, IG and I. Next, we use the specific code shown in this table to determine a fund's classification. Each classification is then matched with a benchmark index to measure the performance of funds within the classification.

Bond Type	CRSP code	SI code	Lipper Code	Benchmark Index
Government Bond Funds				
General	IG	GGN	GUS, GUT	Barclays U.S. Aggregate Government Index
Short Maturity	IGDS	GSM	SUT, SUS	Barclays U.S. Treasury 1-3 Year Index
Intermediate Maturity	IGDI, IG	GIM	IUG, SIU, IGD	Barclays U.S. Treasury Intermediate Index
Corporate Bond Funds				
Short Maturity	ICDS, IC	CSM	SID,SII	Barclays U.S. Credit 1-3 year Index
Intermediate Maturity	ICDI, IC	CIM	SID,SII	Barclays Corporate Intermediate Index
High Quality	ICQH, ICQM, I, IC	CHQ	A	Barclays Corporate A+ Index
BBB Rated	ICQM, ICQY	CMQ	BBB	Barclays U.S. Aggregate Corporate BAA Index
High Yield	ICQY, I	CHY	HY	Barclay U.S Corporate High-Yield Index
Gov/Corp Bond Funds				
Short Maturity	I		SID,SII	Barclays Government/Credit 1-3 Year Index
Intermediate Maturity	I, IGDS, IC	CGN	IID	Barclays Intermediate Government/Credit Index

Appendix Table 1.2
Results from Multi-Factor Regression Models of Return Difference between Bond Fund and Benchmark Indexes

This table summarizes results from the OLS regression of return difference between bond fund and benchmark indexes ($r - r_b$) against the excess return of the aggregate bond fund index ($Agg - r_f$), default spread (Def), term spread ($Term$), and excess return of SP500 ($SP500 - r_f$),

$$r_{i,t} - r_{b,t} = \alpha_i + \beta_{1,i}(Agg_t - r_{f,t}) + \beta_{2,i}Def_t + \beta_{3,i}Term_t + \beta_{4,i}(SP500_t - r_{f,t}) + \epsilon_{i,t},$$

for the sample period of 1998 to 2013. Agg proxies for the average returns of the aggregate bond market and captures the marketwide risk, Def is the difference in returns between the high-yield index and intermediate government index, $Term$ is the return spread between the intermediate term and short term government bond indexes. Only funds that have at least 24 observations in the sample period are included in the analysis. For each bond type, the table shows the cross-sectional average of α (Alpha) estimate with its associated t-value and the percentages of positive/negative Alphas with the percentage of significant Alphas at the 5% level shown in parentheses. It also reports cross-sectional averages of beta coefficient estimates with their associated t-values. Panel A presents results for net returns measured after expenses, and Panel B shows their gross returns counterparts.

	Estimates of Alphas											
Bond Type	Mean	t-value	% of Pos α	% of Neg α	β_1	t-value	β_2	t-value	β_3	t-value	β_4	t-value
Government Bond Funds												
General	-0.107	-8.29	6.86 (0.00)	93.14 (51.96)	0.279	4.07	0.015	1.15	-0.311	-2.00	-0.010	-2.02
Short Maturity	-0.058	-9.25	3.90 (0.00)	96.10 (58.44)	0.036	1.64	0.031	7.92	-0.067	-1.86	-0.002	-2.00
Intermediate Maturity	-0.090	-11.16	1.02 (0.00)	98.98 (75.51)	0.332	12.54	0.036	4.59	-0.641	-10.00	0.006	0.85
Corporate Bond Funds												
Short Maturity	-0.074	-10.81	6.73 (0.96)	93.27 (45.19)	-0.174	-1.87	0.018	0.85	0.672	1.86	0.019	1.46
Intermediate Maturity	-0.044	-5.40	33.94 (1.82)	66.06 (24.24)	-0.134	-5.18	-0.057	-8.50	0.040	0.87	0.002	0.63
High Quality	-0.022	-2.21	41.38 (6.03)	58.62 (14.66)	-0.229	-5.58	-0.011	-1.30	0.041	0.70	-0.002	-1.00
BBB Rated	-0.011	-0.89	55.96 (8.26)	44.04 (5.50)	-0.159	-2.04	-0.156	-10.19	-0.229	-1.76	0.037	3.92
High Yield	-0.108	-5.82	30.29 (3.32)	69.71 (21.58)	0.090	2.25	-0.166	-11.71	-0.532	-5.83	0.052	8.76
Gov/Corp Bond Funds												
Short Maturity	-0.078	-3.41	18.18 (2.60)	81.82 (32.47)	0.041	1.14	0.087	9.24	0.002	0.03	0.009	1.33
Intermediate Maturity	-0.082	-4.80	26.72 (5.60)	73.28 (26.72)	0.282	7.20	0.146	11.47	-0.517	-6.88	0.027	6.06

Chapter 2

Insider Trading, Informativeness, and Price Efficiency around the World

2.1 Introduction

Whether or not insider trading should be regulated has been the subject of a long-standing debate among researchers and policymakers. Opponents of insider trading regulation contend that allowing insiders to benefit from their information advantage in trading promotes more informationally efficient financial markets (e.g., Manne, 1966; Carlton and Fischel, 1983; Leland, 1992; George and Seyhun, 2002). Proponents of insider trading regulation, however, argue that unrestricted insider trading can adversely affect the incentives of outside investors to acquire and produce information, hence making stock prices less informationally efficient (e.g., Fishman and Hagerty, 1992; Khanna, Slezak, and Bradley, 1994). Bhattacharya and Daouk (2002) make the first attempt to look at varying enactments and first-time prosecution of insider trading laws across 103 countries. They find that only first-time legal prosecution of insider trading laws can reduce a country's cost of equity, thereby lending support of insider trading regulation.[1] However, their study provides no direct evidence on the informativeness of insider trades across different regulation regimes, the potential tradeoff between the informational benefit of insider trading and the cost of reduced information acquisition, and the overall impact of insider trading regulation on price efficiency.

[1]Our unreported results show that first-time prosecution has no effect on the informativeness of insider trading.

Thus, the purpose of our study is to address all these important issues and provide evidence that helps settle the debate.

Our research represents the first to directly evaluate and compare the information contents of insider trading activities across different regulation and enforcement regimes. We exploit a newly available global dataset which contains information of global insider transactions of senior corporate executives and corporate directors from 44 countries over the period of 2007 to 2013. By examining insider trading activities in this large number of countries with varying levels of insider trading enforcement, we seek to provide the first comprehensive evidence on insider trading activities and their informativeness across different markets, to understand the role of insider trading regulation in determining insider trade informativeness, and to assess the relation between insider trading regulation and stock price efficiency.

We start by examining insider trading activities and their informativeness across different insider trading regulation regimes. All 44 countries in our sample have insider trading laws, but enforcement of insider trading laws varies widely across these countries. To measure the extent to which a country enforces its insider trading regulation consistently and rigorously, we construct an "Active Enforcement" variable that is based on the prosecution of insider trading in a country during the sample period of 2007-2013.[2] Active Enforcement is a binary variable that equals one if the country is actively enforcing its insider trading regulation in that it has at least one insider trading prosecution case during the sample period; otherwise, it is zero. We measure the informativeness of insider trades based on abnormal stock returns subsequent to insider transactions. For each country, we compute the average cumulative returns of stocks traded by insiders for buys and sells, separately, in excess of the country index return for varying periods of 5 to 120 days following the day of insider trades.

Several results emerge from the comparison of the large number of insider trades across the countries. First, corporate insiders trade actively, and their trades, particularly their buy transactions, are informative, and the effect is more pronounced in countries with active enforcement of

[2]We also construct the same variable using information five years prior to 2007. Both constructs yield qualitatively similar results. Given varying start years of the availability of insider transactions for the sample of countries, we choose to report the results based on the construct for the sample period.

insider trading regulations than in countries without.[3] Abnormal returns associated with insider buy transactions over the different periods from 5 to 120 days subsequent to insider transaction dates are positive and highly significant, while those associated with sell transactions show no robust evidence. Furthermore, insider trading informativeness is related to various country-level economic and legal characteristics, but the legal characteristic variables such as the rule of law, the general effectiveness of law enforcement, investor protection, and the quality of government do not substitute for the effects of enforcement of insider trading regulation. Second, insider trading regulations do not seem to affect the level of insider trading activities. The results show no significant difference in overall insider trading activities (scaled by a country's stock market capitalization) between countries with and without active enforcement of insider trading regulations.

Why does active insider trading regulation result in more, not less, informative insider trades? How does insider trading regulation affect stock price efficiency? To answer these questions, we examine insider trading activities around an important corporate event – corporate earnings announcements, and also investigate the relation between insider trading regulation, insider trading activity, and market reaction to earnings news. In countries with active enforcement of insider trading regulations, insiders trade less actively before corporate earnings announcements, but market reactions to earnings news are stronger. These findings suggest that active enforcement of insider trading regulation deters insiders from exploiting non-public and material corporate information in their stock trading, but seems to facilitate market efficiency. Furthermore, insiders trade actively before earnings announcements in countries without active enforcement of insider trading but with lockout period requirements, implying that active enforcement of insider trading regulation, not insider trading regulation itself, determines insider trading activity around earnings announcements. All these results are robust after controlling for various country, market, and institutional characteristics.

Finally, to further corroborate the informativeness of insider trades, we examine insider profits around earnings announcement dates. If insiders are able to exploit their information advantage, they should be able to make more profits from trading prior to earnings announcements. We find

[3]U.S. studies such as Ravina and Sapienza (2010) and Cohen, Malloy, and Pomorski (2012) also find that insiders still have the ability to trade on private information, in spite of the U.S.'s rigorous enforcement of insider trading regulations.

that insider trading profits are larger before earnings announcements in countries with active enforcement of insider trading regulation, but no difference in insider profits before and after earnings announcements in countries without enforcement. Therefore, these findings indicate that insider trading activities are informative only in countries that enforce their insider trading regulations. In other words, insiders from countries without enforcement could exploit their information advantage, such as corporate earnings news, in their trades, but market reactions to such news are weak, thereby resulting in noisier stock prices, which in turn, reduce the potential information advantage of insiders and subsequently lower the informativeness of their trades.

Our study makes several contributions to the literature. First, the newly available insider trading database from a broad spectrum of countries affords us the opportunity to empirically examine and compare insider trading activities and the informativeness of insider trading under different regulation regimes. Our analysis not only expands the extensive literature that focuses mainly on insider trading in a single country or in a small group of countries, but also provides the first direct comparison of insider trading activities and their informativeness across countries. These comparisons allow us to assess the effects of insider trading regulations on insider trading activities and the informativeness of insider trades.

Second, our findings offer important insights on the opposing views regarding the effects of insider trading regulation on price informativeness and market efficiency. We present the first and direct evidence that insider trading regulation improves both the informativeness of insider trades and the efficiency of stock prices. The evidence provides support to the argument that insider trading regulation improves stock price efficiency. Several previous studies show that insider trading restrictions lead to greater information acquisition efforts (Bushman, Piotroski, and Smith, 2005) and that the first enforcement of insider trading laws improves stock price informativeness (Fernandes and Ferreira, 2009). Our results are consistent with the findings of the two studies, but we provide direct evidence on the mechanism of how insider trading regulation can improve the informativeness of stock prices. Specifically, we show that allowing insiders to freely exploit their information advantage over the investor public has substantial adverse effects that can easily overwhelm any informational benefits from insider trading. Such adverse effects not only lead to noisier and less informative stock prices, but also reduce the informativeness of insider trades (and

hence their information advantage).

Our study thus fills the gap of existing findings on insider trading regulation and stock price efficiency in different countries. Bhattacharya et al. (2000) examine shares trading on the Bolsa Mexicana de Valores and find that share prices do not react to company news in the Mexico stock market. They argue that because insider trades may have already transmitted such information to the market, company announcements do not add new information. Such arguments implicitly assume that insider trades in unregulated markets are informative and that stock prices, if fully reflecting insider information, could be efficient even if they do not respond to company announcements. While our sample does not include Mexico, our evidence suggests that insider trades in Mexico may not convey much information because their stock prices may not fully respond to any corporate news, either through corporate announcements or insider trades.

The remainder of the paper is organized as follows. In the next section, we provide a brief discussion of the related literature. Section 3 describes the data, and Section 4 evaluates the informativeness of insider trades and the impact of insider trading regulation on insider trade informativeness. Section 5 employs a corporate event – corporate earnings announcements – to examine the impact of insider trading regulation on stock price efficiency, and the final section concludes.

2.2 Related Literature

Over the past few decades, the economics of insider trading has remained a highly controversial topic among securities authorities and academics. The main issue is whether insider trading is economically inefficient and hence, ought to be subject to regulation. Critics of insider trading regulation argue that without regulation, inside information will be efficiently allocated to investors who value the information the most, and that the benefit of more efficient prices is a more efficient allocation of resources (for example, Coase, 1960; Manne, 1966). Carlton and Fischel (1983) further argue that increased price efficiency can reduce investor uncertainty and better protect corporation information. Subsequent theoretical models (such as Dye, 1984; Leland, 1992; Shin, 1996; Noe, 1997) also suggest that insider trading makes stock prices more responsive to changes in the market.

In other words, unimpeded insider trading facilitates the incorporation of information into stock prices, thereby improving price informativeness.

Proponents of insider trading regulation, however, argue that under certain circumstances, the adverse effects of insider trading could lead to less efficient stock prices. Manove (1989) shows that insider trading increases trading costs of liquidity traders and hence, discourages liquidity trading and decreases market liquidity. This liquidity discount can be incorporated into the firm's stock price, thereby increasing the firm's cost of capital. Fishman and Hagerty (1992) put forth two adverse effects of insider trading. First, insider trading discourages non-insiders from obtaining information and trading, and this reduces the number of informed investors in the market. Second, in the presence of better informed insiders, the information gets unevenly distributed across investors in the market. As a result, the market becomes less competitive and stock prices become less efficient.

It is worth pointing out that both the opponents and proponents of insider trading regulation hold the view that unrestricted insider trading is more informative than regulated insider trading. For the opponents, more informed insider trading leads to more efficient prices. For the proponents, the highly informed insider trading, through its adverse effects on other market participants, leads to less efficient prices.

There is an extensive empirical literature that examines the informational value of insider trading. Given the widely available US insider trades data, many of existing, especially earlier, studies focus on US markets and find that insider trades are informative (Finnerty, 1976; Jaffe, 1974; Seyhun, 1988; Lakonishok and Lee, 2001; George and Seyhun, 2002; Brochet, 2010). Non-US studies also reach the same conclusion for Canada (Baesel and Stein, 1979), the UK (Pope, Morris, and Peel, 1990), Hong Kong (Wong, Cheung, and Wu, 2000), Germany (Betzer and Theissen, 2009), Switzerland (Zingg, Lang, Wyttenbach, 2007), Australia (Hotson, Kaur, and Singh, 2007), Thailand (Budsaratragoon, Hillier, and Lhaopadchan, 2012), the Netherlands (Degryse, de Jong, and Lefebvre, 2014; Cziraki, de Goeij, and Rennenboog, 2014), and European countries (Fidrmuc, Korczak, and Korczak, 2012). But other studies find that insider purchases contain no informational value in Norway (Eckbo and Smith, 1998), Spain (Del Brio, Miguel, and Perote, 2002), and Australia (Brown, Foo, and Watson, 2003).

These empirical studies are primarily based on a single country or a small group of countries within a region. The findings do not offer systematic evidence on the informativeness of insider trades across countries, and these studies do not attempt to compare and explain the differences in the informativeness of insider trades across the countries. Because these studies typically investigate insider trading under the same regulatory regime, they also do not address the core question of the debate on insider trading regulation, i.e., whether or not insider trading regulation helps to improve stock price efficiency.

Several recent studies have examined some aspects of the effects of insider trading regulation on the financial market. For example, Bushman, Piotroski, and Smith (2005) show that restriction of insider trading leads to greater information acquisition efforts by financial analysts. Bhattacharya and Daouk (2002) find that the first legal prosecution of insider trading can help to lower a country's cost of equity, presumedly because of improved information efficiency. Studying the effects of the first enforcement of insider trading laws, Denis and Xu (2009) find similar results for executive compensation, and Chen et al. (2014) show similar effects for corporate investment. Fernandes and Ferreira (2008) examine the impact of first enforcement of insider trading laws on the informativeness of stock markets. They find that price informativeness is substantially improved after the first enforcement of insider trading laws in developed markets.

These recent studies provide some evidence on the potential effects of insider trading regulation on stock price efficiency. However, none of these studies examine the effects of insider trading regulation on insider trading activities and the informativeness of insider trades. Without such direct evidence, we cannot study the mechanism through which insider trading regulation affects stock prices and address the core question of the debate on insider trading regulation. The purpose of our study is to address these issues.

2.3 Data and Summary Information

2.3.1 Insider Transactions

Our global insider transactions data are obtained from Director Deals, a specialist global market data company that monitors and analyzes share transactions made by directors and top executives of firms. Director Deals gathers information of share transactions by insiders of about 40,000 firms from 56 countries globally. The source of their data comes from company announcements made public under disclosure regulations and from stock exchanges. For a given transaction, this dataset includes stock identifiers (ISIN and SEDOL), market capitalization at the time of the transaction in US dollars, company information, the country where the trade took place, ticker symbol, personal information of the insiders (name, title, date of birth), transaction type (award, buy, sell, transfer, exercise, given away, etc.), transaction date, price and number of shares traded, total value of transaction (in British pounds, euros and US dollars), and the date an insider trade was announced or reported.

Our sample focuses on insider transactions in the home country where the firm's headquarter is located and where the transaction occurred and reported.[4] We exclude countries with fewer than five firms with reported insider transactions for the entire sample period, and also exclude one major developed market, Japan, where insider trades are not required to be reported by law. Furthermore, our analysis is restricted to open-market insider buys and sells as other types of transactions are more likely attributable to liquidity and portfolio diversification considerations (Ofek and Yermack, 2000; Carpenter and Remmers, 2001). As a result, our final sample consists of 44 countries with varying start years when information on insider transactions becomes available. In Director Deals, the UK, Ireland, and the Netherlands have the longest sample period from 1999 to 2013, whereas most emerging markets (such as Brazil, Chile, Indonesia, and Pakistan) have data starting from 2013. As a result, our sample period is from 2007 to 2013.

Table 2.1 presents the sample period for each country. The table reports the number of unique firms with reported insider transactions, average annual number of transactions, average annual

[4]These transactions include the vast majority of insider trades in the database.

value of transactions (in US dollars) and average annual number of shares traded. The number of unique firms with reported insider transactions varies from 5 in Czech Republic to 6,501 in the US, and the total number of unique firms employed in this study is 24,135. The average annual number of transactions ranges from 20 for Hungary to 45,558 for the US. The average ratio of the annual total value of transactions relative to total market capitalization varies from 0.005% for Brazil to 1.723% for Greece.

2.3.2 Insider Trading Laws

Table 2.1 also reports the year in which insider trading laws came into existence in a country and the year of first insider trading prosecution under insider trading laws. Information on the enactment of insider trading laws is obtained from Bhattacharya and Daouk (2002). All countries in our sample have adopted insider trading laws starting from 1934 (the US) to 1999 (Cyprus). Bhattacharya and Daouk also provide information on the first insider trading prosecution in a country up to 1998. We use the same source and supplement the first enforcement information for our sample of countries. The year that the initial prosecution under insider trading laws took place is between 1961 and 2012, and only two countries in the sample have not enforced their insider trading laws. With the exception of Egypt (2009) and Estonia (2012), the first enforcement of insider trading laws in most countries occurred much earlier than our sample period. Our analysis has found that the first-time enforcement variable exhibits no impact on the informativeness of insider trades, and hence, we do not report the results in the subsequent tables.

In this paper, we develop a new measure of insider trading regulation based on how rigorously and actively one country enforces insider trading laws. Even though most countries in our sample have had at least one insider trading prosecution (for example, the initial prosecution), many countries do not pursue such cases rigorously. During our sample period of 2007-2013, there was not a single case of insider trading litigation in 15 countries in the sample.[5] We thus define a variable "Active Enforcement" to measure the extent to which a country enforces its insider trading regulation consistently and rigorously. "Active Enforcement" is a dummy variable that equals 1

[5]The results remain qualitatively similar even if we construct our enforcement variable based on a five-year period prior to 2007.

if the country has a prosecution event under insider trading laws within the sample period, and 0 if otherwise. We collect information on such prosecution events from three major data sources: (1) the market regulator's official announcements and direct communication with the regulatory authorities; (2) news search; and (3) Capital IQ Key Development database. Capital IQ provides corporate events internationally, and we manually check the events that have a key word of insider(s) to ensure that the reported event is an insider trading prosecution event. The results are shown in Table 2.1. Among the 44 countries in our sample, 29 have recent enforcement of insider trading laws over the sample period, while 15 countries do not have any active enforcement events.

2.3.3 Other Variables

Our analysis includes several country-level variables relating to legal, institutional, and economic development characteristics of the sample of countries. These variables could affect insider trading regulation and the enforcements, or could potentially serve as substitutes to the more specific insider trading regulation enforcement variable we constructed above. The country-level characteristic variables we employ in our empirical analysis are listed in Appendix Table 2.1.

Legal Origin is a binary indicator that takes the value of 1 if the origin of the country's legal system is common law and 0 if otherwise, and such information is from Table II of La Porta et al. (1998). Anti-self-dealing is obtained from Djankov et al. (2008) and is a measure of investor protection against expropriation by corporate insiders.[6] The table also presents time-series averages of three law or regulation enforcement variables, namely the rule of law (Rule of Law), government effectiveness (Effectiveness), and regulatory quality (RegQuality), from 1999 to 2013. These three variables are obtained from the Worldwide Governance Indicators (WGI) project, 2014 Update. These aggregate indicators combine views and survey results and intend to measure governance quality at the country level. Rule of law reflects the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement and property rights. Government effectiveness reflects the quality of public services, the quality of the civil service, and the degree of its independence from political pressures, the quality of policy

[6]The anti-self-dealing index was constructed to measure minority shareholder protection based on private enforcement mechanisms, such as disclosure and litigation, that govern a hypothetical self-dealing transaction. It does not cover insider trading. See Djankov et al. (2008) for detailed description on the construction of the index.

formulation and implementation, and the credibility of the government's commitment to such policies. RegQuality reflects the ability of the government to formulate and implement policies and regulations. The value of all these variables ranges from -2.5 to 2.5. As shown in the table, Pakistan has the lowest governance indicators: -0.851 for Rule of Law, -0.574 for Effectiveness, and -0.636 for RegQuality. Finland, on the other hand, has the highest Rule of Law (1.946) and Effectiveness (2.152), and Singapore maintains the highest RegQuality of 1.927.

The sample of countries are divided into developed and developing countries based on World Bank classifications. We use the ratio of country-level stock market capitalization to annual GDP to measure the level of stock market development in a country. Our data source for the time-series annual GDP is the World Bank's World Development Indicators (WDI) database. The stock market development variable and the developed country status serve as additional control variables in our empirical analysis.

2.4 Regulation Enforcement and Insider Trading

In this section, we study insider trading activities across 44 countries and evaluate their informational contents. We first document insider trading profits of varying time horizons in the sample of countries and then examine whether insider trading regulation enforcement has any influence on both insider trading activities and the informativeness of insider trades around the world.

2.4.1 Insider Trading Profits

We obtain daily stock prices from Compustat Global and North America, and further supplement stock return information from DataStream to compute insider trading profits. Drawn from the existing literature, for each country, we measure insider trading profits for insider buys and sells, separately, and we compute the profits based on the cumulative returns of the traded stocks in excess of the country index return over 5, 10, 20, 30, 60, 90, and 120 days after insider transaction dates.[7] To conserve space, Table 2.2 reports the overall results on insider trading profits estimated

[7]The reporting requirements of insider trading differ across countries. For our sample period, the majority of the countries require reporting within two days of transaction.

over 5, 10, 20, 60, and 120 days after transaction dates by country.

As Table 2.2 indicates, average cumulative excess returns associated with insider buys are mainly positive and those related to insider sells are primarily negative. For example, the 5-day cumulative excess returns for insider buys are positive in 38 countries, and 29 of them are statistically significant at the 5% level. On the other hand, 32 of the 44 countries yield negative 5-day average cumulative excess returns for insider sells, and about half of these returns are statistically significant at the 5% level. For insider buys, average cumulative excess returns range from -0.759% in Luxembourg to 1.530% in Ireland, and for insider sells, they are between -0.954% in Hungary and 1.550% in Czech Republic. Similar patterns are observed in cumulative returns computed over longer horizons up to 120 days. Insider profits are higher for most countries when measured over longer horizons, but they also vary vastly across the countries.

Our findings are broadly consistent with the results of most prior studies based on some of the individual countries, but they contradict the evidence shown in a few studies. For example, our findings of profitable insider purchases are in accord with the findings of numerous studies on insider purchases, such as Seyhun (1988), Lakonishok and Lee (2001) and Jeng, Metrick, and Zeckhauser (2003) on US firms, Baesel and Stein (1979) on Canadian firms, Pope, Morris, and Peel (1990) on UK firms, Wong, Cheung, and Wu (2000) on Hong Kong firms, Betzer and Theissen (2009) on German firms, Zingg, Lang, Wyttenbach (2007) on Swiss firms, Hotson, Kaur, and Singh (2007) on Australian firms, Budsaratragoon, Hillier, and Lhaopadchan (2012) on Thai firms, and Degryse, de Jong, and Lefebvre (2014) on Dutch firms. Our finding is also in line with Del Brio, Miguel, and Perote (2002) on Spanish firms; the authors find no profitability in insider purchases or sales in Spain.

Our evidence differs from the findings of a few studies, such as Eckbo and Smith (1998) on Norwegian firms and Brown, Foo, and Watson (2003) on Australian firms. Using a similar methodology, Eckbo and Smith (1998) find insider sales but not purchases, are profitable, whereas our analysis delivers the opposite results. Eckbo and Smith's study is based on insider trades of stocks in 197 companies from 1985 to 1992, whereas ours looks at insider trades of 262 Norwegian stocks between 2007 and 2013. Brown, Foo, and Watson find that directors' sales, but not purchases, are profitable during the 1996-2000 period. On the contrary, our analysis shows that insider purchases

are profitable over the 2007-2013 period.

In summary, the above results broadly suggest that insider trades, particularly insider buys, are informative in the global stock markets. Insiders exploit their information advantage and profit from their trades. There also seem to be substantial variations in the profits of insider trades across the countries, as well as over different time horizons. We next turn to the analysis on the determinants of the informativeness of insider trades by exploiting the different insider trading regulation enforcement regimes and the different institutional characteristics across our sample of 44 countries.

2.4.2 Active Enforcement and Insider Trading Profits

In this subsection, we investigate whether active enforcement of insider trading regulation influences insider trading activities and their informativeness as measured by insider trading profits over varying horizons. We also examine how insider trading regulation enforcement relates to the legal environments in a country and whether any enforcement effects on informativeness and insider trades are driven by country-specific characteristics and general regulatory environments.

In our analysis, we estimate the following multivariate panel regression with various combinations of country-specific variables that are described above.

$$\begin{aligned} \text{IT Profits}_{i,t} &= \beta_1 + \beta_2 \text{Active Enforcement}_{i,t} + \beta_3 \text{Legal Origin}_{i,t} + \beta_4 \text{Rule of Law}_{i,t} \\ &\quad + \beta_5 \text{Effectiveness}_{i,t} + \beta_6 \text{RegQuality}_{i,t} + \beta_7 \text{Anti-Self-Dealing}_{i,t} + \beta_8 \text{Stock Dev}_{i,t} \\ &\quad + \beta_9 \text{Dev}_{i,t} + \epsilon_{i,t}, \end{aligned} \tag{2.1}$$

where IT Profits denote profits associated with insider transactions in year t. We first compute insider trading profits separately for insider buys and insider sells over different time horizons. For each country and each year, we then compute the average insider trading profits for buy and sell transactions for the different horizons. Active Enforcement is the indicator variable as defined earlier. In our discussion below, we use active enforcement and enforcement interchangeably if the context is clear. We include several legal environment variables in the analysis to see whether insider trading regulation enforcement plays any unique role in different legal environments. These legal

environment variables are more broadly defined and they could encompass the effects of insider trading regulation enforcement; they are Rule of Law, Effectiveness, and RegQuality as defined in the previous section. Anti-Self-Dealing is a proxy for investor protection against corporate insider self-dealing in business decisions. As shown in Appendix Table 2.2, the three law and regulation variables are highly correlated. The high correlation is not surprising as the three variables substantially measure similar quality of a country's regulatory environment. Hence, in our subsequent analyses, our regression model only incorporates these variables one at a time.

Additionally, we include several broad country-level characteristics in our baseline model. Legal Origin equals 1 if the country has a common law origin, 0 if otherwise. Stock Dev is defined as the ratio of a country's stock market capitalization to its annual GDP, and proxies for the level of stock market development. The countries in the sample are divided into developed and developing countries, and we include a developed country indicator (Dev) in the regressions.

We estimate model (1) using insider trading profits measured over varying horizons as separate dependent variables. To conserve space, Table 2.3 reports results based on insider trading profits measured over 5, 10, 20, and 120 day intervals for insider buys and sells, separately. Our unreported results, based on other time horizons, are qualitatively similar to those reported in Table 2.3.

Several results emerge from the table. First, the results show strong evidence that informativeness of insider buys measured over both short (5-day, 10-day, 20-day) and long horizons (120-day) correlates highly with active enforcement of insider trading regulation. The coefficients of Active Enforcement are robustly significant across the model specifications in columns (1)-(9) and across the four panels spanning the different time horizons. In contrast, the results for insider trading profits based on sell transactions in columns (10)-(18) produce significantly weaker evidence of informativeness. For example, in Panel A, the Active Enforcement coefficient is fairly stable at 0.003 with a t-value greater than 2 for buy transactions across varying horizons. In contrast, not all of the Active Enforcement coefficients associated with sell transactions are statistically significant. We find some significant, though weaker, results for insider sells for the short-horizon of 5 days. However, moving beyond the 5-day horizon, the significant insider-sell results disappear completely. The different results for buy and sell transactions are not surprising, given the well-documented evidence in the literature that insider buy transactions are informative while insider sell transac-

tions are not. In general, the evidence reveals that active insider trading regulation enforcement is associated with more, not less, informative insider trading.

Second, the results show that other variables that measure the broad legal environments do not subsume the effects of insider trading regulation enforcement. Because of the high correlation among the three legal environments variables, we include them separately, along with Active Enforcement in the regressions. Rule of Law, Effectiveness, and RegQuality are significantly related to insider trading profits in a small number of specifications for the short horizons, but neither of these variables substitutes the effects of Active Enforcement. Other broad measures of country characteristics, such as the Dev dummy and stock market development (Stock Dev), also do not materially alter the significance of the Active Enforcement effects. Our findings highlight the unique role of insider trading regulation and suggest that the main determinant of insider trading profits is the effectiveness of insider trading regulation and not the overall effectiveness of the legal system in a country.

We also examine the potential effects of insider trading regulation on overall insider trading activities. It is possible that a lax insider trading regulation could lead to rampant insider trading, thereby resulting in, on average, less informed insider trading. It is also possible that differences in the effectiveness of insider trading regulation may lead to differences in legal vs. illegal insider trading and to differences in reported and unreported insider trading across the countries. We estimate regressions similar to those specified in model (1) with the dependent variable of insider trading activity, defined as insider buy and sell transactions in dollar value scaled by the firm's market capitalization. Regression results for insider buys and sells are presented separately in Table 2.4. We exclude the specifications with the two variables of Effectiveness and RegQuality from the table as these two variables are highly correlated with Rule of Law, and the results are qualitatively similar.

As shown in Table 2.4, insider trading regulation is not significantly related to reported insider trading activities. For both insider buys and sells, the coefficients on our main variable of interest, Active Enforcement, are not statistically significant across all the 12 models. None of the other country characteristics are consistently and significantly associated with insider trading activities. The results suggest that there is no statistical difference between the level of insider trading activity

in countries with and without active regulation enforcement. While the analysis here does not rule out the possibility that there could be systematic differences in insider trading reports, the evidence and particularly our analysis on insider trading activity before corporate earnings announcements in the next section indicate that such differences, if any, are unlikely to lead to systematic biases in our results.

To sum up, this section shows that total insider trading activities, based on the value of insider transactions to market capitalization, do not differ significantly across countries. But insider trades are more informative in countries that actively enforce insider trading laws. These results are surprising. If insiders could exploit less from their information advantage, they should earn greater profits in their trades, all other things being equal. Opponents of insider trading regulation also stress that allowing insiders to freely use their information leads to more informative insider trading and consequently promotes market price efficiency. Our results contradict these views. In the next section, we investigate how active insider trading regulation enforcement leads to more, not less, informative insider trading and more informative prices.

2.5 Regulation Enforcement and Insider Trading around Earnings Announcements

In the preceding section, we have established that informativeness of insider trades varies across countries with different insider trading regulation regimes. Specifically, insider trading informativeness is more pronounced in countries with active enforcement of insider trading laws. In this section, our research design focuses on insider trading activities around corporate earnings announcements to examine how insiders behave around earnings announcements across countries with varying degrees of enforcement in insider trading. This approach contrasts the recent work by DeFond, Hung, and Trezevant (2007) who find that earnings announcements are more informative in countries with higher earnings quality, stronger investor protection, or in countries that have implemented enforcement of their insider trading laws for the first time. Our analysis of insider trading around this important corporate event allows us to assess the effects of insider trading regulation on insider trading activities, the informativeness of insider trading, and how insider trading activities under

different regulation regimes affect price efficiency.

2.5.1 Insider Trading around Earnings Announcements

The global earnings announcement data are obtained from the I/B/E/S database, which provides extensive coverage on analyst recommendations and forecasts from brokerage firms across the world. I/B/E/S contains earnings announcement dates of firms covered by analysts, firm names, analyst earnings forecasts, and actual earnings.

We compute 10-day, 20-day, and 30-day insider buying and selling activities before and after earnings announcement dates, whose information is available from the I/B/E/S database. Due to data availability in the I/B/E/S database, we are only able to compute Pre-Buy or Pre-Sell ratios for 40 countries. For an N-day trading activity around earnings announcements, we calculate the Pre-Buy (Pre-Sell) ratio as follows. The Pre-Buy (Pre-Sell) ratio is the amount of insider buys (sells) over N days prior to an earnings announcement date divided by insider buys (sells) over N days before and N days after the announcement date. We measure insider buys (sells) based on the number of shares, or based on the share value traded. For example, the 10-day Pre-Buy ratio is the ratio of insider buy transactions in the 10-day period before earnings announcements to the sum of insider buy transactions in the 10-day period before and 10-day period after earnings announcements.

Table 2.5 reports Pre-Buy and Pre-Sell ratios over varying lengths of windows around earnings announcements and also highlights the Pre-Buy and Pre-Sell ratios that are significantly different from 0.5 at the 5% level by using an asterisk. Results show that insiders tend to buy or sell less prior to than after earnings announcements. Across all countries, their Pre-Buy and Pre-Sell ratios are mostly lower than 0.5. Based on the ratios computed over a 10-day period, 35 of the Pre-Buy ratios are statistically significant, whereas 30 of the Pre-Sell ratios are statistically significant at the 5% level. The Pre-Buy ratio based on shares ranges from 0 (Hungary) to 0.445 (Greece), while the Pre-Sell ratio varies between 0 (Czech Republic, Ireland, and Luxembourg) and 0.598 (Hungary); these ratios are 0.072 and 0.165, respectively, for the US. Note that none of the Pre-Buy and Pre-Sell ratios of greater than 0.5 is statistically significant at conventional levels.

The results on insider trading reveal that insider trading regulation has substantial effects on insider trading activities around earnings announcements. The lower trading activity prior to earnings announcements could possibly indicate the joint effects of general insider trading regulation, insider trading lockout periods before earnings announcement imposed at the country level, and/or corporate internal policies prohibiting any insider from trading prior to earnings announcements.[8] On average, such regulations or policies deter insiders from trading on any material information contained in the earnings reports prior to the release of such information to the public. However, we do observe considerable insider trading activities, even during the short 10-day window before earnings announcements, in most of the countries. Also, insider trading activities vary substantially across the countries. Based on the 10-day results, insiders in Sweden and the UK rarely trade before earnings announcements (with ratios of 0.038 and 0.042, respectively), but insiders in Greece and the Philippines trade almost as much before earnings announcements as after (with ratios of 0.445 and 0.439, respectively).

We perform the following multivariate regression to examine whether insider trading behavior around earnings announcements is related to insider trading regulation enforcement.

$$\text{Pre-Buy}_{i,t} \text{ (or Pre-Sell}_{i,t}) = \beta_1 + \beta_2 \text{Active Enforcement}_{i,t} + \text{Control Variables} + \epsilon_{i,t}, \qquad (2.2)$$

where Pre-Buy and Pre-Sell are country-year observations. Active Enforcement, together with the control variables, are defined earlier. In this multivariate regression, we also include year fixed effects and report adjusted standard errors clustered at the country level. Table 2.6 reports regression results using Pre-Buy and Pre-Sell ratios calculated over 10 days, 20 days, or 30 days around earnings announcement dates as dependent variables.

The multivariate regression results corroborate the univariate ones shown in Table 2.5. Corporate insiders tend to buy less before earnings announcements in countries that actively enforce their insider trading laws. Enforcement actions deter insiders from trading prior to earnings announcements. For example, the coefficient of Active Enforcement in columns (1)-(6) of Panel A is consistently negative and statistically significant at the 5% level, even after controlling for the country's legal origin, rule of law, anti-self dealing, and stock market development. The Active En-

[8] We examine the issue of lock-up periods in a following subsection.

forcement coefficient varies between -0.066 (t =-2.18) and -0.103 (t =-2.43). In contrast, for insider sells, almost all of the Active Enforcement coefficients are statistically insignificant, suggesting that insider trading regulation affects only insider buys but not sells. One possible explanation for the insider sell results is that in many countries insiders could schedule their transactions, mostly sell transactions, in advance and conduct transactions based on such schedules. These transactions are not affected by corporate events and are largely immune to concerns of illegal insider trading.

Furthermore, the variables, Legal Origin and Rule of Law, have a consistently negative impact on both Pre-Buy and Pre-Sell ratios computed over varying windows, and their coefficients are mainly statistically significant. Their negative effects on Pre-Buy suggest that in countries with strong investor protection and better law and order, insiders tend to buy significantly less before earnings announcements. We find similar results for Anti-self-dealing regulations.

In summary, the results show that insiders from countries without rigorous enforcement of insider trading regulation are far more likely to exploit material corporate information in their trading decisions than insiders from countries with rigorous enforcement. Even though corporate earnings announcements are high profile events that are closely followed and observed by investors and regulators alike, the substantial differences in reported insider trading activities across the countries suggest that insiders in countries without active enforcement not only conduct but also disclose their trades before earnings announcements. The results further suggest that different reporting requirements across countries, if any, or non-reporting by insiders for sensitive trades are unlikely to systematically affect our findings in the paper.

2.5.2 Insider Trading and Price Reaction to Earnings News

The extant literature has shown that earnings announcements generate significant price reactions. Recent studies also find that market reactions to corporate news, including corporate earnings news, differ across markets (see, e.g., Bhattacharya et al, 2000; DeFond, Hung, and Trezevant, 2007). We examine market price reactions to earnings announcements in our sample of countries and investigate the association between price reactions and insider trading regulations and between price reactions and insider trading activities before earnings announcements.

We compute three different measures of price reactions, namely the cumulative return difference, return difference standard deviation, and abnormal return variance. Following existing studies, we focus on the price reaction of the [-1, 1] event window, which is arguably less noisy. These three measures are defined as follows.

(i) *Abnormal return variance*: The abnormal return variance is the stock return variance over the event window [-1, 1], scaled by stock return variance over the estimation window [-120, -21]. Stock return variance over the event window is the average of squared prediction errors from the market model during the event window [-1, 1], whereas the stock return variance over the estimation window is the variance of residuals from the market model estimated over the estimation period [-120, -21].

(ii) *Cumulative return difference*: The absolute value of the cumulative stock return in excess of the country index return over the event window [-1, 1].

(iii) *Return difference standard deviation*: Standard deviation of stock returns in excess of the country index return over the event window [-1, 1].

All the price reaction measures are computed first by taking an average of the variables for each firm and then averaging within each country.

Table 2.7 presents results of the three price reaction measures. These measures indicate that price reactions around earnings announcements vary widely across the sample of countries. The average price reaction is 2.317 for abnormal return variance, 6.758% for cumulative return difference, and 2.728% for return difference standard deviation. The abnormal return variance varies from 1.214 (Hungary) to 4.554 (UK), cumulative return difference ranges between 3.562% (Chile) and 11.430% (Indonesia), and return difference standard deviation is between 1.394% (Chile) and 5.746% (Indonesia). Similar to the findings of DeFond, Hung, and Trezevant (2007), our results suggest that developed countries such as the US and UK have stronger price reactions, whereas emerging countries such as Chile and the Philippines have the weakest.

We now examine whether and how each price reaction measure is related to insider trading regulation and insider trading activities. We first regress price reactions on Active Enforcement,

along with the control variables, and the results are shown in Table 2.8. We find a consistently positive relation between active insider trading regulation enforcement and market price reactions to earnings news. Independent of the price reaction measure employed, Active Enforcement has a positive and statistically significant effect on market price reaction. The coefficients on Active Enforcement are all positive and statistically significant mostly at the 5% level. These results are consistent with our earlier findings that active enforcement of insider trading laws enhances price informativeness. In countries that rigorously enforce insider trading regulation, corporate earnings announcements contain substantial information, and stock price reacts strongly to earnings news.

We next examine the link between insider trading activities and price reactions around earnings announcements. We have documented that insiders actively trade around earnings announcements. In countries without active regulation enforcement, insiders in fact trade actively before earnings announcements. A natural question to ask is whether such trading activities have any substantial influence on price reactions to earnings announcements. We therefore estimate the following regression model.

$$\text{Price Reaction}_{i,t} = \beta_0 + \beta_1 \text{BuyS}_{i,t} \text{ (or BuyV}_{i,t}\text{)} + \text{Control Variables} + \epsilon_{i,t}, \tag{2.3}$$

where Price Reaction is again measured by the abnormal return variance, cumulative return difference, and standard deviation of return difference. BuyV (BuyS) is the ratio of the total dollar value (the number of shares) of insider buys before earnings announcement dates to the sum of the total dollar value (the number of shares) of insider buys before and after earnings announcement dates. Both the price reactions and insider trading variables are country-year averages. Our regression models focus on insider buys as a measure of insider trading intensity before earnings announcements in the regression, because insider buys are generally more informative and also, insider buy ratios before earnings announcements are closely related to insider trading regulation.

Table 2.9 provides evidence on the relation between insider trading activity around earnings announcement (over a 10-day window) and market price reaction to earnings news. The main variables of interest are BuyS in columns (1)-(6) and BuyV in columns (7)-(12) with varying combinations of control variables. We find that insider trading activities before earnings announcements signif-

icantly dampen market price reaction to earnings news. The coefficients of BuyS and BuyV are consistently negative and highly significant across different measures of price reactions. Unreported results based on insider trading activities over different event windows (20-day and 30-day) show similar results. Stock prices on average react less to earnings news when insiders trade actively before earnings announcements. These findings are consistent with our earlier evidence documented above: enforcement of insider trading regulation affects insider trading activity before earnings announcements, and such enforcements are also strongly associated with price reactions to earnings news.

2.5.3 Lockout Periods, Insider Trading, and Price Reaction

As part of insider trading regulation, some countries explicitly impose lockout periods around earnings announcement dates. While some countries do not explicitly impose such restrictions, it is generally understood that insiders should refrain from trading on non-public material information, including corporate earnings information. Additionally, for some countries, corporations impose their own internal lockout periods for high level corporate executives and board directors (see, e.g., Bettis et al, 2000). During an explicit lockout period, corporate insiders are not allowed to buy or sell their shares before or shortly after the earnings announcement date. One may argue that countries that actively enforce their insider trading laws could be more likely to adopt explicit lockout periods. Hence, the relatively lower insider trading activity prior to earnings announcement dates in those countries and the relation between insider regulation and insider trading activity might be due to lockup restrictions. If this is the case, such lockout restrictions might potentially affect our key findings. In this subsection, we examine whether incorporating lockout periods into our analysis would alter our main results.

We collect information on lockout periods of our sample of 40 countries from publications of the countries' security regulatory agencies, by direct communications with the agencies, or both. Appendix Table 2.3 presents the information about their policies on lockout periods. Our information indicates that only 18 of the countries have lockout periods but with varying lengths. For example, in Austria, insiders are not allowed to trade three weeks before the release of quarterly financial reports and six weeks before the annual financial report release. In the Philippines, however, insid-

ers are prohibited from trading during the period within which a material non-public information is obtained and up to two trading days after the sensitive information is being released. However, despite these legally imposed lockout periods in place, none of these countries appear to enforce their lockout periods. As shown in Table 2.5, insiders from these 18 countries still continue to trade during the announcement period, although their trading activity is lower before than after announcement dates. In addition, we find no evidence that the existence of lockup periods in a country is significantly correlated with the enforcement of insider trading regulation. We first examine whether there is any difference in the Pre-Buy or Pre-Sell ratio between countries with lockout periods and those without. Our unreported test results find no statistical difference in the ratios between the two groups of countries, and that the evidence is robust across the Pre-Buy and Pre-Sell ratios computed over varying intervals.

To further address the concern that lockup period adoption could affect our main findings, we replicate our results reported in Tables 2.6, 2.8, and 2.9 by including a lockout indicator, which takes the value of 1 if the country has a lockout period and 0 if otherwise, in the regression. Our regression analysis also includes an interaction variable of the lockout indicator and Active Enforcement to evaluate any joint effects of the two variables. These results are reported in Table 2.10. Briefly, the lockup period variable and the interaction term exhibit no effect on the documented relation between Active Enforcement and insider trading activities before earnings announcements (columns 1-4). While the lockup period and interaction variables are significant in some specifications (columns 5-6), they do not materially change the significant relation between Active Enforcement and price reaction. Nor do they alter the significant relation between insider trading activity and price reaction in columns 9 to 12.

2.5.4 Regulation Enforcement, Insider Trading, and Price Efficiency

We have presented evidence on the link between enforcement of insider trading regulation, insider trading activities, and price reactions around earnings announcements. Our results show that insiders trade significantly less before corporate earnings announcements in countries with active enforcement of insider trading regulations and that these insiders are less inclined to exploit material corporate information in their trading decisions. In countries with more rigorous insider trading

enforcement, stock price reactions to corporate earnings announcements are also stronger. These results imply that insider trading regulation enforcement restrains insiders from trading on material information and leads to stronger stock price reactions to corporate earnings announcements.

We now examine the potential mechanism through which insider trading regulation affects insider trading and price efficiency. Do insider trading activities before earnings announcements reduce stock price informativeness without advancing price discovery, or do insider trades help incorporate earnings-related information into stock prices prior to the announcements, thus reducing stock price reactions to earnings announcements? In the former case, insider trades lead to less informative prices, as the trades themselves add little information to the market. In the latter, insider trades could affect when and what information gets impounded into stock prices, but may not affect the overall stock price efficiency.

In Table 2.11, we examine and compare gains associated with insider buys 10 days before and 10 days after earnings announcements in countries with and without active regulation enforcement. We use two variables to measure pre-announcement insider trading gains: insider trading gains over the period up to one day *before* earnings announcement and insider trading gains over the period up to one day *after* earnings announcement. The first variable measures the informativeness of insider trading excluding the public announcement of earnings information, and the second variable measures the informativeness of insider trading including the earnings information. For example, if an insider trade occurs on day -10 (where day 0 is the earnings announcement day), we compute the insider's trading profits from day -9 to day -2 by summing up the stock return in excess of the country return from day -9 to day -2. Then, we take the average of the profits of all insider transactions that occur within each year for each country. This represents the insider trading profits excluding earnings announcement returns. For profits including earnings announcement returns, we would compute the insider's trading profits from day -9 to day 1 by summing up the stock return in excess of the country return from day -9 to day 1. If an insider trade occurs on day 1, we compute the insider's trading profits from day 2 to day 11 by summing up the stock return in excess of the country return during this period, and then compute the average of the profits of all insider transactions that occur within each year for each country. All insider trading gains after earnings announcements are measured over the 10-day period after the transaction. We employ a

"Before" dummy to denote insider trading gains from pre-announcement trading activities. The first six models use insider trading gains excluding earnings announcement abnormal returns. Such gains measure insider trading profits before earnings information becomes public.

The results show that independent of whether or not we include the 3-day stock returns around earnings announcements, insider trading around earnings announcements is more informative in countries with active enforcement of insider trading regulation than in those without. Based on insider trading gains that include earnings announcement abnormal returns, the interaction of Active Enforcement and "Before" dummies is positive and mainly significant at the 10% level. The implication is that in countries where insider trading regulation is actively enforced, insider trades are more informative before earnings announcements. However, in countries without active enforcement, there is no significant difference between pre- and post-announcement insider trades, thereby indicating that these trades are not informative at all. Our results are consistent with the interpretation that in countries with lax regulatory environments, active insider trading before earnings announcements reduces stock price informativeness without advancing earnings news or helping to incorporate earnings information into stock prices.

It should be noted that the analysis here is based on reported insider trades around earnings announcements. Because of the potential litigation concerns, even in countries without active enforcement, insiders may refrain from trading based on highly profitable non-public information before earnings announcements. For example, Huddart et al. (2007) find that US insiders avoid profitable trades before quarterly earnings are announced. It is likely that such litigation concerns have a greater impact on insider trading in countries with active enforcement than in countries without active enforcement. Even with this potential caveat, insider trades are more profitable in countries with active enforcement than in countries without active enforcement.

To summarize, our results suggest that active enforcement of insider trading regulations leads to more informative insider trading and greater stock price efficiency. Even though insiders from countries with weak insider trading regulations could exploit their information advantage, such as corporate earnings news, in their trades, market reactions to corporate news are weaker, resulting in noisier stock prices. At the same time, the noisier stock prices reduce the potential information advantage of insiders and hence, lower the informativeness of insider trades.

2.6 Conclusion

This study offers direct evidence that active insider trading enforcement engenders more, and not less, informative insider trades. These findings are in stark contrast to the arguments that insider trading regulation reduces the informativeness of insider trades and hinders price efficiency. These results remain robust after controlling for various country-level institutional characteristics that include the rule of law and the general effectiveness of law enforcement. Our analysis of insider trading activities around corporate earnings announcements provides insights on why active insider trading enforcement results in more informative insider trades and more efficient stock prices. In countries with active enforcement of insider trading regulations, (i) insiders trade significantly less prior to corporate earnings announcements over 10- to 30-day intervals; (ii) insiders tend to refrain from trading on material non-public information; and (iii) stock price reactions to corporate earnings announcements are stronger. In countries without active insider trading enforcement, insiders trade more before earnings announcements, but their trades do not help to incorporate earnings-related information into stock prices, and stock prices also react less to earnings announcements.

Perhaps our most striking finding is that enforcement of insider trading regulation leads to both more informative insider trading and greater stock price efficiency. Opponents of insider trading regulation argue that unrestricted insider trading leads to more informed trading and to more efficient prices; however, our results show no support for this argument. While proponents of insider trading regulation contend that unrestricted insider trading could lead to less informationally efficient stock prices, they also tend to hold the view that such insider trades can be highly informative. Our results show that less informative prices render less informative insider trades. The evidence suggests that informativeness of insider trades and stock price efficiency are simultaneously determined, parallel results.

Our research has additional public policy implications. Enforcement of insider trading laws, not the establishment of the insider trading laws, facilitates stock market efficiency and promotes informative insider trading. Bhattacharya and Daouk (2002) and several subsequent studies find that initial enforcement of insider trading regulation could significantly affect price efficiency. Our study shows that continuous and active enforcement of insider trading regulation could help to

achieve regulators' primary goal of monitoring insider trading activities and improving stock market efficiency.

Table 2.1
Insider Trading Activity, Regulation, and Enforcement around the World

This table provides by country, the market type (developed (DEV) or emerging (EMG)), start year of insider trades at Director Deals, number of unique firms that report insider trades, average annual number of insider trades, average value of trades in millions $, average annual trade value relative to market capitalization in %, the year the insider trading (IT) law was established, the year IT law was first enforced, and a dummy variable (Active Enforcement) that equals 1 if insider trading prosecution occurred during the sample period, and 0 otherwise.

	Market	Start	# of	# of	Insider Trades		IT Laws	First	Active
Country	Type	Year	Firms	Trades	Value (mil $)	Value (%)	Existence	Enforcement	Enforcement
Australia	DEV	2008	1723	3044	1116.36	0.085	1991	1996	1
Austria	DEV	2008	63	181	319.03	0.331	1993	2000	1
Belgium	DEV	2007	116	352	751.88	0.229	1990	1994	0
Brazil	EMG	2013	103	421	463.26	0.005	1976	1978	1
Canada	DEV	2009	2517	14440	4609.26	0.218	1966	1976	1
Chile	EMG	2013	60	394	636.26	0.240	1981	1996	0
China	EMG	2010	1228	3750	3670.44	0.098	1993	2000	1
Croatia	EMG	2008	24	76	10.75	0.046	1995	no	0
Cyprus	EMG	2008	25	42	13.10	0.184	1999	2000	0
Czech Republic	EMG	2007	5	25	9.28	0.016	1992	1993	0
Denmark	DEV	2007	177	429	330.12	0.108	1991	1996	1
Egypt	EMG	2009	75	283	68.03	0.113	1992	2012	1
Estonia	EMG	2007	18	54	26.90	0.824	1996	2009	1
Finland	DEV	2013	54	379	335.84	0.111	1989	1993	0
France	DEV	2007	582	2026	4548.90	0.210	1967	1975	1
Germany	DEV	2007	516	1261	1658.31	0.031	1994	1995	1
Greece	DEV	2008	193	2941	1386.44	1.723	1988	1996	0
Hong Kong	DEV	2009	848	3254	5714.20	0.197	1991	1994	1
Hungary	EMG	2009	11	20	10.66	0.047	1994	1995	1
India	EMG	2008	1363	3759	865.09	0.067	1992	1998	1
Indonesia	EMG	2013	28	130	113.30	0.033	1991	1996	0
Ireland	DEV	2007	47	69	99.37	0.100	1990	2000	1
Israel	EMG	2010	247	716	280.84	0.151	1981	1989	1
Italy	DEV	2007	281	1656	1667.62	0.184	1991	1996	1
Luxembourg	DEV	2010	7	31	15.31	0.007	1991	2000	0
Malaysia	EMG	2009	832	4270	1574.94	0.361	1973	1996	1
Netherlands	DEV	2007	116	281	245.89	0.023	1989	1994	1
New Zealand	DEV	2008	105	199	95.10	0.033	1988	2000	0
Norway	DEV	2007	262	737	748.27	0.277	1985	1990	1
Pakistan	EMG	2013	57	414	26.33	0.045	1995	no	0
Philippines	EMG	2009	167	979	1132.32	0.614	1982	1994	1
Poland	EMG	2010	374	1086	756.27	0.322	1991	1993	1
Portugal	EMG	2009	38	226	819.94	0.502	1986	2000	0
Singapore	DEV	2008	542	1268	807.30	0.093	1973	1978	1
South Africa	EMG	2008	308	942	570.57	0.068	1989	2000	1
South Korea	EMG	2011	1197	2650	1968.77	0.166	1976	1988	1
Spain	DEV	2007	132	719	2009.44	0.206	1994	1998	0
Sri Lanka	EMG	2010	154	397	89.71	0.474	1987	1996	0
Sweden	DEV	2007	289	1573	1302.90	0.196	1971	1990	1
Switzerland	DEV	2007	228	1529	1854.53	0.155	1988	1995	1
Thailand	EMG	2010	378	2299	867.61	0.101	1984	1993	0
Turkey	EMG	2010	160	1064	682.89	0.268	1981	1996	1
United Kingdom	DEV	2007	1984	3630	2316.78	0.046	1980	1981	1
United States	DEV	2007	6501	45588	44812.71	0.044	1934	1961	1

Table 2.2

Insider Trading Profits Over 5 to 120 Days from Transaction Dates

This table reports insider trading profits for insider buys (Buy) and sells (Sell), separately, over varying periods from the transaction dates. Insider trading profits are the average cumulative excess return (i.e., the return of a stock in excess of its country-level index) over 5 days, 10 days, 20 days, 60 days and 120 days after the insider transaction date. Insider trading profits are expressed in percentage with their statistical significance at the 5% level denoted by an *.

	5-Day		10-Day		20-Day		60-Day		120-Day	
Country	Buy	Sell	Buy	Sell	Buy	Sell	Buy	Sell	Buy	Sell
Australia	0.613*	-0.160	0.718*	-0.185	0.573*	0.114	0.728*	1.079*	2.646*	1.359*
Austria	0.727*	0.262	0.899*	-0.465	1.603*	-0.217	3.805*	1.640	7.708*	5.833*
Belgium	0.671*	-0.237	0.934*	-0.062	0.958*	-0.227	1.822*	-0.063	1.608*	-0.415
Brazil	-0.021	-0.531*	0.462	-0.930*	-0.606	-1.780*	-1.898	-2.232*	-4.167	-6.050*
Canada	0.664*	0.061	1.109*	0.232*	1.985*	0.705*	4.000*	2.014*	6.944*	3.416*
Chile	0.583*	-0.087	0.837*	-0.984*	1.463*	-0.903	2.999*	-2.997	-2.077	-7.759*
China	0.455*	-0.652*	0.892*	-0.643*	1.138*	-0.433*	3.070*	1.147*	4.871*	3.167*
Croatia	0.023	0.116	0.066	-0.556	-0.298	-1.098	-1.124*	-1.025	-1.910*	-1.812
Cyprus	0.799	0.744	0.121	-1.280	-1.214	-2.745*	4.195	-6.905*	4.897	-7.742*
Czech Republic	1.434	1.550*	1.414	0.144	0.863	-0.625	1.706	-1.255	5.222*	3.786
Denmark	0.586*	0.277	0.798*	0.429	0.473	0.859*	0.341	1.445*	3.515*	1.762
Egypt	0.049	-0.430*	-0.017	-0.724*	-0.602	-0.920*	-0.060	-3.414*	1.348	-0.555
Estonia	0.624	-0.559	0.600	-0.558	2.034*	-0.981	0.603	-2.557	0.080	-3.969
Finland	0.099	-0.520*	-0.527	-0.599	-1.481*	-1.894*	-4.528*	-5.533*	-5.283*	-6.061*
France	0.247*	-0.263*	0.434*	-0.358*	0.675*	-0.499*	1.170*	-0.818*	1.138*	-1.472*
Germany	1.319*	-0.386*	1.818*	-0.439*	2.150*	-0.500*	3.010*	-0.926*	4.232*	-0.370
Greece	0.326*	-0.208	0.644*	-0.296	1.217*	-0.924*	2.314*	-3.713*	4.641*	-5.238*
Hong Kong	0.566*	-0.277*	0.843*	-0.283	1.009*	-0.020	1.644*	0.184	3.446*	2.159*
Hungary	1.139	-0.954*	2.922	-1.132*	3.591	-1.443*	2.939	-2.105*	5.534	-1.541
India	0.120*	-0.110*	0.186*	-0.094	0.345*	0.352*	0.861*	1.179*	1.420*	2.376*
Indonesia	-3.333	0.202	-4.054	2.744	0.476	3.036	2.911*	2.679	-2.697*	6.756
Ireland	1.530*	0.490	1.466*	0.302	1.432*	0.360	1.927	4.361*	-0.152	4.559
Israel	0.779*	0.022	0.977*	0.651*	1.217*	0.317	2.283*	1.177	0.229	1.742
Italy	0.220*	-0.237*	0.432*	-0.418*	0.523*	-0.679*	0.334	-1.786*	0.510*	-3.413*
Luxembourg	-0.759*	-0.209	-1.186*	0.555	-0.927	0.488	-4.292*	2.590	-5.192*	-0.551
Malaysia	0.187*	-0.374*	0.405*	-0.554*	0.868*	-0.863*	2.225*	-1.108*	3.918*	-2.928*
Netherlands	-0.162	-0.578*	0.112	-0.605*	-0.099	-0.797*	-0.657	-3.783*	0.485	-5.160*
New Zealand	0.610*	0.594*	0.712*	0.445	1.029*	0.365	0.941	0.517	4.876*	4.868*
Norway	0.911*	-0.308	1.017*	0.100	0.835*	0.494	0.888*	0.954	1.520*	1.948
Pakistan	0.301	0.664	1.124	0.698	-0.183	0.452	1.028	2.358*	-7.652*	-0.432
Philippines	0.198	-0.106	0.293	-0.304*	0.635*	-0.592*	1.212*	-0.948*	1.647*	-0.262
Poland	0.430*	-0.144	0.527*	-0.501*	0.893*	-0.641*	0.951*	-0.975*	-0.137	-4.093*
Portugal	-0.006	-0.583	-0.016	-0.763	-0.102	-1.320*	-0.493	0.444	0.352	-2.202
Singapore	0.245*	-0.292	0.538*	-0.729*	0.799*	-0.653*	2.117*	1.068*	3.021*	2.693*
South Africa	0.614*	-0.142	0.777*	-0.200	1.135*	0.076	2.277*	0.007	6.382*	2.490*
South Korea	0.787*	-0.322*	1.270*	-0.233	2.789*	-0.135	4.187*	1.806*	8.540*	5.750*
Spain	-0.002	-0.261*	-0.174	-0.751*	-0.396*	-1.547*	-0.925*	-2.870*	-3.130*	-7.819*
Sri Lanka	1.302*	-0.187	1.050*	-1.103	2.314*	-0.613	2.977*	-1.019	5.594*	2.228
Sweden	0.337*	-0.323*	0.452*	-0.461*	0.558*	-0.745*	1.086*	-0.517	1.489*	-1.184*
Switzerland	0.040	-0.009	-0.028	-0.002	-0.029	-0.106	-0.165	-0.987*	-0.336	-2.312*
Thailand	0.303*	-0.102	0.541*	0.102	0.454*	0.128	1.002*	0.452	-0.917	0.863
Turkey	0.323*	-0.946*	0.718*	-1.041*	1.073*	-1.392*	1.172*	-4.260*	-1.350*	-9.266*
UK	1.146*	0.064	1.327*	0.039	1.297*	-0.111	1.578*	0.390	2.291*	1.407*
US	1.384*	-0.037*	1.796*	0.092*	2.449*	0.397*	5.062*	1.189*	8.695*	2.424*

Table 2.3

Insider Trading Regulation Enforcement and Insider Trading Profits

This table presents panel regressions of aggregate insider trading profits (IT Profits) on Active Enforcement and country-level control variables, as well as year-fixed effects for insider buys and sells, separately. IT profits are computed by first cumulating stock returns in excess of country-level indexes over N days and then taking an average of the profits within each year for each country. Active Enforcement is a dummy variable that equals 1 if there is an IT law prosecution event within the sample period of the countries in our sample, 0 otherwise. Legal Origin identifies the legal origin of the company law or commercial code of each country (common law or civil law). It equals to 1 if the law origin of a country is common law and 0 otherwise. Rule of Law reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement and property rights. Effectiveness reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. RegQuality reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. The definition of these three variables are obtained from the *2014 Worldwide Governance Indicators*. Anti-Self-Dealing is a proxy for investor protection and is obtained from Djankov et al. (2008). Stock Dev is defined as the ratio of country-level stock market capitalization to GDP and is a proxy for stock market development. Dev dummy equals 1 if the country is developed, 0 otherwise. t-statistics, based on clustered standard errors at the country level, are reported in parentheses. Statistical significance is denoted by *, **, and *** at the 10%, 5%, and 1% levels, respectively.

	Panel A: 5-Day IT Profits																	
	Insider Buys									Insider Sells								
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Active Enforcement	0.005*** (2.73)	0.004** (2.60)	0.003** (2.16)	0.004** (2.30)	0.004** (2.22)	0.004** (2.19)	0.003** (2.18)	0.003** (2.24)	0.003** (2.28)	-0.002 (-1.46)	-0.002 (-1.63)	-0.003** (-2.10)	-0.003* (-2.01)	-0.003** (-2.11)	-0.002 (-1.30)	-0.003* (-2.00)	-0.003** (-2.21)	-0.003** (-2.08)
Legal Origin		0.004*** (2.93)	0.004*** (3.03)	0.004*** (2.87)	0.004*** (2.92)	0.005 (1.49)	0.004*** (2.95)	0.004*** (3.11)	0.004*** (3.06)		0.002** (2.36)	0.002** (2.50)	0.002** (2.38)	0.002** (2.44)	0.004** (2.53)	0.003*** (3.07)	0.002** (2.41)	0.003*** (2.78)
Rule of Law			0.002** (2.33)				0.002** (2.35)	0.001 (0.43)	0.001 (0.43)			0.001* (1.78)				0.001* (2.02)	0.002* (1.73)	0.002* (1.78)
Effectiveness				0.002* (1.80)									0.001 (1.66)					
RegQuality					0.002* (1.69)									0.002** (2.24)				
Anti-Self-Dealing						-0.001 (-0.23)									-0.004 (-0.97)			
Stock Dev							0.000 (0.01)		-0.000 (-0.40)							-0.000** (-2.21)		-0.000* (-1.79)
Dev								0.003 (1.33)	0.003 (1.37)								-0.001 (-0.66)	-0.001 (-0.43)
N	226	226	226	226	226	213	226	226	226	225	225	225	225	225	214	225	225	225
Adjusted R^2	0.052	0.079	0.089	0.085	0.083	0.088	0.085	0.091	0.087	0.000	0.012	0.018	0.014	0.020	0.013	0.019	0.015	0.016
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 2.3 - Continued
Insider Trading Regulation Enforcement and Insider Trading Profits

	Panel A: 10-Day IT Profits																	
	Insider Buys									Insider Sells								
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Active Enforcement	0.004** (2.32)	0.004** (2.16)	0.004* (1.88)	0.004* (1.88)	0.004* (1.85)	0.004* (1.71)	0.004* (1.85)	0.004* (1.87)	0.004* (1.84)	-0.000 (-0.14)	-0.001 (-0.23)	-0.001 (-0.55)	-0.001 (-0.46)	-0.001 (-0.57)	-0.002 (-0.98)	-0.001 (-0.59)	-0.002 (-0.63)	-0.002 (-0.64)
Legal Origin		0.003** (2.17)	0.003** (2.18)	0.003** (2.13)	0.003** (2.15)	0.005* (1.69)	0.003* (1.79)	0.004** (2.23)	0.003* (1.83)		0.002 (1.21)	0.002 (1.21)	0.002 (1.19)	0.002 (1.16)	0.003 (0.82)	0.002 (0.93)	0.002 (1.34)	0.002 (1.15)
Rule of Law			0.001 (0.89)				0.001 (0.81)	0.001 (0.53)	0.001 (0.53)			0.002** (2.14)				0.002* (1.85)	-0.000 (-0.17)	-0.000 (-0.17)
Effectiveness				0.001 (0.75)									0.001 (1.39)					
RegQuality					0.001 (0.78)									0.002* (1.85)				
Anti-Self-Dealing						-0.003 (-0.42)									0.001 (0.12)			
Stock Dev							0.000 (0.36)		0.000 (0.31)							0.000 (0.35)		-0.000 (-0.07)
Dev								0.001 (0.32)	0.001 (0.25)								0.004 (1.16)	0.004 (1.19)
N	226	226	226	226	226	213	226	226	226	225	225	225	225	225	214	225	225	225
Adjusted R^2	0.049	0.056	0.054	0.053	0.053	0.052	0.050	0.050	0.046	0.013	0.016	0.021	0.017	0.020	0.018	0.016	0.028	0.023
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 2.3 - Continued
Insider Trading Regulation Enforcement and Insider Trading Profits

	Panel A: 20-Day IT Profits																	
	Insider Buys									Insider Sells								
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Active Enforcement	0.008** (2.63)	0.008** (2.42)	0.007* (2.01)	0.007** (2.03)	0.007* (1.96)	0.006** (2.08)	0.006** (2.05)	0.007** (2.06)	0.006** (2.08)	0.003 (0.77)	0.003 (0.64)	0.001 (0.31)	0.002 (0.39)	0.001 (0.28)	0.001 (0.23)	0.001 (0.29)	0.001 (0.26)	0.001 (0.26)
Legal Origin		0.003 (1.28)	0.003 (1.27)	0.003 (1.25)	0.003 (1.26)	0.008* (1.80)	0.003 (0.84)	0.004 (1.36)	0.003 (0.92)		0.004 (1.48)	0.004 (1.45)	0.004 (1.44)	0.004 (1.38)	0.007 (1.47)	0.004 (1.12)	0.004 (1.59)	0.004 (1.35)
Rule of Law			0.002 (1.13)				0.001 (0.89)	0.001 (0.29)	0.001 (0.29)			0.003* (1.96)				0.002* (1.69)	-0.000 (-0.12)	-0.000 (-0.12)
Effectiveness				0.001 (0.57)									0.002 (1.21)					
RegQuality					0.002 (0.82)									0.003* (1.71)				
Anti-Self-Dealing						-0.007 (-0.82)									-0.002 (-0.27)			
Stock Dev							0.001 (0.89)		0.000 (0.82)							0.000 (0.50)		0.000 (0.11)
Dev								0.002 (0.58)	0.002 (0.45)								0.006 (1.11)	0.006 (1.12)
N	226	226	226	226	226	213	226	226	226	225	225	225	225	225	214	225	225	225
Adjusted R^2	0.045	0.046	0.045	0.043	0.044	0.036	0.042	0.042	0.038	0.023	0.027	0.029	0.026	0.029	0.012	0.025	0.033	0.028
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 2.3 - Continued
Insider Trading Regulation Enforcement and Insider Trading Profits

	Panel A: 120-Day IT Profits																	
	Insider Buys									Insider Sells								
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Active Enforcement	0.035*** (3.45)	0.034*** (3.20)	0.034*** (3.12)	0.034*** (3.05)	0.037*** (3.21)	0.028*** (3.24)	0.034*** (3.16)	0.034*** (3.25)	0.033*** (3.25)	0.028 (1.52)	0.026 (1.34)	0.021 (0.99)	0.022 (1.01)	0.022 (1.03)	0.014 (1.07)	0.020 (1.00)	0.020 (0.97)	0.020 (0.98)
Legal Origin		0.013 (1.65)	0.013 (1.65)	0.013 (1.65)	0.013* (1.74)	0.023 (1.66)	0.011 (1.28)	0.014* (1.78)	0.012 (1.44)		0.020 (1.37)	0.019 (1.35)	0.019 (1.33)	0.019 (1.33)	0.020 (1.45)	0.018 (1.04)	0.020 (1.43)	0.019 (1.17)
Rule of Law			-0.000 (-0.09)				-0.001 (-0.23)	-0.005 (-0.57)	-0.005 (-0.57)			0.010* (1.72)				0.010 (1.48)	0.003 (0.19)	0.003 (0.19)
Effectiveness				-0.000 (-0.02)									0.009 (1.16)					
RegQuality					-0.006 (-1.01)									0.008 (0.99)				
Anti-Self-Dealing						-0.013 (-0.51)									0.017 (0.65)			
Stock Dev							0.001 (0.75)		0.001 (0.61)							0.001 (0.34)		0.000 (0.18)
Dev								0.009 (0.72)	0.008 (0.63)								0.015 (0.49)	0.015 (0.49)
N	226	226	226	226	226	213	226	226	226	225	225	225	225	225	214	225	225	225
Adjusted R^2	0.041	0.043	0.039	0.039	0.041	0.079	0.035	0.035	0.031	0.009	0.017	0.020	0.017	0.016	0.029	0.016	0.019	0.014
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 2.4

Insider Trading Regulation Enforcement and Aggregate Insider Trading Activities

This table presents panel regressions of aggregate insider trade values on Active Enforcement and country-level control variables as well as year-fixed effects for insider buys and sells, separately. IT Value is computed by first summing up insider transaction values within each year scaled by country-level stock market capitalization. Active Enforcement is a dummy variable that equals 1 if there is an IT law prosecution event within the sample period of the countries in our sample, 0 otherwise. Legal Origin identifies the legal origin of the company law or commercial code of each country (common law or civil law). It equals to 1 if the law origin of a country is common law and 0 otherwise. Rule of Law reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement and property rights. The definition of Rule of Law is obtained from the *2014 Worldwide Governance Indicators*. Anti-Self-Dealing is a proxy for investor protection and is obtained from Djankov et al. (2008). Stock Dev is defined as the ratio of country-level stock market capitalization to GDP and is a proxy for stock market development. Dev dummy equals 1 if the country is developed, 0 otherwise. t-statistics, based on clustered standard errors at the country level, are reported in parentheses. Statistical significance is denoted by *, **, and *** at the 10%, 5%, and 1% levels, respectively.

	Insider Buys						Insider Sells					
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Active Enforcement	-1.027	-0.979	-0.931	-1.142	-0.923	-0.972	-0.195	-0.144	-0.029	-0.306	-0.006	-0.023
	(-1.10)	(-1.09)	(-1.07)	(-1.20)	(-1.05)	(-1.10)	(-0.33)	(-0.25)	(-0.05)	(-0.53)	(-0.01)	(-0.04)
Legal Origin		-0.630	-0.622	0.452	-0.588	-0.583		-0.649*	-0.622*	-0.028	-0.527	-0.628*
		(-1.46)	(-1.47)	(0.88)	(-1.31)	(-1.49)		(-1.85)	(-1.91)	(-0.08)	(-1.61)	(-1.90)
Rule of Law			-0.194		-0.180	-0.645			-0.460*		-0.423	-0.378
			(-0.97)		(-0.88)	(-0.79)			(-1.81)		(-1.62)	(-0.58)
Anti-Self-Dealing				-2.119						-1.019		
				(-1.25)						(-0.85)		
Stock Dev					-0.023						-0.062	
					(-0.27)						(-0.85)	
Dev						0.940						-0.171
						(0.64)						(-0.14)
N	230	230	230	230	230	230	227	227	227	227	227	227
Adjusted R^2	0.037	0.046	0.045	0.056	0.041	0.053	0.011	0.009	0.034	0.006	0.033	0.030
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 2.5

Insider Trading Activities around Earnings Announcements

This table reports insider trading activities around earnings announcement dates by country. Pre-Buy (Pre-Sell) Ratios are computed over 10-day, 20-day, and 30-day insider buy (insider sell) activities surrounding earnings announcement dates (EA). For an N-day trading activity around earnings announcement dates, the Pre-Buy (Pre-Sell) Ratio is the insider buys (sells) over N-days prior to the announcement date divided by insider buys (sells) over N days before and N days after the announcement date. We measure insider buys (sells) based on the number of shares traded (Share), or on the share value traded (Value). * denotes a significant difference in insider buys (sells) between pre- and post-earnings announcement dates.

	10 Days Around EA				20 Days Around EA				30 Days Around EA			
	Pre-Buy Ratio		Pre-Sell Ratio		Pre-Buy Ratio		Pre-Sell Ratio		Pre-Buy Ratio		Pre-Sell Ratio	
	Share	Value	Share	Value	Share	Value	Share	Value	Share	Value	Share	Value
Australia	0.091*	0.091*	0.153*	0.152*	0.127*	0.129*	0.183*	0.182*	0.159*	0.385*	0.290*	0.290*
Austria	0.179*	0.173*	0.100*	0.100*	0.302*	0.305*	0.244*	0.244*	0.383*	0.159*	0.221*	0.220*
Belgium	0.172*	0.173*	0.125*	0.126*	0.208*	0.209*	0.220*	0.219*	0.299*	0.297*	0.361*	0.359*
Brazil	0.140*	0.140*	0.196*	0.197*	0.261*	0.263*	0.369*	0.369*	0.323*	0.325*	0.357*	0.357*
Canada	0.176*	0.173*	0.190*	0.187*	0.238*	0.233*	0.241*	0.237*	0.301*	0.298*	0.304*	0.300*
Chile	0.169*	0.169*	0.433	0.433	0.214*	0.215*	0.519	0.520	0.312*	0.216*	0.191*	0.190*
China	0.283*	0.283*	0.135*	0.135*	0.299*	0.298*	0.161*	0.161*	0.384*	0.313*	0.553	0.555
Czech Republic	0.217	0.217	0.000	0.000	0.185*	0.187*	0.255*	0.256*	0.253	0.385*	0.310*	0.311*
Denmark	0.061*	0.061*	0.103*	0.103*	0.076*	0.077*	0.132*	0.132*	0.140*	0.255	0.262	0.262
Finland	0.162*	0.162*	0.176*	0.176*	0.174*	0.174*	0.268*	0.267*	0.218*	0.394*	0.397*	0.393*
France	0.179*	0.177*	0.191*	0.190*	0.293*	0.293*	0.284*	0.283*	0.368*	0.141*	0.154*	0.154*
Germany	0.276*	0.276*	0.319*	0.319*	0.346*	0.349*	0.322*	0.322*	0.393*	0.432*	0.425	0.428
Greece	0.445	0.444	0.371*	0.368*	0.432*	0.432*	0.492	0.489	0.480	0.223*	0.342*	0.345*
Hong Kong	0.080*	0.079*	0.138*	0.138*	0.088*	0.088*	0.114*	0.114*	0.159*	0.372*	0.356*	0.352*
Hungary	0.000	0.000	0.598	0.600	0.070*	0.069*	0.647	0.647	0.142*	0.066*	0.076*	0.076*
India	0.254*	0.253*	0.218*	0.216*	0.349*	0.347*	0.356*	0.356*	0.373*	0.485	0.507	0.508
Indonesia	0.093*	0.097*	0.500	0.500	0.166*	0.170*	0.197*	0.196*	0.313	0.156*	0.216*	0.213*
Ireland	0.039*	0.039*	0.000	0.000	0.041*	0.042*	0.022*	0.022*	0.055*	0.142*	0.437	0.436
Israel	0.247*	0.247*	0.109*	0.109*	0.311*	0.311*	0.155*	0.156*	0.329*	0.321	0.156*	0.156*
Italy	0.223*	0.218*	0.252*	0.253*	0.373*	0.372*	0.391*	0.389*	0.441*	0.055*	0.011*	0.011*
Luxembourg	0.042*	0.042*	0.000	0.000	0.103*	0.103*	0.100*	0.100*	0.256*	0.327*	0.267*	0.267*
Malaysia	0.162*	0.163*	0.251*	0.246*	0.166*	0.164*	0.235*	0.234*	0.284*	0.374*	0.402*	0.404*
Netherlands	0.151*	0.150*	0.158*	0.159*	0.183*	0.187*	0.174*	0.175*	0.253*	0.438*	0.443*	0.438*
New Zealand	0.097*	0.097*	0.083*	0.083*	0.095*	0.095*	0.105*	0.106*	0.115*	0.458*	0.498	0.493
Norway	0.092*	0.093*	0.094*	0.094*	0.161*	0.161*	0.196*	0.196*	0.220*	0.377*	0.396	0.399
Pakistan	0.333	0.333	0.195	0.193	0.549	0.550	0.347	0.345	0.531	0.256*	0.100*	0.100*
Philippines	0.439	0.432	0.373*	0.371*	0.452	0.450	0.438	0.436	0.438	0.283*	0.369*	0.368*
Poland	0.182*	0.182*	0.189*	0.187*	0.268*	0.270*	0.320*	0.319*	0.343*	0.255*	0.238*	0.238*
Portugal	0.261*	0.261*	0.162*	0.165*	0.400	0.401	0.263*	0.258*	0.457	0.219*	0.230*	0.231*
Singapore	0.038*	0.038*	0.019*	0.015*	0.168*	0.167*	0.208*	0.204*	0.269*	0.116*	0.149*	0.149*
South Africa	0.056*	0.056*	0.089*	0.089*	0.056*	0.056*	0.102*	0.099*	0.073*	0.436	0.488	0.484
South Korea	0.421*	0.422*	0.488	0.488	0.441*	0.443*	0.490	0.488	0.453*	0.534	0.320	0.319
Spain	0.243*	0.242*	0.319*	0.320*	0.350*	0.351*	0.415*	0.417*	0.431*	0.355*	0.362*	0.366*
Sri Lanka	0.264*	0.263*	0.381	0.381	0.355*	0.357*	0.377	0.374	0.376*	0.455	0.321*	0.315*
Sweden	0.038*	0.038*	0.057*	0.057*	0.055*	0.055*	0.097*	0.096*	0.200*	0.201*	0.213*	0.210*
Switzerland	0.142*	0.141*	0.106*	0.105*	0.169*	0.168*	0.149*	0.147*	0.214*	0.268*	0.331*	0.327*
Thailand	0.241*	0.239*	0.298*	0.290*	0.235*	0.229*	0.339*	0.337*	0.310*	0.302*	0.411*	0.410*
Turkey	0.325*	0.325*	0.443	0.443	0.334*	0.338*	0.455	0.451	0.365*	0.369*	0.511	0.505
UK	0.042*	0.042*	0.038*	0.038*	0.048*	0.048*	0.046*	0.045*	0.065*	0.156*	0.227*	0.223*
US	0.072*	0.071*	0.165*	0.163*	0.106*	0.105*	0.184*	0.181*	0.156*	0.072*	0.121*	0.119*

Table 2.6

Insider Trading Regulation Enforcement and Insider Trading Activities around Earnings Announcements

This table presents panel regressions of aggregate N-day insider trading activities around earnings announcements (Pre-Buy or Pre-Sell) on Active Enforcement and country-level control variables as well as year-fixed effects for insider buys and sells, separately. Pre-Buy is defined as insider buy ratio before earnings announcements and is computed by taking the ratio of the total number of insider buy (in shares) before an earnings announcement to the sum of the total number insider buy (in shares) before and after earnings announcements. Active Enforcement is a dummy variable that equals 1 if there is an insider trading prosecution under the laws during our sample period, 0 if otherwise. Legal Origin identifies the legal origin of the company law or commercial code of each country (common law or civil law). It equals to 1 if the law origin of a country is common law and 0 otherwise. Rule of Law reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement and property rights. The definition of Rule of Law is obtained from the *2014 Worldwide Governance Indicators*. Anti-Self-Dealing is a proxy for investor protection and is obtained from Djankov et al. (2008). Stock Dev is defined as the ratio of country-level stock market capitalization to GDP and is a proxy for stock market development. Dev dummy equals 1 if the country is developed, 0 otherwise. The regression model is performed using 10-day, 20-day, and 30-day insider trading activities before earnings announcement for buy and sell, separately. t-statistics, based standard errors clustered at country level, are reported in parentheses. Statistical significance is denoted by *, **, and *** at the 10%, 5%, and 1% levels, respectively.

	Panel A: 10-Day Insider Trading Activities Around Earnings Announcements											
	Insider Buys						Insider Sells					
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Active Enforcement	-0.103**	-0.093**	-0.067**	-0.094**	-0.066**	-0.067**	-0.013	-0.005	0.022	-0.006	0.022	0.021
	(-2.43)	(-2.27)	(-2.19)	(-2.53)	(-2.18)	(-2.21)	(-0.31)	(-0.10)	(0.62)	(-0.15)	(0.61)	(0.57)
Legal Origin		-0.067**	-0.074***	0.018	-0.065**	-0.075***		-0.066*	-0.071**	0.033	-0.072**	-0.072**
		(-2.09)	(-3.08)	(0.32)	(-2.50)	(-3.08)		(-1.75)	(-2.36)	(0.72)	(-2.25)	(-2.27)
Rule of Law			-0.093***		-0.090***	-0.089***			-0.096***		-0.096***	-0.085**
			(-5.11)		(-4.84)	(-2.83)			(-4.39)		(-4.35)	(-2.50)
Anti-Self-Dealing				-0.195*						-0.233**		
				(-1.79)						(-2.18)		
Stock Dev					-0.006						0.001	
					(-1.15)						(0.11)	
Dev						-0.010						-0.024
						(-0.17)						(-0.36)
N	199	199	199	199	199	199	200	200	200	200	200	200
Adjusted R^2	0.077	0.122	0.340	0.153	0.342	0.337	0.024	0.010	0.203	0.050	0.199	0.201
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 2.6 - Continued

Insider Trading Regulation Enforcement and Insider Trading Activities Around Earnings Announcements

	Panel B: 20-Day Insider Trading Activities Around Earnings Announcements											
	Insider Buys						Insider Sells					
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Active Enforcement	-0.100**	-0.085**	-0.063**	-0.085***	-0.062**	-0.063**	-0.059	-0.044	-0.018	-0.045	-0.017	-0.019
	(-2.57)	(-2.33)	(-2.49)	(-2.72)	(-2.47)	(-2.47)	(-1.23)	(-0.94)	(-0.49)	(-1.14)	(-0.47)	(-0.52)
Legal Origin		-0.098***	-0.105***	0.007	-0.096***	-0.105***		-0.106**	-0.111***	0.034	-0.104***	-0.112***
		(-2.89)	(-4.07)	(0.14)	(-3.47)	(-4.04)		(-2.57)	(-3.42)	(0.72)	(-3.14)	(-3.33)
Rule of Law			-0.087***		-0.084***	-0.092***			-0.100***		-0.097***	-0.093**
			(-4.48)		(-4.18)	(-3.50)			(-3.91)		(-3.76)	(-2.62)
Anti-Self-Dealing				-0.243***						-0.322***		
				(-2.72)						(-2.71)		
Stock Dev					-0.005						-0.005	
					(-1.25)						(-1.03)	
Dev						0.010						-0.016
						(0.24)						(-0.25)
N	208	208	208	208	208	208	208	206	206	206	206	206
Adjusted R^2	0.054	0.147	0.321	0.197	0.322	0.318	0.009	0.100	0.297	0.176	0.296	0.294
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Panel C: 30-Day Insider Trading Activities Around Earnings Announcements											
Active Enforcement	-0.102**	-0.084**	-0.065**	-0.084**	-0.064**	-0.065**	-0.081*	-0.064	-0.040	-0.064	-0.039	-0.040
	(-2.30)	(-2.16)	(-2.27)	(-2.39)	(-2.23)	(-2.24)	(-1.76)	(-1.51)	(-1.29)	(-1.63)	(-1.27)	(-1.29)
Legal Origin		-0.115***	-0.121***	-0.037	-0.116***	-0.120***		-0.111***	-0.116***	-0.026	-0.115***	-0.117***
		(-3.18)	(-4.11)	(-0.76)	(-3.65)	(-4.08)		(-2.73)	(-3.69)	(-0.53)	(-3.24)	(-3.69)
Rule of Law			-0.076***		-0.074***	-0.080***			-0.094***		-0.094***	-0.086***
			(-3.88)		(-3.64)	(-3.02)			(-3.92)		(-3.81)	(-2.96)
Anti-Self-Dealing				-0.179*						-0.193*		
				(-1.85)						(-1.78)		
Stock Dev					-0.003						-0.001	
					(-0.66)						(-0.16)	
Dev						0.007						-0.018
						(0.16)						(-0.42)
N	209	209	209	209	209	209	209	209	209	209	209	209
Adjusted R^2	0.059	0.182	0.308	0.206	0.306	0.305	0.054	0.149	0.312	0.172	0.309	0.309
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 2.7
Market Price Reactions to Earnings Announcements

This table reports price reaction around earnings announcements over the event window of [-1, 1] for the sample period from 2007 to 2013. Price reaction is measured in three ways: abnormal return variance, cumulative absolute return difference, and return difference standard deviation. Abnormal return variance is the stock return variance over the event window [-1, 1], scaled by the stock return variance over the estimation window [-120, -21]. Cumulative absolute return difference is computed by cumulating the absolute value of stock return in excess of country-level indexes over the event window [-1, 1]. Return difference standard deviation is defined as the standard deviation of stock return in excess of country-level indexes over the event window [-1, 1]. Stock return variance over the event window is the average of squared prediction errors from the market model during the event window [-1, 1]. The stock return variance over the estimation window is the variance of residuals from the market model estimated over the estimation period [-120, -21]. All the price reaction measures are computed first by taking an average of the measures for each firm and then average within each country. Cumulative absolute return differences and return difference standard deviation are expressed in percentage.

	Price Reactions		
Country	Abnormal Return Variance	Cumulative Return Difference in (%)	Return Difference Standard Deviation in (%)
Australia	2.636	8.747	3.441
Austria	2.093	6.053	2.311
Belgium	2.635	6.216	2.515
Brazil	1.630	6.826	2.774
Canada	2.204	6.417	2.563
Chile	1.399	3.562	1.394
China	1.561	6.184	2.326
Czech Republic	1.634	5.069	2.080
Denmark	2.965	7.827	3.175
Finland	3.624	7.988	3.156
France	3.024	6.577	2.661
Germany	2.115	10.327	4.667
Greece	1.512	6.375	2.452
Hong Kong	3.003	7.956	3.157
Hungary	1.214	5.824	2.146
India	2.163	7.371	2.825
Indonesia	1.969	11.430	5.746
Ireland	2.623	9.207	3.679
Israel	1.878	5.554	2.123
Italy	1.980	5.821	2.259
Luxembourg	2.439	7.284	2.870
Malaysia	1.750	5.466	2.244
Netherlands	4.236	6.985	2.754
New Zealand	2.830	5.327	2.176
Norway	2.584	8.771	3.539
Pakistan	1.661	5.226	1.823
Philippines	1.228	4.009	1.596
Poland	1.690	6.637	2.600
Portugal	1.676	5.136	2.045
Singapore	1.914	6.107	2.413
South Africa	2.314	5.743	2.264
South Korea	1.591	9.057	3.893
Spain	1.873	5.488	2.126
Sri Lanka	1.844	7.387	3.196
Sweden	3.870	8.973	3.591
Switzerland	3.052	6.060	2.381
Thailand	2.126	5.359	2.154
Turkey	1.611	5.275	2.016
United Kingdom	4.554	8.530	3.427
United States	3.994	6.158	2.546
Average	2.317	6.758	2.728

Table 2.8

Insider Trading Regulation Enforcement and Price Reactions to Earnings Announcements

This table presents panel regressions of earnings announcement price reaction on insider trading Active Enforcement and country-level control variables as well as year-fixed effects. Price reaction is measured in three ways: abnormal return variance, cumulative absolute return difference, and return difference standard deviation. Abnormal return variance is the stock return variance over the event window [-1, 1], scaled by the stock return variance over the estimation window [-120, -21]. Cumulative absolute return difference is computed by cumulating the absolute value of stock return in excess of country-level index return over the event window [-1, 1]. Standard deviation of return difference is defined as the standard deviation of stock return in excess of country-level index return over the event window [-1, 1]. Stock return variance over the event window is the average of squared prediction errors from the market model during the event window [-1, 1]. The stock return variance over the estimation window is the variance of residuals from the market model estimated over the estimation period [-120, -21]. The price reaction measures are computed first by taking an average of the measures for each firm and then average within each country. Active Enforcement is a dummy variable that equals 1 if there is an insider trading prosecution under the laws during our sample period, 0 if otherwise. Legal Origin identifies the legal origin of the company law or commercial code of each country (common law or civil law). It equals to 1 if the law origin of a country is common law and 0 otherwise. Rule of Law reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement and property rights. The definition of Rule of Law is obtained from the *2014 Worldwide Governance Indicators*. Anti-Self-Dealing is a proxy for investor protection and is obtained from Djankov et al. (2008). Stock Dev is defined as the ratio of country-level stock market capitalization to GDP and is a proxy for stock market development. Dev dummy equals 1 if the country is developed, 0 otherwise. t-statistics, based standard errors clustered at country level, are reported in parentheses. Statistical significance is denoted by *, **, and *** at the 10%, 5%, and 1% levels, respectively.

	Abnormal Return Variance						Cumulative Return Difference						Return Difference Standard Deviation					
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Active Enforcement	0.688**	0.650**	0.483**	0.650**	0.469**	0.493**	0.009**	0.010**	0.008*	0.010**	0.008*	0.008**	0.004**	0.004**	0.003*	0.004**	0.003*	0.003*
	(2.65)	(2.53)	(2.53)	(2.56)	(2.41)	(2.65)	(2.33)	(2.44)	(1.94)	(2.46)	(1.98)	(2.06)	(2.13)	(2.17)	(1.79)	(2.18)	(1.83)	(1.86)
Legal Origin		0.242	0.289	0.188	0.198	0.313		-0.003	-0.002	-0.001	-0.001	-0.002		-0.001	-0.001	-0.001	-0.001	-0.001
		(0.82)	(1.17)	(0.44)	(0.79)	(1.28)		(-0.63)	(-0.56)	(-0.20)	(-0.20)	(-0.50)		(-0.63)	(-0.58)	(-0.26)	(-0.26)	(-0.53)
Rule of Law			0.656***		0.621***	0.346**			0.007**		0.007**	0.003			0.003**		0.003**	0.001
			(5.59)		(5.14)	(2.31)			(2.40)		(2.54)	(0.75)			(2.17)		(2.31)	(0.69)
Anti-Self-Dealing				0.123						-0.004						-0.001		
				(0.12)						(-0.28)						(-0.17)		
Stock Dev					0.055						-0.001						-0.000	
					(1.03)						(-1.03)						(-0.98)	
Dev						0.646***						0.008						0.003
						(2.74)						(1.58)						(1.34)
N	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210
Adjusted R^2	0.181	0.189	0.396	0.186	0.403	0.425	0.208	0.210	0.272	0.207	0.276	0.283	0.137	0.138	0.185	0.134	0.186	0.192
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 2.9

Earnings Announcement Price Reactions and Insider Trading Activity

This table presents panel regressions of earnings announcement price reaction on insider buy activities 10 days before earnings announcement dates and country-level control variables as well as year-fixed effects. Price Reaction is measured in three ways: abnormal return variance, cumulative return difference and standard deviation of return difference . BuyS is defined as the insider buy ratio before earnings announcement dates in shares and is computed by taking the ratio of the total number insider buy (in shares) before earnings announcement dates to the sum of the total number insider buy (in shares) before and after earnings announcement dates. BuyV is defined as insider buy ratio before earnings announcement dates in dollar value and is computed by taking the ratio of the total insider buy (in dollar value) before earnings announcement dates to the sum of the total insider buy (in dollar value) before and after earnings announcement dates. Legal Origin identifies the legal origin of the company law or commercial code of each country (common law or civil law). It equals to 1 if the law origin of a country is common law and 0 otherwise. Rule of Law reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement and property rights. The definition of Rule of Law is obtained from the *2014 Worldwide Governance Indicators*. Anti-Self-Dealing is a proxy for investor protection and is obtained from Djankov et al. (2008). Stock Dev is defined as the ratio of country-level stock market capitalization to GDP and is a proxy for stock market development. Dev dummy equals 1 if the country is developed, 0 otherwise. The regression model is performed using 10-day insider buying activities before earnings announcement dates. t-statistics, based standard errors clustered at country level, are reported in parentheses. Statistical significance is denoted by *, **, and *** at the 10%, 5%, and 1% levels, respectively.

	Panel A: Dependent Variable: Abnormal Return Variance											
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
BuyS	-3.746***	-3.724***	-2.185***	-3.867***	-2.110***	-2.297***						
	(-5.55)	(-5.61)	(-3.58)	(-5.44)	(-3.45)	(-3.89)						
BuyV							-3.729***	-3.708***	-2.169***	-3.848***	-2.093***	-2.293***
							(-5.49)	(-5.54)	(-3.55)	(-5.39)	(-3.42)	(-3.94)
Legal Origin		0.022	0.160	0.303	0.085	0.185		0.020	0.159	0.296	0.084	0.183
		(0.09)	(0.64)	(0.90)	(0.33)	(0.76)		(0.08)	(0.64)	(0.88)	(0.33)	(0.75)
Rule of Law			0.455***		0.431***	0.149			0.456***		0.433***	0.147
			(3.88)		(3.77)	(0.99)			(3.88)		(3.77)	(0.96)
Anti-Self-Dealing				-0.673						-0.663		
				(-0.75)						(-0.73)		
Stock Dev					0.047						0.047	
					(0.92)						(0.92)	
Dev						0.632***						0.637***
						(2.81)						(2.83)
N	198	198	198	198	198	198	198	198	198	198	198	198
Adjusted R^2	0.358	0.355	0.420	0.359	0.424	0.445	0.357	0.353	0.419	0.358	0.424	0.445
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 2.9 - Continued
Earnings Announcement Price Reactions and Insider Trading Activity

	Panel B: Dependent Variable: Cumulative Return Difference											
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
BuyS	-0.030*	-0.035**	-0.014	-0.037**	-0.015	-0.015						
	(-1.92)	(-2.30)	(-0.77)	(-2.45)	(-0.85)	(-0.85)						
BuyV							-0.030*	-0.034**	-0.013	-0.036**	-0.014	-0.014
							(-1.84)	(-2.21)	(-0.70)	(-2.34)	(-0.78)	(-0.80)
Legal Origin		-0.005	-0.003	-0.001	-0.001	-0.002		-0.005	-0.003	-0.001	-0.001	-0.002
		(-0.96)	(-0.55)	(-0.11)	(-0.23)	(-0.48)		(-0.95)	(-0.53)	(-0.12)	(-0.22)	(-0.47)
Rule of Law			0.006*		0.007*	0.002			0.006*		0.007*	0.002
			(1.81)		(1.89)	(0.49)			(1.84)		(1.92)	(0.51)
Anti-Self-Dealing				-0.009						-0.009		
				(-0.73)						(-0.71)		
Stock Dev					-0.001						-0.001	
					(-0.96)						(-0.95)	
Dev						0.008						0.008
						(1.29)						(1.29)
N	198	198	198	198	198	198	198	198	198	198	198	198
Adjusted R^2	0.202	0.210	0.245	0.211	0.249	0.255	0.200	0.208	0.244	0.208	0.248	0.254
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Panel C: Dependent Variable: Return Difference Standard Deviation											
BuyS	-0.011*	-0.013**	-0.004	-0.014**	-0.005	-0.005						
	(-1.69)	(-2.03)	(-0.53)	(-2.13)	(-0.59)	(-0.59)						
BuyV							-0.011	-0.013*	-0.004	-0.013**	-0.004	-0.005
							(-1.63)	(-1.96)	(-0.48)	(-2.05)	(-0.54)	(-0.54)
Legal Origin		-0.002	-0.001	-0.001	-0.001	-0.001		-0.002	-0.001	-0.001	-0.001	-0.001
		(-0.91)	(-0.52)	(-0.22)	(-0.25)	(-0.46)		(-0.90)	(-0.50)	(-0.23)	(-0.23)	(-0.45)
Rule of Law			0.003		0.003	0.001			0.003		0.003	0.001
			(1.57)		(1.64)	(0.46)			(1.60)		(1.67)	(0.48)
Anti-Self-Dealing				-0.003						-0.003		
				(-0.49)						(-0.48)		
Stock Dev					-0.000						-0.000	
					(-0.86)						(-0.86)	
Dev						0.003						0.003
						(1.12)						(1.12)
N	198	198	198	198	198	198	198	198	198	198	198	198
Adjusted R^2	0.125	0.131	0.159	0.128	0.159	0.165	0.124	0.129	0.158	0.127	0.159	0.164
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 2.10
Lockout Periods, Enforcement, and Insider Trading

This table replicates models in columns (1) and (5) of Table 6, Panel B, models in columns (13) and (17) of Table 8, and models in (1) and (5) of Table 9. Pre-Buy is defined as the insider buy ratio before earnings announcements and is computed by taking the ratio of the total number of insider buy (in shares) before an earnings announcement to the sum of the total number insider buy (in shares) before and after earnings announcements. Price reaction is measured using the abnormal return variance which is the stock return variance over the event window [-1, 1], scaled by the stock return variance over the estimation window [-120, -21]. Stock return variance over the event window is the average of squared prediction errors from the market model during the event window [-1, 1]. The stock return variance over the estimation window is the variance of residuals from the market model estimated over the estimation period [-120, -21]. Active Enforcement is a dummy variable that equals 1 if there is an insider trading prosecution under the laws during our sample period, 0 if otherwise. Lockout dummy equals to 1 if if there is a lockout period in the country and zero if otherwise. Legal Origin identifies the legal origin of the company law or commercial code of each country (common law or civil law). It equals to 1 if the law origin of a country is common law and 0 otherwise. Rule of Law reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement and property rights. The definition of Rule of Law is obtained from the *2014 Worldwide Governance Indicators*. Anti-Self-Dealing is a proxy for investor protection and is obtained from Djankov et al. (2008). Stock Dev is defined as the ratio of country-level stock market capitalization to GDP and is a proxy for stock market development. The regression model is performed using 10-day insider trading activities around earnings announcements and earnings announcement price reaction. t-statistics, based standard errors clustered at country level, are reported in parentheses. Statistical significance is denoted by *, **, and *** at the 10%, 5%, and 1% levels, respectively.

	Insider Buys				Price Reactions							
	Dependent Variable: Pre-Buy				Dependent Variable: Abnormal Return Variance							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Active Enforce	-0.100**	-0.117**	-0.053*	-0.066*	0.703**	0.931**	0.418	0.612**				
	(-2.41)	(-2.41)	(-1.77)	(-1.87)	(2.11)	(2.68)	(1.63)	(2.20)				
BuyS									-3.696***	-3.884***	-1.954***	-2.307***
									(-5.59)	(-4.97)	(-3.27)	(-3.30)
Lockout	-0.006	-0.067	-0.027	-0.073**	-0.033	0.851***	0.106	0.841***	0.118	0.055	0.186	0.055
	(-0.17)	(-1.35)	(-1.05)	(-2.33)	(-0.09)	(4.12)	(0.35)	(7.02)	(0.49)	(0.13)	(0.75)	(0.14)
Active Enforce *Lockout		0.073		0.055		-1.047**		-0.877**				
		(1.15)		(1.35)		(-2.43)		(-2.54)				
BuyS*Lockout										0.397		0.851
										(0.29)		(0.68)
Legal Origin			-0.068**	-0.068**			0.211	0.210			0.107	0.130
			(-2.65)	(-2.62)			(0.80)	(0.78)			(0.41)	(0.51)
Rule of Law			-0.092***	-0.091***			0.631***	0.610***			0.455***	0.466***
			(-5.02)	(-5.02)			(5.00)	(4.67)			(3.80)	(3.95)
Stock Dev			-0.005	-0.005			0.053	0.058			0.043	0.042
			(-1.00)	(-1.05)			(0.91)	(1.05)			(0.74)	(0.75)
N	199	199	199	199	210	210	210	210	198	198	198	198
Adjusted R^2	0.073	0.075	0.345	0.346	0.177	0.201	0.402	0.418	0.358	0.355	0.429	0.428
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 2.11
Enforcement and Insider Transaction Profits around Earnings Announcements

This table presents panel regressions of insider trading profits for trading activities 10 days before and 10 days after earnings announcements on Active Enforcement and country-level control variables as well as year-fixed effects for insider buys including and excluding earnings announcement profits, separately. Insider trading profits (including earnings announcement profits, Include EA Profits) are computed by first cumulating stock returns of each insider trading transaction that occurs between 10 days before and 10 days after earnings announcements in excess of country-level indexes, including the return on the day of the earnings announcement, and then taking an average of the profits within each year for each country. Insider trading profits (excluding earnings announcement profits, Exclude EA Profits) are computed by first cumulating stock returns of insider trading transactions 10 days before and 10 days after earnings announcements in excess of country-level indexes, but excluding the return on the day of the earnings announcement, and then taking an average of the profits within each year for each country. Active Enforcement is a dummy variable that equals 1 if there is an insider trading prosecution under the laws during our sample period, 0 if otherwise. Before dummy equals 1 if the profit is before earnings announcements, 0 otherwise. Legal Origin identifies the legal origin of the company law or commercial code of each country (common law or civil law). It equals to 1 if the law origin of a country is common law and 0 otherwise. Rule of Law reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement and property rights. The definition of Rule of Law is obtained from the *2014 Worldwide Governance Indicators*. Anti-Self-Dealing is a proxy for investor protection and is obtained from Djankov et al. (2008). Stock Dev is defined as the ratio of country-level stock market capitalization to GDP and is a proxy for stock market development. Dev dummy equals 1 if the country is developed, 0 otherwise. The regression model is performed using 10-day insider trading activities before earnings announcements. t-statistics, based standard errors clustered at country level, are reported in parentheses. Statistical significance is denoted by *, **, and *** at the 10%, 5%, and 1% levels, respectively.

	Insider Buys (Exclude EA Profits)						Insider Buys (Include EA Profits)					
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Active Enforcement	0.006**	0.006**	0.005**	0.006**	0.005*	0.005*	0.006**	0.006***	0.005**	0.006***	0.005**	0.006**
	(2.57)	(2.45)	(2.08)	(2.45)	(1.87)	(1.96)	(2.70)	(2.78)	(2.42)	(2.83)	(2.11)	(2.45)
Before	0.000	0.000	0.001	0.000	0.001	0.001	-0.005	-0.005	-0.004	-0.005	-0.004	-0.004
	(0.10)	(0.10)	(0.17)	(0.05)	(0.22)	(0.18)	(-1.29)	(-1.29)	(-1.24)	(-1.31)	(-1.15)	(-1.24)
Active Enforcement*Before	0.000	0.000	-0.000	0.000	-0.000	-0.000	0.007*	0.008*	0.007*	0.008*	0.007	0.007*
	(0.04)	(0.02)	(-0.01)	(0.07)	(-0.07)	(-0.02)	(1.72)	(1.73)	(1.71)	(1.76)	(1.58)	(1.71)
Legal Origin		-0.001	-0.001	-0.007*	-0.003	-0.001		0.003	0.003	-0.002	0.001	0.003
		(-0.43)	(-0.37)	(-1.94)	(-0.94)	(-0.45)		(0.79)	(0.85)	(-0.71)	(0.19)	(0.86)
Rule of Law			0.002		0.002	0.004			0.002		0.001	0.001
			(1.11)		(0.83)	(1.67)			(1.00)		(0.56)	(0.63)
Anti-Self-Dealing				0.013*						0.012		
				(1.84)						(1.68)		
Stock Dev					0.001***						0.001**	
					(3.07)						(2.25)	
Dev						-0.003						0.001
						(-1.65)						(0.30)
N	353	353	353	353	353	353	365	365	365	365	365	365
Adjusted R^2	0.003	0.001	0.004	0.004	0.006	0.002	0.038	0.038	0.038	0.041	0.045	0.036
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Appendix Table 2.1
Summary of Country Characteristics

This table provides country variables used in our study. Legal Origin is obtained from La Porta et al. (1998), and Anti-Self-Dealing is obtained from Djankov et al. (2008). The remaining variables are the average values from 1999 to 2013 and are obtained from *The Worldwide Governance Indicators, 2014 Update*.

Country	Legal Origin	Anti-Self-Dealing	Rule of Law	Government Effectiveness	Regulatory Quality
Australia	Common	0.76	1.749	1.739	1.649
Austria	Civil	0.21	1.849	1.812	1.512
Belgium	Civil	0.54	1.305	1.726	1.255
Brazil	Civil	0.27	-0.279	-0.058	0.179
Canada	Common	0.64	1.736	1.872	1.603
Chile	Civil	0.63	1.261	1.198	1.457
China	Civil	0.76	-0.424	0.009	-0.258
Croatia	Civil	0.25	0.018	0.450	0.335
Cyprus	Common		1.020	1.304	1.224
Czech Republic	Civil	0.33	0.850	0.859	1.073
Denmark	Civil	0.46	1.898	2.126	1.805
Egypt	Civil	0.20	-0.123	-0.378	-0.385
Estonia	Civil		0.913	0.915	1.353
Finland	Civil	0.46	1.946	2.152	1.777
France	Civil	0.38	1.405	1.575	1.114
Germany	Civil	0.28	1.643	1.653	1.490
Greece	Civil	0.22	0.714	0.633	0.774
Hong Kong	Common	0.96	1.354	1.608	1.904
Hungary	Civil	0.18	0.813	0.818	1.091
India	Common	0.58	0.091	-0.074	-0.333
Indonesia	Civil	0.65	-0.716	-0.348	-0.376
Ireland	Common	0.79	1.638	1.573	1.703
Israel	Common	0.73	0.919	1.223	1.083
Italy	Civil	0.42	0.538	0.571	0.876
Luxembourg	Civil	0.28	1.801	1.808	1.732
Malaysia	Common	0.95	0.471	1.061	0.529
Netherlands	Civil	0.20	1.761	1.902	1.815
New Zealand	Common	0.95	1.846	1.747	1.788
Norway	Civil	0.42	1.914	1.916	1.388
Pakistan	Common	0.41	-0.851	-0.574	-0.636
Philippines	Civil	0.22	-0.431	-0.024	-0.029
Poland	Civil	0.29	0.597	0.563	0.819
Portugal	Civil	0.44	1.119	1.068	1.021
Singapore	Common	1.00	1.568	2.146	1.927
South Africa	Common	0.81	0.104	0.547	0.487
South Korea	Civil	0.47	0.894	0.943	0.751
Spain	Civil	0.37	1.187	1.346	1.196
Sri Lanka	Common	0.39	0.071	-0.238	-0.050
Sweden	Civil	0.33	1.869	1.983	1.579
Switzerland	Civil	0.27	1.857	1.976	1.666
Thailand	Common	0.81	0.104	0.260	0.265
Turkey	Civil	0.43	0.034	0.138	0.308
UK	Common	0.95	1.677	1.720	1.773
US	Common	0.65	1.556	1.649	1.539

Appendix Table 2.2
Correlation Matrix

This table displays the correlation matrix of the variables used in the regression analysis. Active Enforcement is a dummy variable that equals 1 if there is an insider trading law prosecution event within the sample period of the countries in our sample, 0 if otherwise. Legal Origin identifies the legal origin of the company law or commercial code of each country (common law or civil law). It equals 1 if the law origin of a country is common law and 0 if otherwise. Rule of Law reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement and property rights. Effectiveness reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. RegQuality reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. The definition of these three variables are obtained from the *2014 Worldwide Governance Indicators*. Anti-Self-Dealing is a proxy for investor protection and is obtained from Djankov et al. (2008). Stock Dev is defined as the ratio of country-level stock market capitalization to GDP and is a proxy for stock market development. Dev dummy equals 1 if it is a developed country, 0 if otherwise.

	Legal Origin	Rule of Law	Effectiveness	RegQuality	Anti-Self-Dealing	Stock Dev	DEV
IT Active Enforce	0.057	0.301	0.302	0.334	0.201	0.169	0.265
	(0.397)	(<.001)	(<.001)	(<.000)	(0.003)	(0.011)	(<.001)
Legal Origin		0.017	0.052	0.041	0.826	0.365	-0.041
		(0.795)	(0.436)	(0.540)	(<.001)	(<.001)	(0.543)
Rule of Law			0.955	0.953	0.107	0.233	0.766
			(<.001)	(<.001)	(0.119)	(<.001)	(<.001)
Effectiveness				0.937	0.186	0.276	0.698
				(<.001)	(0.006)	(<.001)	(<.001)
RegQuality					0.170	0.283	0.722
					(0.013)	(<.001)	(<.001)
Anti-Self-Dealing						0.396	0.050
						(<.001)	(0.464)
Stock Dev							0.276
							(<.001)

Appendix Table 2.3
Lockout Periods around Earnings Announcements

This table summarizes lockout periods around earnings announcements for 40 countries. A lockout period refers to the period in which insiders are banned from trading before and after financial report releases. The lockout period information is obtained directly from either the security exchange's official website of a country or contacting the country's regulation authorities.

Country	Lockout Period	Details of Lockout Periods
Australia	No	
Austria	Yes	3 weeks before quarterly financial report release, 6 weeks before annual financial report release
Belgium	Yes	15 days
Brazil	No	
Canada	No	
Chile	No	
China	Yes	10 days before earnings pre-announcements and 30 days before the formal financial report is issued
Czech Republic	No	
Denmark	No	
Finland	No	
France	Yes	2 weeks prior to the publication of its half-yearly or annual financial statements
Germany	Yes	Insiders are prohibited from trading with their securities from the moment of the origin of the inside information up to its announcement
Greece	No	
Hong Kong	Yes	30 to 60 days
Hungary	Yes	15 days
India	Yes	No retail trading for the period between the 20th trading day prior to the last day of any financial period for which results are required to be announced by the issuer of the securities and the second trading day after the disclosure of such financial results
Indonesia	No	
Ireland	Yes	30 days before quarterly financial report release, 60 days before annual financial report release
Israel	No	
Italy	No	
Luxembourg	No	
Malaysia	No	
Netherlands	No	
New Zealand	No	
Norway	No	
Pakistan	Yes	The closed period shall start from the day when any document statement, which forms the basis of price sensitive information, is sent to the board of directors and terminate after the information is made public
Philippines	Yes	During the period within which a material nonpublic information is obtained and up to two trading days after the sensitive information
Poland	Yes	2 weeks before quarterly financial report release, 1 month before annual financial report release, 2 months before annual financial report release
Portugal	No	
Singapore	Yes	Two weeks before the announcement of the company's financial statements for the first three quarters of its financial year, or one month before the half-year or financial year end
South Africa	Yes	In the case of reporting on a quarterly basis, the date from the end of the quarter up to the date of the publication of the quarterly results
South Korea	No	
Spain	No	
Sri Lanka	No	
Sweden	Yes	30 days before publishing of interim reports
Switzerland	Yes	10 days prior to financial report release
Thailand	No	
Turkey	Yes	Insiders cannot make any transaction from the end of the financial period till the announcement day of the financial reports. For annual reports banned period begins on January 1st and ends with the announcement of a firm' report. For semi-annual reports banned period begins on July 1st and ends with the announcement of the firm' report
UK	Yes	2 months before publication of full year results, one month before publication of interims
US	No	

Chapter 3

Local Institutional Investors and Stock Prices

3.1 Introduction

Both the U.S. money managing industry and public firms are clustered geographically. The money managing industry is mainly concentrated in certain areas. The top 5 states where the money managing industry is headquartered are New York, Massachusetts, California, Pennsylvania, and Illinois. The total AUM of financial institutions in these 5 states accounts for 70.80% of the U.S. aggregate AUM of institutional investors. The north-eastern region has a long history as the financial center, where the major exchanges are located. Since the first Europeans settled in New England, the financial industry was developed in the north-eastern area. Money management has been industrialized naturally in this region due to the ease of acquiring information and security trades around major exchanges. In comparison, the AUM of the money managing industry of the bottom 5 states is only 0.07% of the nationwide institutional AUM.[1] The percentage of the top 5 states AUM among U.S. aggregate AUM is stable over time: 72.78% in 1980, 71.98% in 1997, and 70.45% in 2013, respectively. On the other hand, public firms are inclined to locate in New York, California, Texas, Illinois, and New Jersey. The total market capitalization of firms in these states constitutes 52.57% of the market capitalization of U.S. public firms. Firms located in the bottom 5

[1]The bottom 5 states are Arkansas, Mississippi, Idaho, North Dakota, and South Dakota.

states represent 10.88% of the aggregate market capitalization.[2] The cluster trend of public firms weakens overtime, ranging from 63.25% in 1980 to 53.60% in 2013. Regardless of the time-varying trend, both the money managing industry and public firms display strong clustering preference for certain geographic regions.

The U.S. money managing industry and public firms are also misaligned geographically. For instance, from 1980 to 2013, the average number of firms in Texas is 468 with an average size of $83.9 billion and the average number of financial institutions in Texas is 60 with an average size of $1.3 billion. Whereas, in Massachusetts, one of the major clusters for the money managing industry, the average number of firms and institutions is 301 and 118, and the average size of firms and institutions is $23.9 billion and $90.2 billion, respectively. There are more firms and fewer institutions in Texas and firm size is smaller compared with institutional investors' AUM. This mismatch phenomenon is prevalent in other states. Therefore, the questions are: Does the mismatch of location clusters between the money managing industry and public firms have real effects on firms? What are the real consequences of the skewed distribution of the money managing industry in the financial market?

In this paper, we study whether and how the geographic mismatch of investors and public firms affects corporate financial policies, firm valuation, and firm performance. We provide the first piece of evidence on the real effects of the mismatch of location clusters between institutions and firms and the economic implications of the concentration of the money managing industry. This mismatch of location clusters matters for several reasons.

First of all, the concentration of the money managing industry has important economic implications. The development of the financial industry is crucial for other economic sectors and companies. The financial industry provides capital to companies and households.[3] The developed financial market facilitates the access to external financing for firms and results in better investment opportunities, mobilization of savings, innovations, and improvement of risk taking which eventually leads to better economic growth.

Secondly, the U.S. financial market is not fully integrated and firm locations have corporate

[2]The bottom 5 states are West Virginia, Vermont, Montana, Alabama, and Wyoming.

[3]At the country level (Rajan and Zingales (1998)) and at the local level (Guiso, Sapienza and Zingales (2004)).

finance and asset pricing implications. Previous studies have documented that firm location is important in the aspect of stock returns comovement (Pirinsky and Wang (2006)), acquisitions and leverage (Almazan et al.(2010)), dividend policy (Becker, Ivkovic, and Weisbenner (2011), and investment policy (Dougal, Parsons, and Titman (2015)). Recent studies associate the aggregate level of local individual investors' risk tolerance with firm valuation (Hong, Kubik, and Stein (2008)). Whereas, we relate the level of a firm's stock price to its local market condition of financial institutions.

It has been documented that institutional investors exhibit local preference in their portfolio choice. Past literature offers two major explanations for local preference. The first explanation is that local investors face low communication and information gathering costs, which further reduce information asymmetry. Taking advantage of location proximity, investors are able to directly inspect local firms and obtain information. In addition, local media enhances the coverage of local firms. It is easier for local investors to build social networks with local managers and obtain soft information.[4] The second explanation rests on familiarity and awareness of local stocks.[5] As a result, institutions tend to contribute more capital to local firms.

In general, firms have two financing sources: equity financing and debt financing. Our study mainly concentrates on the equity financing channel of firms since the cost of equity financing has an important impact on firm capital structure and corporate decisions. The cost of external equity financing diverges from other financing channels and influences the pattern of equity issuance and firm policies (Baker, Stein, and Wurlgler (2003)). They show that equity financing matters for corporate investment. In addition, Shleifer and Vishny (2003) argue that the cost of equity financing has a strong impact on merger activities. In particular, local equity financing is essential for firms, especially for financially constrained and equity dependent firms. Local investors face low

[4]Ivkovic and Weisbenner (2005) argue that individual investors can earn an additional return of 3.2% from local holdings which indicates that investors can exploit local information. Coval and Moskowitz (2001) find that local stocks held by mutual funds exhibit return of 3% higher than local stocks not held by mutual funds. They suggest that this is mainly driven by local investors' information advantage. Chhaochharia, Kumar, and Niessen-Ruenzi (2012) show that local investors are effective monitors of public firms. As a result, firms have better internal governance, are more profitable, and are less likely to manage earnings. Ayers, Ramalingegowda, and Yeung (2011) find that managers use financial reporting discretion less frequently when local institutional ownership is high.

[5]Barber and Odean (2003) show that individual investors are net buyers of stocks that catch their attention. This attention-driven strategy contributes to their investment style. Loughran and Schultz (2005) investigate the relation between location and liquidity and find that after adjusting for risk factors, rural firms trade less, are covered by fewer analysts, and have lower institutional ownership.

information gathering and monitoring costs due to geographical proximity. As a result, geographical proximity can better facilitate transmission of soft information, reduce information asymmetry, and enhance monitoring effects.

Finally, over the past decades, institutional investors have expanded substantially. Given their importance, growing theoretical studies highlight the asset pricing kernel of financial institutions rather than households.[6] Studies empirically emphasize the role of institutional investors to effectively monitor public firms (Mccahery, Sautner, and Starks (2016)) and to influence stock prices (Gompers and Metrick (2001) and Hong, Kubik, and Stein (2008)). Our findings provide empirical support for the theoretical literature that highlights the asset pricing role of financial institutions.

In order to study the role of local financial institutions as marginal investors and measure the mismatch between financial institutions and firms, we construct a new variable, AM Ratio, defined as the ratio of the aggregate AUM of institutions in a state to the total market capitalization of public firms in the same state. This variable is a good proxy for aggregate risk tolerance of financial intermediaries in the town and measures the mismatch between institutions and firms. AM Ratio effectively captures the relative funding effect of local institutions and ease of access to such funding in a state.[7]

We start by examining the stock-price consequences of local institutional investors on firms. We show that firms located in states with high AM Ratios experience significantly high valuation. We further investigate the joint effect of local bias and AM Ratio on firm valuation. The main effect of AM Ratio comes from local bias which varies across states. Our findings indicate that the positive effect of AM Ratio on firm valuation is significantly stronger in the states with high local bias. Firms experience high valuation when nearby institutions have abundant funds and, at the same time, exhibit strong preference for local stocks. Without sufficient local institutional funding, simple local bias alone does not contribute to high valuation. In addition, we examine the effect of AM Ratio for subsamples of firms based on firm size, age, payout ratio, credit rating,

[6]See Gromb and Vayanos (2002), Kyle and Xiong (2001), Vayanos (2004), Brunnermeier and Pedersen (2009), Adrian and Shin (2010), Basak and Pavlova (2013), He and Krishnamurthy (2012), He and Krishnamurthy (2013), and He, Kelly, and Manela (2016).

[7]Local institutions have information advantage given their geographical proximity. Their investment in local firms is better informed than non-local institutions. Reduced information asymmetry thus leads to lower cost of capital and higher price efficiency.

or KZ index. Small, young, low payout ratio, low credit rating, or high KZ index firms are more likely to be affected by local funding since they face difficulty raising debt financing and are more dependent on equity. We find that the valuation effect of local institutional funding is stronger for equity dependent firms.

We further examine the channels of how firms benefit from local institutional funding by investigating two corporate policies: investment and issuance. These two corporate decisions are affected by the cost of external financing. Mismatched clusters result in easier financing that leads to more equity issuance when capital is needed, allowing companies to invest more. When a firm is located in a state with plenty of institutional dollars, it does not have to rely on internally generated cash flow and could raise more equity.[8] We show that firms indeed undertake more investment opportunities and issue more equity but not more debt when they are located in high AM Ratio states.

As the next step, we analyze whether being located close to more institutional capital eases firms' financial constraints. In a frictionless world, firms invest in accordance with their investment opportunities proxied by Tobin's Q. However, previous studies empirically show that firm investment is sensitive to internal cash flow, especially for financially constrained companies. We find consistent evidence that greater nearby institutional capital leads to significantly lower investment-cash flow sensitivity. Moreover, firms located in high AM Ratio states tend to be more positively sensitive to investment opportunities. Being located in high AM Ratio states mitigates the constraints of internal cash flow on firm investment.

We then explore why companies in the states with more institutional capital are able to undertake more investment. If AM Ratio proxies for the ease of funding from local institutions, firms in those states are expected to issue more. We find more equity issuance of firms located in high AM Ratio states. Furthermore, we show that firms with greater need of external finance issue more equities when they are located in states with high AM Ratios. We also provide direct evidence that financial institutions are the main players in reducing equity financing costs, since they indeed hold a large proportion of new shares of local companies. In contrast, we do not find significant impact of AM Ratio on debt issuance and leverage. Since institutional investors are more specialized in

[8]The increase in equity issuance is from institutional holdings of the firm's stock.

equity trading, it is plausible that AM Ratio is not related to debt issuance. This evidence confirms that our results are driven specifically by the presence of institutional investors, but not by the overall development of the local financial market.

To consolidate our findings, we perform additional analyses on the firm relocation subsample. We document that when firms relocate, investors in their old locations significantly reduce holdings of the moving firms while financial institutions in the new locations substantially hold more shares of the moving firms. However, local institutional funding does not seem to be one of the major reasons that drive firms to relocate. Overall, firms move from high AM Ratio states to low AM Ratio states.

Finally, we examine the real effects of local institutions on firms: stock market performance persistence and operating performance. The high valuation could be an overvaluation which reflects inefficient investment of behaviorally biased institutional investors. Such overvaluation would be likely to reverse in the long term. The high valuation could also be a result of efficient investment and asset allocation leading to a persistent valuation effect. Our results support the efficient market hypothesis as we find no significant evidence of return reversal and find better operating performance. We also use the 2000 tech bubble as an exogenous shock to establish the causality between AM Ratio and firm valuation. The non-technological companies in the states with large composition of technology companies in their aggregate institutional holding experience substantially lower valuation during the period of technological bubble.

Our paper is closely related to Sulaeman and Wei (2014). They use the total AUM of local institutional investors at the state level as a proxy for institutional presence and find that high institutional presence leads to higher liquidity, faster information incorporation, lower cost of equity, and less financing frictions. Their study mainly concentrates on the role of institutional investors as enhancing informational efficiencies within the firm. In contrast, our study examines how market valuation of firms are influenced by the mismatched location clusters of financial institutions and firms. Thus, our main variable of interest, AM Ratio, considers both the asset under management of institutional investors and the market capitalization of all firms located in a state. This variable ensures that our results are not dominated by some states where total institutional AUM is high and the total market capitalization of firms is also high.

The remainder of the paper is organized as follows. Section 2 describes the data, and Section 3 evaluates the impact of AM Ratio on firm valuation. Section 4 explores local institutions and corporate investment and financing decisions. Section 5 provides further evidence and examines the implications for firm performance and the final section concludes.

3.2 Data and Summary Information

3.2.1 Data

Our sample is composed of U.S. domestic firms traded on NYSE, Amex, and Nasdaq from 1980 to 2013, which corresponds to the sample period of firm and institution location.

We collect state-level institutional investors' location from 1980 to 2013. The main source of institutional investors' location is 13F filings in the Securities and Exchange Commission (SEC). We acquire location information from 13F filings and match them with holdings in Thomson Reuters S34 to link cik and mgrno. The filings in Edgar start from 1993 so many filings in early years are missing. We complement the location data using Nelson's Directories of Investment Managers and Money Market Directories from 1980 to 1999. We include institutions located in 50 states and in the District of Columbia. Table 3.1 reports the summary statistics of the number of institutions for the top 5, middle 5, and bottom 5 states ranked by the state-level AUM in 1980, 1997, and 2013. The total number of institutions increases from 223 in 1980 to 3049 in 2013. The average number of institutions varies from 1.13 for Alaska to 386.65 for New York. Institutional investors are more likely to cluster in New York, California, Massachusetts, and Illinois. These four states are ranked among the top 5 states for most of the years from 1980 to 2013.

We define a firm's location as the headquarter of a firm following Coval and Moskowitz (1999), Ivkovic and Weisbenner (2005), and Loughran and Schultz (2005). Corporate headquarters are close to major business activities and function as the information exchange center between suppliers and investors.[9] Headquarter state and county information is collected from COMPUSTAT annual files. In addition, historical state and county information is cross-checked using Compact Disclosure.

[9]See Pirinsky and Wang (2006) and Davis and Henderson (2004).

Combining these two data sources, Table 3.1 reports the average number of firms for the top 5, middle 5, and bottom 5 states ranked by the state-level AUM in 1980, 1997, and 2013. The average number of firms across states is 114.66. Alaska has the lowest average number of firms (3.18) while California has the highest average number of firms (905.97).

Firm-level financial data is collected from Center for Research in Security Prices (CRSP) and COMPUSTAT. We obtain stock prices and the number of shares outstanding from CRSP. Our sample is restricted to common stocks (share code 10 or 11) traded on NYSE, Amex and Nasdaq (exchange code 1, 2 or 3). We exclude firms in the financial service industry (one-digit SIC codes of 6) in our analysis. Annual accounting information is obtained from COMPUSTAT. These two data sources are then merged to construct firm-level and state-level variables. Institutional quarterly stock holdings are drawn from Thomson Reuter 13F institutional holdings database. Institutional investors (such as banks, insurance companies, mutual fund companies, and investment advisors) with more than $100 million assets under discretionary management are required to disclose their holdings to SEC every quarter.

3.2.2 Measuring Mismatch and Local Bias

In our paper, we develop a state-level funding easiness measure to capture the ease of funding for a firm and two local bias measures to represent institutional investors' local preference. AM Ratio is defined as the ratio of the aggregate AUM of institutions in a state to the total market capitalization of public firms in the same state. This variable proxies for the mismatch between clusters of institutions and firms and the amount of relative funding available at state level. The higher the AM Ratio, the higher the mismatch and the easier it is for firms to get access to local institutional capital. According to Table 3.1, the average of AM Ratio across states ranges from 0.262 in 1980 to 0.771 in 2013. Massachusetts has a relatively high AM Ratio since it is a cluster for financial institutions but not for firms.

Local bias is measured using two methods. The first method (State_LB1) is defined as the difference of the ratio of the total market capitalization of local firms held by local institutions to the total AUM of local institutions and the ratio of the total market capitalization of local firms to the total market capitalization of all firms. State_LB1 is a traditional measure of local bias

and it captures the fraction of local firms held by local institutions relative to the market weight of investable assets considering all investors. The second method (State_LB2) is defined as the difference of the ratio of the total market capitalization of local firms held by local institutions to the total AUM of local institutions and the ratio of the total market capitalization of local firms held by all institutions to the total AUM of all institutions. The second measure captures the fraction of local firms held by local institutions relative to the market weight considering only institutional investors.

$$LB1 = \frac{Total\ MV\ of\ Local\ Firms\ Held\ by\ Local\ Institutions}{Total\ AUM\ of\ Local\ Institutions} - \frac{Total\ MV\ of\ Local\ Firms}{Total\ MV\ of\ All\ Firms} \tag{3.1}$$

$$LB2 = \frac{Total\ MV\ of\ Local\ Firms\ Held\ by\ Local\ Institutions}{Total\ AUM\ of\ Local\ Institutions} - \frac{Total\ MV\ of\ Local\ Firms\ Held\ by\ All\ Institutions}{Total\ AUM\ of\ All\ Institutions} \tag{3.2}$$

According to Coval and Moskowitz (1999), local bias measures the tendency of institutional investors to select their portfolio choices locally relative to the market weights of investable assets. If institutional investors do have local preference, these two measures should be positive. As shown in Table 3.1, the average of local bias decreases from 0.069 in 1980 to 0.019 in 2013 and is positive for most states. The reduction in local bias over the sample period reflects the integration of the U.S. financial market and the expansion of financial institutions. Both local bias measures for New York are small and negative in some years. Financial institutions in New York are generally large and sophisticated investors and they are less likely to exhibit irrational local preference. Local bias is more prevalent in small states where institutional investors are less developed.

To better illustrate AM Ratio measure, we graph the total AUM of institutions to state GDP (Figure 3.1), the total market capitalization of firms to state GDP (Figure 3.2), and the AM Ratio by state (Figure 3.3). The benefit of AM Ratio is that it considers the size of both institutions and firms thus captures the relative easiness to access funding.

3.2.3 Other Variables

Our study examines how local funding easiness affects firm valuation, through which corporate policies firm valuation is influenced, and the real effects of local institutional funding. Besides stock market performance, all other variables are measured at annual frequency and are defined in Appendix Table 3.1.

Firm Valuation. Following Hong, Kubik, and Stein (2008), we employ MB as a measure of firm valuation. MB is defined as the log of market equity value to book equity value.

Investment. We employ four measures of investment: CAPXRND, R&D, CAPEX, and INVESTMENT. CAPXRND is the sum of capital expenditures, research and development expenditures, all scaled by lagged assets. R&D is research and development expenditures scaled by lagged assets. CAPEX is capital expenditures scaled by lagged assets. INVESTMENT is the sum of capital expenditures, research and development expenditures, and 30% of selling, general, and administrative expenses, all scaled by lagged assets.

Issuance and Leverage. We perform analysis on both equity issuance and debt issuance. Equity issuance is defined as the change in book equity and the change in deferred taxes, less the change in retained earnings, all scaled by lagged assets. We measure debt issuance as the change in assets, less the change in book equity, less the change in deferred taxes, all scaled by lagged assets. Leverage is defined as the sum of long term debt and debt in current liabilities, all scaled by lagged assets.

Performance. We examine both stock market performance and operating performance. Stock market performance is defined as the monthly excess stock returns. Operating performance is defined as net income, scaled by lagged assets.

3.3 AM Ratio and Firm Valuation

In this section, we study the effect of AM Ratio on firm valuation. We first document whether the location mismatch have any influence on firm valuation. Then we investigate the joint effect of AM Ratio and local bias on stock prices. In the end, we examine when this influence is stronger and what types of firms are affected more.

3.3.1 AM Ratio and Firm Valuation

Hong, Kubik, and Stein (2008) examine how the aggregate risk tolerance of individual investors in a region influences stock prices. They show that firms have higher stock prices when located in low population density states . Supported by literature on the financial intermediary asset pricing kernel, this section aims to examine the stock-price consequences of the relative size of local institutions. Different from traditional literature (Chhaochharia, Kumar, and Niessen-Ruenzi (2012)) that measures institutional ownership at firm level, our study utilizes the state-level mismatch measure to capture the potential investment of local institutions regardless of their actual holdings. Unlike Sulaeman and Wei (2014), our main variable of interest, AM Ratio, considers both the total AUM of institutional investors and the total market capitalization of firms located in a state. This variable provides a valid measure of the mismatched location distributions of financial institutions and firms. The design of AM Ratio also ensures that the results are not dominated by some states where the institutional AUM is high and the total market capitalization of firms are also high. Additionally, locating close to firms lowers information collecting cost and reduces information asymmetry which eventually leads to lower cost of capital for firms.

Following Hong, Kubik, and Stein (2008), we define the log of market equity value to book equity value to measure firm valuation. We include the same independent variables to control for future growth and profitability.[10] In all the model specifications, we control for year and industry fixed effects. Our regression results are displayed in Table 3.2. In column 1, without any control variables, the coefficient of AM Ratio is 0.011, significant at 1% level. Such finding indicates that firm stock prices increase with the level of location mismatch. In column 2 with control variables, the coefficient of AM Ratio remains significantly positive. When firms have ease of access to external financing from local institutions, they experience high market valuation. In column 3, when we add HKS Ratio, the main variable of interest in Hong, Kubik, and Stein (2008), we obtain similar results. Including their variable does not alter the significant effect of AM Ratio on firm valuation. The results together suggest that institutional investors are as important as individual households. Overall, when firms are located in a state where relative AUM of local institutions is high, their

[10]The variables are: HKS Ratio , R&D Dummy, R&D-to-Sales, and ROE. Detailed definition of these variables are described in Appendix Table 3.1.

stock prices tend to be high.

To ensure the robustness of our results, we perform several additional analyses. Firstly, we construct a neighboring states AM Ratio measure, defined as the ratio of the aggregate AUM of institutions in neighboring states to the total market capitalization of firms in neighboring states. We develop this measure to alleviate concerns that small states are potentially affected by adjacent big states, such as New Jersey next to New York. As reported in column 4, the coefficient of AM Ratio remains significantly positive. Secondly, we estimate similar regressions using region-level AM Ratio measure as shown in column 5. The overall results are statistically consistent when AM Ratio is measured at the region level. A region is a broader definition of clustering than a state. As a result, it could potentially introduce some noisy factors. Thirdly, to make sure that our results are robust across different methodologies, we employ the Fama-Macbeth (1973) approach to estimate the regression model. Consistent with our panel regression evidence, the average of coefficients is significantly positive as reported in columns 6 and 7. Finally, we perform additional subsample analyses, 1980 to 1996 and 1997 to 2013, to examine the time varying effect of AM Ratio on firm valuation. As shown in columns 8 and 9, the coefficients of AM Ratio are not significant while the coefficient of HKS Ratio is significantly negative for the period of 1980 to 1996. Such results are expected in the early period of our sample given that institutional investors just started to grow and expand. At that time, individual investors and households play dominant roles in determining stock prices. In comparison, from 1997 to 2013, the role of financial institutions becomes increasingly important. As displayed in columns 10 and 11, in the recent sample period, firm valuation increases significantly as AM Ratio increases and the effect of households becomes weak. Overall, our main results are consistent across various samples and two alternative measures of AM Ratio. The robust results suggest that AM Ratio is a valid proxy for location mismatch and funding access from local institutions. In our later analyses, we use the panel regression approach rather than the Fama-Macbeth (1973) approach as the primary method.

To sum up, the results in this subsection imply that the mismatch of location clusters does have an impact on firm valuation and that the ease of access to funding from local institutions is beneficial to firms.

3.3.2 AM Ratio, Local Bias, and Firm Valuation

We have shown that the ease of access to local funding enhances firm valuation. AM Ratio measures the potential capital from local institutional investors regardless of their actual investment decisions. Previous studies provide evidence that both individual investors and institutional investors exhibit strong local bias. The effect of AM Ratio mainly comes from local bias. If there is no local preference, there will be no AM Ratio effect. As shown in Table 3.1, both local bias and AM Ratio vary substantially across states. In this subsection, we examine the joint influence of AM Ratio and local bias on firm valuation. We construct two measures of local bias at the state level. The first measure captures local bias relative to the market weight of investable assets for all investors while the second measure considers local bias relative to the market weight of investable assets for institutional investors only.

We introduce an interaction term to examine the joint effect of AM Ratio and local bias on firm valuation. The results are displayed in Table 3.3. We start by examining the pure effect of local bias. As shown in columns 1 and 2, the relation between local bias and firm valuation is significantly negative. Local bias is stronger in small states where financial institutions are less sophisticated. The results imply that without sufficient funding, simply high local bias does not contribute to firm valuation. We then examine the joint effect of local bias and AM Ratio. In columns 3 and 4, the significantly positive coefficients of the interaction terms indicate that firms benefit more from local institutional funding when they are located in high local bias states. The overall evidence implies that local bias alone does not have valuation effect. Its impact is pronounced when states have sufficient local equity funding supply from financial institutions.

3.3.3 Subsample Analysis

We have documented the aggregate effect of local funding supply on firm valuation. In this subsection, we split our sample into two subsamples and examine when the presence of local institutional equity matters more. Ferreira and Matos (2008) show that all institutional investors prefer large and liquid stocks across 27 countries. As a result, it is easier for large firms to obtain financing from institutions regardless of their locations. Whereas, small and equity dependent firms need

capital to grow but they are more likely to be neglected by non-local institutional investors. It is difficult for them to raise capital at a distance. Thus, the ease of funding from local institutions should contribute more to such firms.

We employ five measures to form subsamples: (1) Size. A firm is considered as small if its market capitalization is below the 20% NYSE size breakpoints and large if its market capitalization is above the 80% NYSE size breakpoints; (2) Age. A firm is considered as young if it had an IPO in the past 5 years and old if it had an IPO more than 40 years ago; (3) Payout Ratio. We define payout ratio as the sum of dividends and stock repurchases to net income and use the bottom and top 20% breakpoints to form low payout ratio and high payout ratio firms; (4)Credit Rating. A firm is considered as financially constrained if it does not have an S&P credit rating or has an S&P credit rating of below BBB-; (5) KZ index. The higher the KZ index, the more equity dependent a firm is. To be consistent, we use the top and bottom 20% breakpoints to form equity dependent and independent firms.[11]

The comparison results are displayed in Table 3.4. The coefficients of AM Ratio are significantly and consistently positive for small, young, low payout ratio, low rating, or high KZ index firms. These firms have difficulty accessing debt financing and are more dependent on equity financing. In contrast, none of the coefficients of AM Ratio is significant for equity independent firms. Our results suggest that the ease of access to local institutional funding mitigates the financial constrains of equity dependent firms.

3.4 Local Institutions and Corporate Investment and Financing Decisions

In the previous section, we document a positive relation between the state-level AM Ratio and firm valuation. In this section, we explore the channels of this positive relation by examining two corporate policies: investment and issuance. Previous literature addresses the importance of institutional investors in improving corporate decisions and governance (Ferreira and Matos (2008)). Recent studies highlight the role of local institutional investors in improving corporate

[11] We employ four-variable version of the KZ index as in Baker, Stein, and Wurgler (2003) equation 5.

governance (Gaspar and Massa (2007)), engaging in monitoring activities (Kang and Kim (2008)), increasing firm valuations (Ferreira and Matos (2008)), and encouraging dividend payout (Becker, Ivkovic, and Weisbenner (2011b)). Overall, institutional investors contribute to better corporate decision making and governance. Motivated by previous studies, we investigate the mechanism of the relation between firm valuation and AM Ratio. We first study how state-level local institutional funding affects corporate policies. Then we examine the channels through which firms have access to local institutional funding.

3.4.1 AM Ratio and Investment

In a frictionless world, firms undertake investment in accordance with their investment opportunities proxied by Tobin's Q. In reality, firm investment decisions are influenced by both internal and external financing. High AM Ratio proxies for low cost of external financing and low information asymmetry. As a result, it makes it easier for firms to obtain external financing. With abundant external financing, firms are expected to increase investment. We examine whether investment policies of firms located in high and low AM Ratio states differ substantially. We employ four measures of investment: CAPXRND, R&D, CAPEX, and INVESTMENT. R&D proxies for high risk and intangible investment while CAPEX represents low risk and tangible investment policies. CAPXRND and INVESTMENT capture firm aggregate investment policy. Given sufficient and low cost external financing, firms should undertake more high risk and low risk investment. We estimate the regression model of firm investment on AM Ratio to test our hypothesis.

Table 3.5 reports the regression analysis results. For four measures of investment in columns 1, 4, 7, and 10, the coefficients of AM Ratio are significantly positive at 5% level. Managers take advantage of easily accessible external financing and allocate more capital to both high risk and low risk investment. High AM Ratio is associated with reduced cost of financing and the ease of access to external financing which in turn enables managers to explore more investment opportunities.

Furthermore, investment is affected by both internal and external financing. When firms have difficulty accessing external financing, they would exhibit high investment-cash flow sensitivities and low investment-Q sensitivities. However, when firms do not face external funding constraints, they would rely less on internal cash flow to make investment decisions. Since AM Ratio prox-

ies for the ease of external equity financing, investment of firms in high AM Ratio states should become less sensitive to internal cash flow. In addition, firms that have more investment opportunities are also in greater need of external finance. Thus, when located in high AM Ratio states, firms tend to undertake investment according to their investment opportunities. To test our hypotheses, we examine the investment-cash flow sensitivity which proxies for financing constraints and the investment-Q sensitivity to capture the relation between actual and potential investment opportunities. We therefore estimate the following model.

$$Firm\ Investment_{j,t} = \beta_1 + \beta_2 AMRatio_{i,t-1} + \beta_3 Cash\ Flow_{j,t} \text{ or } Q_{j,t-1} + \beta_4 Interaction_{j,t-1} + \mathrm{X}_{j,t-1} + \epsilon_{j,t}, \tag{3.3}$$

where $Firm\ Investment_{j,t}$ is defined using four measures. Cash flow is a proxy for internal financing and Q proxies for investment opportunities. We also add the interactions of Cash Flow (Q) and AM Ratio to test whether financing constraints are loosened when firms are located in states with abundant local institutional funding.

We report the regression results in Table 3.5. In columns 2, 5, 8, and 11, the coefficients of the interaction terms are significantly negative at 1% level. This finding suggests that the investment-cash flow sensitivity is reduced for firms located in high AM Ratio states. When firms can access local financing at low cost, their investments rely less on internal cash flow. Therefore, local institutional funding mitigates the financial constraints of firms. Moreover, in columns 3, 6, 9, and 12, the parameter estimations of the interaction terms are significantly positive. When there are more investment opportunities and enough external funding, firms are more likely to increase their investments.

Overall, sufficient capital funding motivates firms to undertake more investment and their investments are less dependent on internal cash flow. High Q firms are able to make investment decisions in accordance with their opportunities. Therefore, local institutional funding eases the financial constraints of firms.

3.4.2 Local Institutions and Issuance

In this subseciton, we examine how firms are able to undertake more investment by investigating firm issuance policy. Corporate issuance is affect by the cost of external financing. When firms are located in high AM Ratio states, they should issue more given low cost of equity financing, especially for low cash flow and high Q firms. In addition, capital structure is influenced by firm financing decisions. Thus, we also examine the relation between AM Ratio and firm leverage.

Table 3.6 reports the regression estimates for equity issuance, debt issuance, and leverage. The results in column 1 indicate that locating in high AM Ratio states makes it easier and less costly for firms to obtain external equity financing. Consequently, firms are inclined to issue more equity. In column 2, the estimate of the interaction term is -0.309 with a t-value of -2.87 implying that equity issuance sensitivity to cash flow becomes increasingly negative when AM Ratio is high. Low cash flow firms are financially constrained and tend to issue more equity when the external financing cost is low. As shown in column 3, equity issuance sensitivity to Q increases with AM Ratio. When firms have more investment opportunities and are located in high AM Ratio states, their equity issuance increases accordingly. The results suggest that high AM Ratio proxies for low financing frictions. In comparison, when firms are located states with high level of mismatch, they do not turn to debt for external financing, especially for low cash flow firms. These firms lack the ability to meet debt payment and prefer to seek equity financing. The results together suggest that our previous findings are not driven by the overall effects of the financial sector development. AM Ratio is a valid proxy for equity financing and the development of equity financing sector has valuation implications.

In our unreported results, we introduce a CF dummy, which takes the value of one if cash flow is negative, zero otherwise. Firms with negative cash flows are regarded as truly financially constrained. We show that equity issuance to cash flow becomes more negatively sensitive for firms with negative cash flows. In addition, we replicate the regression analyses in Table 3.6 using two alternative measures of equity issuance.[12] We find robust evidence that equity issuance is more

[12]Two alternative measures of equity issuance are constructed by adopting a breakpoint of 3%. Issuance_Alt is set to be zero if Equity Issuance is less than 3% , equals to Equity Issuance otherwise. Issuance Dummy is an indicator variable that takes the value of one if Equity Issuance is higher than 3%, zero otherwise.

negatively sensitive to cash flow and more positively sensitive to Q as AM Ratio increases.

We have shown that low cash flow and high Q firms have the incentives to raise more equity capital. To provide direct evidence that the increased equity capital is indeed raised from local institutions, we examine the percentage of newly issued shares held by local institutions compared with three benchmarks. This analysis is performed on a subsample of firms that have equity issuance of higher than 3%.[13] We construct three variables to capture the newly issued equity absorbing effect by local institutions. *Absorb* is defined as the percentage of newly issued shares held by local institutions. Measure 1 is defined as the difference of *Absorb* and the ratio of the total AUM of local institutions to the total AUM of all institutions. It compares *Absorb* with the proportion of local institutional AUM among all institutions. If this measure is positive, it implies that local institutions invest unevenly more in newly issued shares than they should based on their AUM weight. Measure 2 is defined as the difference of *Absorb* and the ratio of the total market capitalization of local firms held by local institutions to the total market capitalization of all local firms. The second benchmark captures the percentage of local firms held by all local institutions. Measure 3 is defined as the difference of *Absorb* and the ratio of the number of existing shares held by local institutions to the total number of existing shares of a firm.

Table 3.7 summarizes the three measures for the full sample and two subsample periods: 1980-1996 and 1997-2013. The absorb effect is stronger in recent sample period due to the expansion of financial institutions. For all three measures, local institutions tend to hold more newly issued shares when firms are located in high AM Ratio states. In addition, the absorb effect is stronger for large firms. Small firms do not issue as much equity as large firms so the absorb effect is comparatively weak. When double sorted on AM Ratio and firm size, local institutions hold more newly issued shares of large firms located in states with adequate local funding.

In summary, we find that indeed because of local institutional dollars (ease of accessing to institutional money), firms rely less on internal cash flows and have the ability to raise more equity via institutional funding. Nevertheless, low cash flow firms do not issue debt even when they are located in states with ease of access to local funding.

[13]The breakpoint of 3% ensures that real equity issuance is captured while share repurchase or option exercise is not considered.

3.5 Further Evidence

3.5.1 Firm Relocation and Local Institutions

So far, we have provided valid evidence on the importance of local institutional funding. When firms are located in states with abundant local dollars, they experience high valuation and increase investment and equity issuance. Local institutional funding eases the financial constraints of equity dependent firms. Given its importance, in this subsection, we perform several analyses on a subsample of firms that relocate over the sample period. We examine whether local institutional funding is a determinant reason that drives firms to move.

To start with, we examine firm relocation trend. We compare AM Ratio of a firm's new location and old location 1 year to 5 years after it moves. Based on the unreported evidence, firms move from high AM Ratio states to low AM Ratio states. One explanation for this finding is that the concentration of the money managing industry has weakened in recent years. In the proceeding section, we show that equity dependent firms benefit more from local institutional funding. Thus, these firms have the most incentive to chase local equity financing. We then examine whether access to local funding drives equity dependent firms to relocate. We introduce two dependent variables: AM Ratio Change and AM Ratio Change Dummy.[14] Both variables consider the difference in AM Ratio between the new and old states. Our key variables of interests are KZ Index and KZ Dummy.[15] Both variables capture the relocation decision of equity dependent firms. Our relocation sample is composed of 488 firms from 1980 to 2013. As reported in Table 3.8, none of the coefficients of KZ Index and KZ Dummy is significantly positive. Even though local institutional funding contributes more to equity dependent firms, it is not a major incentive for them to relocate. Based on previous studies, there are several reasons that motivate firms to move. Cost cutting is one of the main motivations, such as moving away from centralized areas, tax savings, and moving close to major customers. Other reasons include owners' personal preference and loss/increase of profitability.

We then examine local holding changes of financial institutions in firms' new and old locations.

[14] AM Ratio Change captures the difference of AM Ratio of a firm's new location 1 year after relocation and AM Ratio of a firm's old location 1 year before relocation. AM Ratio Change Dummy is set to one if AM Ratio Change is positive, zero otherwise.

[15] KZ Dummy is set to one if a firm's KZ Index is higher than the top 20% breakpoints, zero otherwise.

Local institutional holding (LH) is defined as the ratio of the local institutional holding to the total institutional holding of a firm. This variable controls for the growing trend of financial institutions. We summarize local institutional holding changes for the full sample, for firms that move from low AM Ratio states to high AM Ratio states (positive move), and for firms that move from high AM Ratio states to low AM Ratio states (negative move). We compare local institutional holding 1 year before firms relocate and 1 to 3 years after firms relocate for institutions in both old and new locations. As shown in Panel A of Table 3.9, when firms relocate, financial institutions in their old locations significantly reduce holdings of the moving firms. This effect is stronger when firms move from low AM Ratio states to high AM Ratio states. In comparison, financial institutions in the new locations hold more shares of the moving firms, especially when firms experience negative move.

To summarize, our analyses on firm relocation subsample provide further support for the previous findings. Even though local institutional funding does not drive firms to relocate, they still benefit from the mismatched clusters between financial institutions and firms.

3.5.2 Persistence of the Valuation Effects

We next examine the real effects of local institutions. We focus on both stock market performance persistence and operating performance. In our earlier analyses, we show that firms exhibit high valuation when they are located in states with ease of access to local funding. We also document that firms increase investment and issue more shares. However, the real effects of adopting these corporate policies are still unclear. The high valuation can be a temporary overvaluation resulted from inefficient and blind investment. In the long run, this overvaluation will be adjusted to firm intrinsic value. If so, we expect stock returns to reverse in the long term. On the other hand, the high valuation can be driven by efficient investment and asset allocation. If so, the high valuation is expected to be persistent. In this subsection, we examine whether the high valuation is temporary or persistent and whether firms become more profitable.

To examine the persistence of the valuation effect, we perform the Fama-Macbeth regressions of the monthly excess stock returns on funding easiness measure. The results are reported in Panel A of Table 3.10. The coefficients of AM Ratio are insignificant for the full sample and for the

two subsamples based on credit rating and KZ index. Stock market performance does not vary significantly for firms located in states with different levels of mismatch. There is no evidence of significant return reversal. Firms in high AM Ratio states do not significantly outperform or underperform firms in low AM Ratio states. The evidence on stock market performance confirms that the high valuation is indeed persistently high. Given more investment, more equity issuance, and persistently high valuation, we expect firms to be more profitable. We then test the relation between AM Ratio and operating performance. As shown in Panel B of Table 3.10, firms located in states with sufficient local funding supply indeed have higher earnings and are more profitable.

To sum up, firms take advantage of the ease of access to capital and allocate resources efficiently. Our results are consistent with the efficient market hypothesis. Firms in high AM Ratio states act differently from firms in low AM Ratio states in corporate decision making. The mismatched clusters between financial institutions and firms have real effects on firms: persistently high valuation and more earnings.

3.5.3 Valuation Effects with Shocks to Local Institutions

In this subsection, we utilize the 2000 tech bust as a natural experiment to establish the causal effect of AM Ratio on firm valuation and stock market performance. We firstly identify the affected states where the average percentage of tech stocks held by local financial institutions is ranked at the top 10% states in 2000. Our analysis is performed on a subsample of non-tech stocks where we exclude tech firms and industries that are highly correlated with tech industry. Financial institutions that held a large portion of tech stocks would be strongly affected by the tech bubble. However, the tech bubble is unlikely to directly affect the fundamentals of non-tech firms. This provides an exogenous shock to financial institutions and firms located in the top 10% states. We perform a Dif-in-Dif test to examine the market valuation and stock market performance of non-tech firms located in the affected states during the period of 2000 to 2002. We restrict our sample period from 1990 to 2008 to ensure that the results are not affected by the 2008 financial crisis.

Table 3.11 reports the results of the regression analyses. In Panel A, we compare the market valuation of non-tech firms located in the top 10% states with the market valuation of firms for the rest of the sample and firms located in the bottom 10%, 20%, and 30% states. The coefficients

of the interaction terms are significantly negative for these 4 model specifications. During the tech bubble period, non-tech firms located in the states where financial institutions are strongly affected by this event experience a significant drop in their market valuation. We further examine the stock market performance of non-tech firms during this period. The results are reported in Panel B. Consistent with the valuation effects, firms in the affected states experience significantly lower returns during 2000 to 2002.

The tech bust analysis provides strong support for the causal relation between AM Ratio and firm valuation. This exogenous shock directly affects financial institutions that held a high portion of tech stocks in their portfolio but does not systematically impact non-tech firms during the tech bubble period. This event influenced these firms through institutional investors.

3.6 Conclusion

Using the unique location information of U.S. institutions and firms from 1980 to 2013, we develop an effective measure, AM Ratio, which captures the potential funding available from local institutions. It also measures the mismatch of location clusters between financial institutions and firms. Our results imply that high AM Ratio proxies for low cost of external financing and low financing frictions.

Our analyses of AM Ratio and firm valuation suggest that firms benefit from being located in states with ease of access to local institutional funding. We find robust evidence that the market valuation of firms is high when the state-level AM Ratio is high. The valuation effect is stronger for equity dependent firms.

Furthermore, firms invest more and issue more equity when located in high AM Ratio states. Firm investment in such states is less dependent on internal cash flow and is more sensitive to investment opportunities. Their equity issuance sensitivity to cash flow is increasingly negative as AM Ratio increases. We further provide direct evidence that a large portion of newly issued shares are held by local institutions. As a result, local institutional funding mitigates the financial constraints of firms through equity issuance channel. Our findings on firm performance support the efficient market hypothesis that high valuation of firms is not a temporary overvaluation but a

result of efficient allocation of resources. Local institutional funding and the mismatch of location clusters indeed have real effects on firms.

Figure 3.1

Total AUM of Local Institutions to State GDP by State

This figure presents a map of the time-series average of the ratio of total AUM of local institutions to state-level GDP for each state.

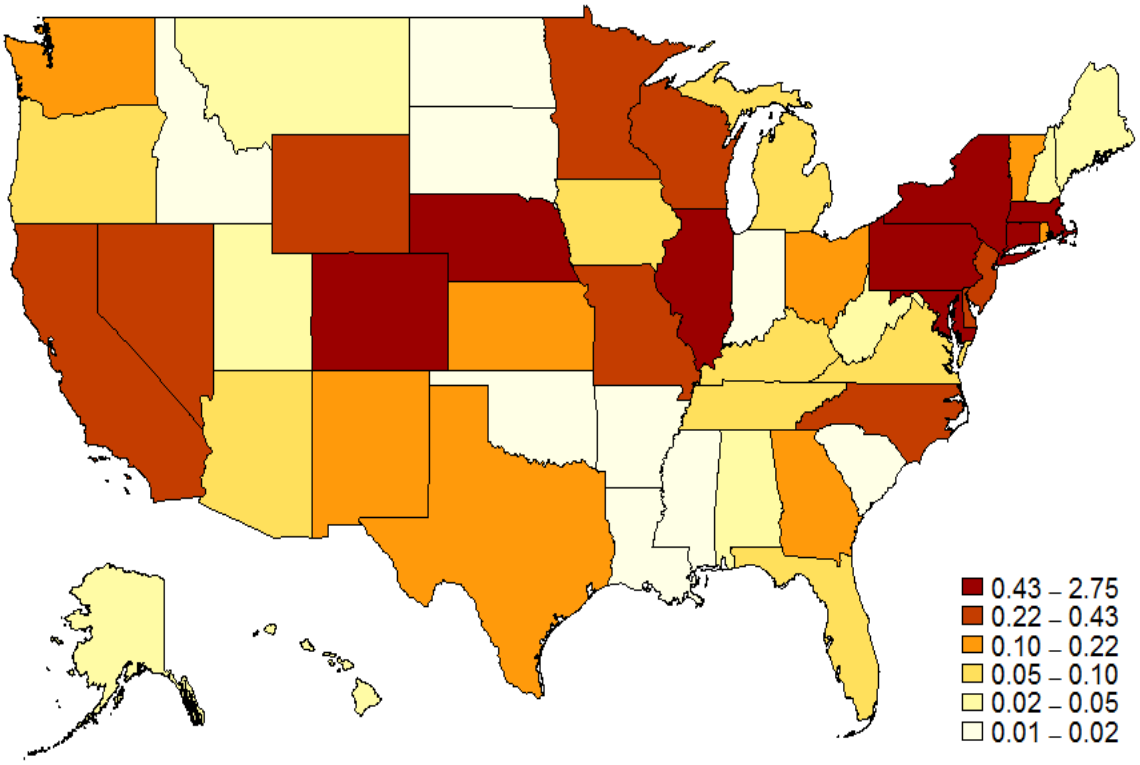

Figure 3.2

Total Market Capitalization of Local Firms to State GDP by State

This figure presents a map of the time-series average of the ratio of total market capitalization of local firms to state-level GDP for each state.

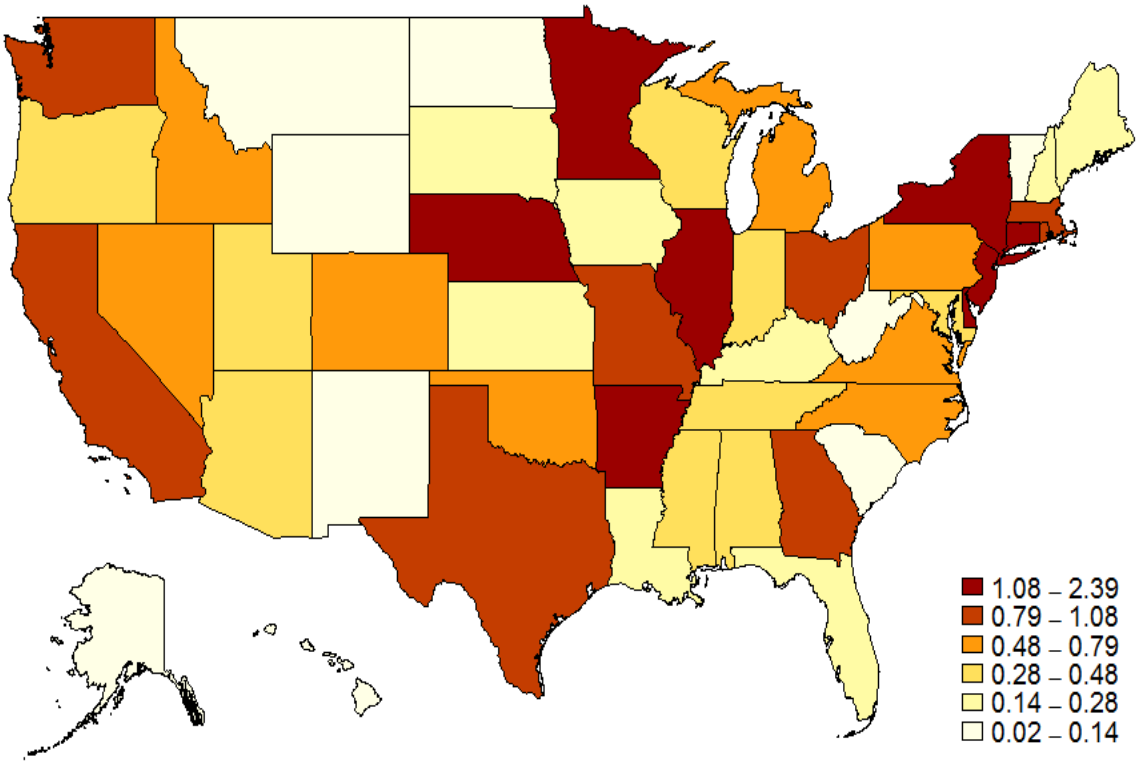

Figure 3.3
AM Ratio by State

This figure presents a map of the time-series average of AM Ratio for each state. AM Ratio is defined as the ratio of the aggregate AUM of institutions in a state to the total market capitalization of public firms in the same state.

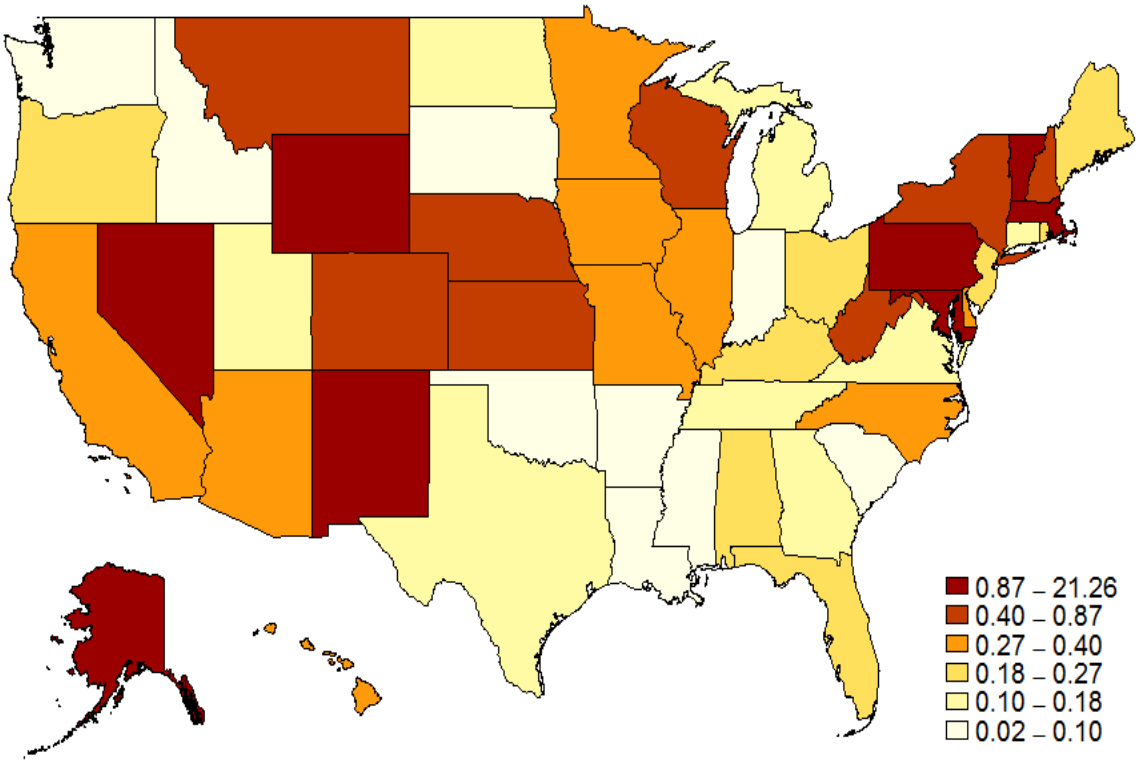

Figure 3.4

Size Ratio and AUM Ratio of the Bottom 5 States

This figure presents Size Ratio and AUM Ratio of the bottom 5 states ranked by AUM Ratio. Size Ratio is defined as the ratio of the state-level market capitalization to the total market capitalization of all firms. AUM Ratio is defined as the ratio of the state-level AUM to the total AUM of all financial institutions.

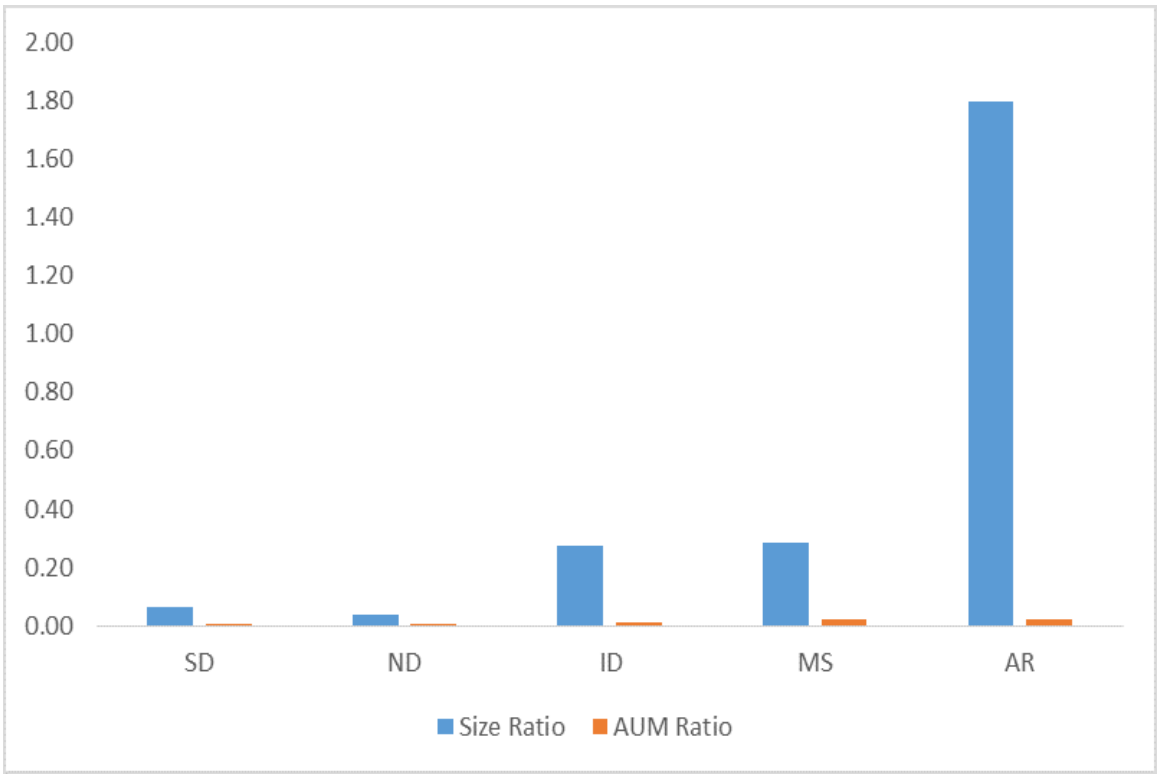

Figure 3.5
Size Ratio and AUM Ratio of the Top 5 States

This figure presents Size Ratio and AUM Ratio of the top 5 states ranked by AUM Ratio. Size Ratio is defined as the ratio of the state-level market capitalization to the total market capitalization of all firms. AUM Ratio is defined as the ratio of the state-level AUM to the total AUM of all financial institutions.

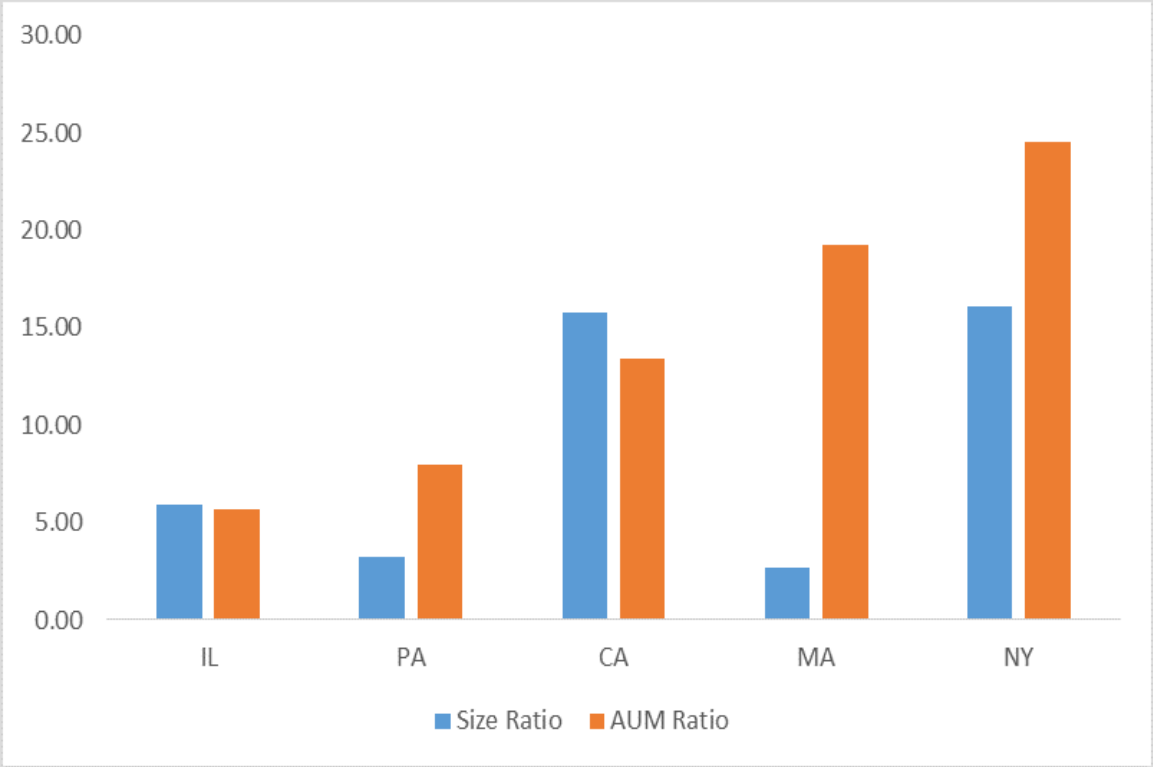

Table 3.1
Summary Statistics

This table reports the summary statistics for the state aggregate asset under management (AUM) of 13F institutions, the number of firms, the number of 13F institutions, the state aggregate market capitalization of firms, AM Ratio, and two local bias measures for 1980, 1997, and 2013. The summary statistics are reported for top 5, middle 5, and bottom 5 states ranked by the state-level total AUM. AM Ratio is defined as the ratio of the aggregate AUM of institutions in a state to the total market capitalization of public firms in the same state. Local bias is measured using two methods. The first method (State_LB1) is defined as the difference of the ratio of the total market capitalization of local firms held by local institutions to the total AUM of local institutions and the ratio of the total market capitalization of local firms to the total market capitalization of all firms. The second method (State_LB2) is defined as the difference of the ratio of the total market capitalization of local firms held by local institutions to the total AUM of local institutions and the ratio of the total market capitalization of local firms held by all institutions to the total AUM of all institutions.

	1980						
	State AUM (in $ billion)	Number of Firms	Number of 13F Institutions	State Market Cap (in $ billion)	AM Ratio	State_LB1	State_LB2
National Aggregate	196.23	4484	223	1202.00	0.163		
State Average	6.54	88	7	40.07	0.262	0.069	0.072
Top 5 States							
NY	68.88	608	62	244.28	0.282	-0.003	0.034
MA	31.89	169	30	35.80	0.891	0.026	0.029
CA	17.25	529	24	148.46	0.116	0.070	0.082
IL	14.41	234	15	104.84	0.137	0.097	0.100
TX	10.39	362	11	189.62	0.055	0.072	0.085
Middle 5 States							
GA	1.31	76	4	16.73	0.079	0.017	0.019
IA	1.07	31	2	3.28	0.327	0.001	0.003
DC	0.98	20	3	4.76	0.207	0.046	0.046
MN	0.94	112	3	24.47	0.038	0.081	0.077
IN	0.90	69	1	11.15	0.081	0.011	0.009
Bottom 5 States							
FL	0.15	180	1	15.86	0.009	0.141	0.145
UT	0.12	37	1	3.87	0.030	0.016	0.018
KY	0.09	29	1	5.95	0.014	-0.005	-0.003
LA	0.08	31	1	13.50	0.006	0.249	0.251
NH	0.05	13	1	2.27	0.021	0.011	0.012

Table 3.1 - Continued
Summary Statistics

	1997						
	State AUM (in $ billion)	Number of Firms	Number of 13F Institutions	State Market Cap (in $ billion)	AM Ratio	State_LB1	State_LB2
National Aggregate	4501.30	7818	1317	9946.57	0.453		
State Average	93.78	153	27	207.22	0.380	0.061	0.063
Top 5 States							
NY	1228.99	695	325	1483.79	0.828	0.006	0.022
MA	872.80	409	116	274.96	3.174	0.006	0.005
CA	614.71	1270	162	1193.72	0.515	0.011	0.019
PA	309.14	346	59	428.12	0.722	0.024	0.027
IL	214.25	323	74	671.44	0.319	0.052	0.056
Middle 5 States							
VA	14.86	201	23	255.94	0.058	0.025	0.025
DE	14.54	25	10	102.73	0.142	-0.006	-0.006
TN	13.29	97	15	99.05	0.134	0.081	0.080
NM	12.16	20	3	6.30	1.929	0.000	0.000
DC	6.29	26	8	105.76	0.060	-0.004	-0.007
Bottom 5 States							
MT	0.45	13	2	2.98	0.151	0.009	0.009
ND	0.31	6	2	2.53	0.121	0.000	0.000
MS	0.26	32	1	42.00	0.006	0.631	0.631
SD	0.24	10	2	6.47	0.037	0.019	0.020
NV	0.15	67	4	23.71	0.006	0.000	0.000
	2013						
	State AUM (in $ billion)	Number of Firms	Number of 13F Institutions	State Market Cap (in $ billion)	AM Ratio	State_LB1	State_LB2
National Aggregate	11865.40	4805	3049	20686.58	0.574		
State Average	232.65	94	60	405.62	0.711	0.019	0.020
Top 5 States							
MA	2588.12	294	219	564.23	4.587	0.009	0.006
NY	2258.86	572	768	2931.25	0.771	0.031	-0.004
CA	1346.12	720	371	4047.77	0.333	0.002	0.018
PA	1320.97	199	134	571.81	2.310	0.004	0.002
IL	845.51	331	172	1174.92	0.720	0.014	0.017
Middle 5 States							
TN	45.48	59	35	215.76	0.211	0.051	0.050
AZ	43.47	51	14	149.84	0.290	-0.006	-0.004
KY	25.06	29	18	90.26	0.278	0.008	0.008
OR	19.19	35	24	126.32	0.152	0.014	0.013
UT	14.04	31	9	42.43	0.331	0.006	0.006
Bottom 5 States							
WY	1.46	3	3	1.31	1.114	0.003	0.003
HI	1.45	12	4	10.20	0.142	0.023	0.023
ID	0.97	13	4	31.18	0.031	0.003	0.003
ND	0.78	3	4	6.15	0.127	0.043	0.043
SD	0.33	9	3	6.60	0.051	0.017	0.017

Table 3.2

AM Ratio and Firm Valuation

This table reports panel and the Fama-Macbeth regressions of MB on AM Ratio and firm-level control variables, as well as year and industry fixed effects. MB is defined as the log of market equity value to book equity value. AM Ratio is defined as the ratio of the aggregate AUM of institutions in a state to the total market capitalization of public firms in the same state. When R&D variable is missing, it is set to zero. R&D Dummy is set to one if R&D variable is missing, otherwise it is set to zero. R&D-to-Sales is defined as research and development expenditures scaled by sales. ROE is defined as net income divided by lagged book equity. HKS Ratio is defined as the total book value of all firms located in state i to the aggregate income of all households located in state i. Neighboring states AM Ratio is defined as the ratio of the aggregate AUM of institutions in neighboring states to the total market capitalization of firms in neighboring states. Census Region AM Ratio is measured at the region level. The sample period is from 1980 to 2013. t-statistics, based on standard errors clustered at the industry level, are reported in parentheses. Statistical significance is denoted by *, ** , and *** at the 10%, 5%, and 1% levels, respectively.

	State AM Ratio			Neighboring States AM Ratio	Census Region AM Ratio	Fama-Macbeth Method		1980-1996		1997-2013	
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
AM Ratio	0.011***	0.008**	0.008**	0.018**	0.020**	0.016**	0.016**	0.010	0.007	0.008**	0.008**
	(3.18)	(2.29)	(2.11)	(2.08)	(2.15)	(2.38)	(2.30)	(1.09)	(0.77)	(2.14)	(2.16)
HKS Ratio			-0.019**	-0.023***	-0.089***		0.009		-0.062***		0.004
			(-2.57)	(-3.08)	(-5.65)		(0.65)		(-4.79)		(0.44)
R&D Dummy		-0.213***	-0.213***	-0.213***	-0.211***	-0.004	-0.310***	-0.146***	-0.146***	-0.297***	-0.297***
		(-6.70)	(-6.70)	(-6.75)	(-6.60)	(-1.58)	(-9.83)	(-6.23)	(-6.23)	(-6.84)	(-6.81)
R&D-to-Sales		0.000**	0.000**	0.000**	0.000**	0.038	0.038	0.002***	0.002***	0.000***	0.000***
		(2.05)	(2.04)	(2.05)	(2.03)	(1.43)	(1.43)	(4.41)	(4.39)	(3.01)	(3.02)
ROE		0.001***	0.001***	0.001***	0.001***	-0.004	-0.004	-0.004***	-0.004***	0.001***	0.001***
		(4.65)	(4.66)	(4.65)	(4.61)	(-1.58)	(-1.58)	(-2.71)	(-2.72)	(12.10)	(11.98)
N	120350	106525	106525	106525	108030	33	33	51570	51570	54955	54955
Adjusted R^2	0.125	0.136	0.136	0.136	0.136	0.050	0.050	0.130	0.131	0.141	0.141
Year FE	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 3.3
AM Ratio, Local Bias, and Firm Valuation

This table reports panel regressions of MB on AM Ratio, local bias, and firm-level control variables, as well as year and industry fixed effects. MB is defined as the log of market equity value to book equity value. AM Ratio is defined as the ratio of the aggregate AUM of institutions in a state to the total market capitalization of public firms in the same state. Local bias is measured using two methods. The first method (State_LB1) is defined as the difference of the ratio of the total market capitalization of local firms held by local institutions to the total AUM of local institutions and the ratio of the total market capitalization of local firms to the total market capitalization of all firms. The second method (State_LB2) is defined as the difference of the ratio of the total market capitalization of local firms held by local institutions to the total AUM of local institutions and the ratio of the total market capitalization of local firms held by all institutions to the total AUM of all institutions. When R&D variable is missing, it is set to zero. R&D Dummy is set to one if R&D variable is missing, otherwise it is set to zero. R&D-to-Sales is defined as research and development expenditures scaled by sales. ROE is defined as net income divided by lagged book equity. The sample period is from 1980 to 2013. t-statistics, based on standard errors clustered at the industry level, are reported in parentheses. Statistical significance is denoted by *, ** , and *** at the 10%, 5%, and 1% levels, respectively.

Variable	(1)	(2)	(3)	(4)
AM Ratio			0.040***	0.039**
			(2.87)	(2.06)
State_LB1*AM Ratio			1.241***	
			(2.66)	
State_LB1	-0.237*		0.290	
	(-1.88)		(1.57)	
State_LB2*AM Ratio				1.009*
				(1.92)
State_LB2		-0.260**		0.211
		(-2.10)		(0.98)
R&D Dummy	-0.226***	-0.226***	-0.224***	-0.224***
	(-7.07)	(-7.07)	(-6.97)	(-6.96)
R&D to Sales	0.000**	0.000**	0.000**	0.000**
	(2.07)	(2.06)	(2.03)	(2.04)
ROE	0.001***	0.001***	0.001***	0.001***
	(4.96)	(4.96)	(5.50)	(5.49)
N	103000	103000	102413	102413
Adjusted R^2	0.137	0.137	0.135	0.135
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes

Table 3.4

AM Ratio and Firm Valuation Subsample Analysis

This table reports panel regressions of MB on AM Ratio and firm-level control variables, as well as year and industry fixed effects for subsamples of firms defined using size, age, payout ratio, credit rating, and KZ index. MB is defined as the log of market equity value to book equity value. AM Ratio is defined as the ratio of the aggregate AUM of institutions in a state to the total market capitalization of public firms in the same state. When R&D variable is missing, it is set to zero. R&D Dummy is set to one if R&D variable is missing, otherwise it is set to zero. R&D-to-Sales is defined as research and development expenditures scaled by sales. ROE is defined as net income divided by lagged book equity. The sample period is from 1980 to 2013. t-statistics, based on standard errors clustered at the industry level, are reported in parentheses. Statistical significance is denoted by *, ** , and *** at the 10%, 5%, and 1% levels, respectively.

	Size		Age		Payout Ratio		Credit Rating		KZ index	
	Small	Large	Young	Old	Bottom 20%	Top 20%	Rating Below BBB-	Rating Above BBB-	Top 20%	Bottom 20%
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
AM Ratio	0.019**	-0.022	0.056**	-0.022	0.020**	0.002	0.013*	-0.015	0.034**	-0.011
	(2.52)	(-0.55)	(2.14)	(-1.45)	(2.52)	(0.12)	(1.77)	(-0.92)	(2.34)	(-1.21)
R&D Dummy	-0.237***	-0.123**	-0.294***	-0.194***	-0.249***	-0.171***	-0.218***	-0.224***	-0.294***	-0.205***
	(-5.96)	(-2.23)	(-4.62)	(-3.63)	(-6.63)	(-6.30)	(-5.94)	(-5.47)	(-4.70)	(-6.92)
R&D-to-Sales	0.000**	0.115*	0.002	0.000**	0.000**	0.012*	0.000**	0.019**	0.000	0.001***
	(2.52)	(1.75)	(1.30)	(2.05)	(2.16)	(1.83)	(2.03)	(2.63)	(1.61)	(4.11)
ROE	-0.007***	0.044***	-0.003	0.003	-0.004***	0.001***	-0.006***	0.001***	0.001***	0.002
	(-4.20)	(5.12)	(-1.03)	(1.16)	(-4.53)	(20.71)	(-3.28)	(10.94)	(9.58)	(0.17)
N	61417	8467	3699	22569	50529	21130	82949	23576	18756	20033
Adjusted R^2	0.142	0.388	0.132	0.177	0.136	0.176	0.138	0.159	0.116	0.176
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 3.5

AM Ratio and Investment

This table reports panel regressions of investment on AM Ratio, two interactions terms and firm-level control variables, as well as year and industry fixed effects. CAPXRND is the sum of capital expenditures, research and development expenditures, all scaled by lagged assets. R&D is research and development expenditures scaled by lagged assets. CAPEX is capital expenditures scaled by lagged assets. INVESTMENT is the sum of capital expenditures, research and development expenditures, and 30% of selling, general, and administrative expenses, all scaled by lagged assets. AM Ratio is defined as the ratio of the aggregate AUM of institutions in a state to the total market capitalization of public firms in the same state. Cash Flow is defined as net income before extraordinary items, depreciation and amortization expenses, all scaled by lagged assets. Q is defined as market value of equity plus total assets, less book value of equity, all scaled by total assets. StateQ is defined as value-weighted Q of firms within each state. ROE is defined as net income divided by lagged book equity. Asset is defined as 1/total assets. Leverage is defined as the sum of long term debt and debt in current liabilities, all scaled by lagged assets. Ret is defined as annualized stock returns. The sample period is from 1980 to 2013. t-statistics, based on standard errors clustered at the industry level, are reported in parentheses. Statistical significance is denoted by * ,** ,and *** at the 10%, 5%, and 1% levels, respectively.

	CAPXRND			R&D			CAPEX			INVESTMENT		
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
AM Ratio	0.010**	0.009***	0.006*	0.007**	0.007***	0.005*	0.002**	0.002**	0.001	0.010***	0.013***	0.006
	(2.48)	(3.79)	(1.80)	(2.50)	(4.37)	(1.90)	(2.06)	(2.20)	(1.36)	(2.84)	(5.28)	(1.32)
Cash Flow*AM Ratio		-0.115***			-0.082***			-0.033**			-0.126***	
		(-3.67)			(-3.62)			(-2.05)			(-4.03)	
Q*AM Ratio			0.008**			0.006**			0.003**			0.010**
			(2.15)			(2.08)			(2.02)			(2.15)
Cash Flow	0.133	0.137	0.134	-0.067	-0.064	-0.066	0.199***	0.201***	0.200***	0.284**	0.286**	0.285**
	(1.14)	(1.23)	(1.15)	(-1.13)	(-1.17)	(-1.13)	(3.25)	(3.34)	(3.27)	(2.37)	(2.46)	(2.40)
Q	0.018***	0.018***	0.019***	0.016***	0.015***	0.016***	0.003	0.003	0.003	0.027***	0.026***	0.027***
	(4.55)	(4.66)	(4.56)	(5.71)	(5.85)	(5.53)	(1.13)	(1.09)	(1.17)	(6.35)	(6.47)	(6.41)
StateQ	0.013***	0.014***	0.013***	0.011***	0.011***	0.011***	0.002**	0.003**	0.002**	0.013***	0.014***	0.013***
	(3.74)	(3.81)	(3.77)	(3.71)	(3.77)	(3.73)	(2.55)	(2.63)	(2.58)	(5.18)	(5.14)	(5.01)
ROE	-0.000*	-0.000	-0.000*	-0.000**	-0.000*	-0.000**	-0.000	-0.000	-0.000	-0.000***	-0.000**	-0.000***
	(-1.73)	(-1.66)	(-1.74)	(-2.05)	(-1.96)	(-2.09)	(-1.30)	(-1.28)	(-1.30)	(-2.66)	(-2.63)	(-2.73)
Asset	0.678***	0.683***	0.686***	0.106	0.110	0.111	0.570***	0.571***	0.572***	1.033***	1.040***	1.041***
	(3.52)	(3.58)	(3.55)	(1.41)	(1.49)	(1.45)	(3.61)	(3.63)	(3.63)	(4.84)	(4.89)	(4.87)
Leverage	-0.008	-0.007	-0.007	-0.017**	-0.017**	-0.017**	0.009***	0.009***	0.009***	-0.021*	-0.021*	-0.021*
	(-0.91)	(-0.90)	(-0.90)	(-2.42)	(-2.42)	(-2.44)	(2.81)	(2.82)	(2.83)	(-1.91)	(-1.90)	(-1.92)
Ret	-0.012**	-0.012***	-0.013***	-0.006**	-0.006***	-0.007**	-0.006**	-0.006**	-0.007**	-0.014**	-0.013***	-0.015***
	(-2.60)	(-2.65)	(-2.70)	(-2.60)	(-2.74)	(-2.60)	(-2.10)	(-2.10)	(-2.18)	(-2.64)	(-2.68)	(-2.80)
N	107067	107067	107067	108146	108146	108146	107067	107067	107067	94513	94513	94513
Adjusted R^2	0.250	0.270	0.254	0.309	0.338	0.315	0.371	0.373	0.371	0.424	0.435	0.427
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 3.6

AM Ratio, Issuance, and Leverage

This table reports panel regressions of Equity Issuance, Debt Issuance and Leverage on AM Ratio, two interaction terms and firm-level control variables, as well as year and industry fixed effects. Equity Issuance is defined as the change in book equity and the change in deferred taxes, less the change in retained earnings, all scaled by lagged assets. Debt Issuance is defined as the change in assets, less the change in book equity, less the change in deferred taxes, all scaled by lagged assets. Leverage is defined as the sum of long term debt and debt in current liabilities, all scaled by lagged assets. AM Ratio is defined as the ratio of the aggregate AUM of institutions in a state to the total market capitalization of public firms in the same state. Cash Flow is defined as net income before extraordinary items, depreciation and amortization expenses, all scaled by lagged assets. Q is defined as market value of equity plus total assets, less book value of equity, all scaled by total assets. When R&D variable is missing, it is set to zero. R&D Dummy is set to one if R&D variable is missing, otherwise it is set to zero. R&D-to-Sales is defined as research and development expenditures scaled by sales. ROE is defined as net income divided by lagged book equity. The sample period is from 1980 to 2013. t-statistics, based on standard errors clustered at the industry level, are reported in parentheses. Statistical significance is denoted by * ,**, and *** at the 10%, 5%, and 1% levels, respectively.

	Equity Issuance			Debt Issuance			Leverage		
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
AM Ratio	0.009**	0.003	-0.003	0.010	0.007	0.006	-0.005	-0.006**	-0.006**
	(2.24)	(0.32)	(-0.51)	(1.19)	(1.52)	(1.35)	(-1.48)	(-2.32)	(-2.56)
Cash Flow*AM Ratio		-0.309***			-0.145			-0.051	
		(-2.87)			(-0.81)			(-0.63)	
Q*AM Ratio			0.027*			0.008			0.410**
			(1.92)			(0.87)			(2.03)
Cash Flow	-0.166	-0.157	-0.163	1.312**	1.316**	1.313**	0.409**	0.411**	0.025***
	(-0.87)	(-0.88)	(-0.86)	(2.29)	(2.31)	(2.29)	(2.03)	(2.05)	(3.16)
Q	0.082***	0.081***	0.083***	0.079***	0.079***	0.079***	0.025***	0.025***	0.002
	(5.49)	(5.66)	(5.79)	(3.68)	(3.71)	(3.70)	(3.13)	(3.14)	(0.51)
R&D Dummy	0.006	0.005	0.005	-0.003	-0.003	-0.003	0.063***	0.063***	0.063***
	(0.54)	(0.50)	(0.51)	(-0.14)	(-0.15)	(-0.14)	(4.73)	(4.73)	(4.71)
R&D-to-Sales	0.000	0.000	0.000	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**
	(0.88)	(0.61)	(0.90)	(2.10)	(2.09)	(2.10)	(2.22)	(2.22)	(2.23)
ROE	-0.000*	-0.000*	-0.000**	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(-1.99)	(-1.92)	(-2.00)	(-1.32)	(-1.31)	(-1.33)	(-0.86)	(-0.86)	(-0.86)
N	104506	104506	104506	104654	104654	104654	108898	108898	108898
Adjusted R^2	0.159	0.187	0.167	0.419	0.421	0.419	0.216	0.217	0.216
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 3.7

Local Institutions and Equity Issuance

This table summarizes equity issuance held by local institutions for a subsample of firms that have equity issuance of higher than 3%. Three variables are defined to capture the absorb effect of local institutions. Absorb is defined as the ratio of the newly issued shares held by local institutions to the total number of newly issued shares. Measure 1 is defined as the difference of Absorb and the ratio of the total AUM of local institutions to the total AUM of all institutions. Measure 2 is defined as the difference of Absorb and the ratio of the total market capitalization of local firms held by local institutions to the total market capitalization of all local firms. Measure 3 is defined as the difference of Absorb and the ratio of the number of existing shares held by local institutions to the total number of existing shares of a firm. The table reports summary statistics for the full sample period and subsample periods of 1980-1996 and 1997-2013.

	Measure 1								
	All firms	High AM Ratio States	Low AM Ratio States	Large Firms	Small Firms	High AM Ratio States /Large Firms	High AM Ratio States /Small Firms	Low AM Ratio States /Large Firms	Low AM Ratio States /Small Firms
Full Sample	0.104	0.117	0.079	0.161	0.047	0.184	0.049	0.109	0.048
1980-1996	0.092	0.113	0.052	0.147	0.037	0.177	0.049	0.088	0.015
1997-2013	0.115	0.120	0.103	0.173	0.057	0.191	0.049	0.127	0.078
	Measure 2								
	All firms	High AM Ratio States	Low AM Ratio States	Large Firms	Small Firms	High AM Ratio States /Large Firms	High AM Ratio States /Small Firms	Low AM Ratio States /Large Firms	Low AM Ratio States /Small Firms
Full Sample	0.123	0.144	0.078	0.178	0.067	0.210	0.078	0.108	0.048
1980-1996	0.111	0.142	0.050	0.164	0.058	0.203	0.082	0.087	0.014
1997-2013	0.133	0.146	0.103	0.190	0.076	0.217	0.075	0.127	0.078
	Measure 3								
	All firms	High AM Ratio States	Low AM Ratio States	Large Firms	Small Firms	High AM Ratio States /Large Firms	High AM Ratio States /Small Firms	Low AM Ratio States /Large Firms	Low AM Ratio States /Small Firms
Full Sample	0.134	0.160	0.080	0.177	0.092	0.210	0.111	0.108	0.053
1980-1996	0.123	0.159	0.055	0.167	0.079	0.207	0.111	0.090	0.021
1997-2013	0.144	0.162	0.102	0.185	0.103	0.212	0.112	0.124	0.081

Table 3.8

Firm Relocation Trend

This table reports panel regressions of AM Ratio Change or AM Ratio Change Dummy on KZ Index or KZ Dummy and firm-level control variables, as well as year and industry fixed effects. AM Ratio Change is defined as the difference of AM Ratio of a firm's new location 1 year after relocation and AM Ratio of a firm's old location 1 year before relocation. AM Ratio Change Dummy is set to one if AM Ratio Change is positive, zero otherwise. KZ Dummy is set to one if a firm's KZ Index is higher than the top 20% breakpoints, zero otherwise. AM Ratio is defined as the ratio of the aggregate AUM of institutions in a state to the total market capitalization of public firms in the same state. Cash Flow is defined as net income before extraordinary items, depreciation and amortization expenses, all scaled by lagged assets. Q is defined as market value of equity plus total assets, less book value of equity, all scaled by total assets. When R&D variable is missing, it is set to zero. R&D Dummy is set to one if R&D variable is missing, otherwise it is set to zero. R&D-to-Sales is defined as research and development expenditures scaled by sales. ROE is defined as net income divided by lagged book equity. Income Change is defined as the difference of the ratio of the personal income per capita to the total personal income per capital of a firm's new location 1 year after relocation and of a firm's old location 1 year before relocation. Tax Change is defined as the difference of the tax rates between new location and old location. The sample period is from 1980 to 2013. t-statistics, based on standard errors clustered at the industry level, are reported in parentheses. Statistical significance is denoted by * ,**, and *** at the 10%, 5%, and 1% levels, respectively.

	AM Ratio Change		AM Ratio Change Dummy	
Variable	(1)	(2)	(3)	(4)
KZ Index	-0.001**	-0.001		
	(-2.19)	(-1.52)		
KZ Dummy			-0.050	-0.039
			(-0.96)	(-0.79)
Cash Flow		0.052**		0.030***
		(2.38)		(3.29)
Q		-0.067***		-0.014**
		(-4.79)		(-2.07)
R&D Dummy		-0.087		0.019
		(-0.95)		(0.33)
R&D to Sales		0.009		0.009***
		(1.56)		(4.22)
ROE		-0.000		-0.008
		(-0.07)		(-1.48)
Income Change		1.089***		1.836**
		(3.68)		(2.46)
Tax Change		-0.002		0.026***
		(-0.13)		(4.57)
N	488	455	488	455
Adjusted R^2	0.135	0.268	0.083	0.117
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes

Table 3.9

Local Institutional Holding (LH) Change

This table reports local institutional holding changes of financial institutions in new and old locations when firms move. Local Institutional Holding (LH) is defined as the ratio of the local institutional holding to the total institutional holding of a firm. We compare local holding of financial institutions 1 year before and 1 year to 3 years after firms relocate for financial institutions in old and new locations. The results are reported for the full sample, the positive move sample (firms move to high AM Ratio states), and the negative move sample (firms move to low AM Ratio states). The table also reports the differences in the local institutional holding before and after firms relocate along with the percentage of positive and negative changes.

Panel A: Old Location Local Institution Holding (LH) Change

	Full Sample					Positive AM Ratio Move					Negative AM Ratio Move				
	After	Dif	t-dif	% of Positive Change	% of Negative Change	After	Dif	t-dif	% of Positive Change	% of Negative Change	After	Dif	t-dif	% of Positive Change	% of Negative Change
(-1,+1)	0.087	-0.006	-0.78	46.99%	53.01%	0.056	-0.020	-2.03	43.31%	56.69%	0.111	0.005	0.51	49.27%	50.73%
(-1,+2)	0.082	-0.011	-1.40	48.82%	51.18%	0.061	-0.016	-1.39	46.21%	53.79%	0.098	-0.008	-0.69	50.49%	49.51%
(-1,+3)	0.063	-0.030	-3.79	39.10%	60.90%	0.041	-0.036	-3.41	35.61%	64.39%	0.079	-0.026	-2.24	41.38%	58.62%

Panel B: New Location Local Institution Holding (LH) Change

	Full Sample					Positive AM Ratio Move					Negative AM Ratio Move				
	After	Dif	t-dif	% of Positive Change	% of Negative Change	After	Dif	t-dif	% of Positive Change	% of Negative Change	After	Dif	t-dif	% of Positive Change	% of Negative Change
(-1,+1)	0.062	0.017	2.96	55.51%	44.49%	0.102	0.025	2.21	52.14%	47.86%	0.031	0.011	2.06	59.09%	40.91%
(-1,+2)	0.064	0.019	3.04	54.64%	45.36%	0.095	0.018	1.62	50.34%	49.66%	0.040	0.019	2.82	59.03%	40.97%
(-1,+3)	0.054	0.009	1.38	52.76%	47.24%	0.076	-0.001	-0.14	49.65%	50.35%	0.037	0.016	2.22	55.78%	44.22%

Table 3.10

AM Ratio and Firm Performance

This table reports results of the monthly Fama-Macbeth regressions of stock returns on AM Ratio and firm-level control variables in Panel A and panel regressions of Profitability on AM Ratio and firm-level control variables, as well as year and industry fixed effects in Panel B. Stock return is defined as the monthly excess returns. Profitability is defined as net income to total assets. AM Ratio is defined as the ratio of the aggregate AUM of institutions in a state to the total market capitalization of public firms in the same state. MB is defined as the log of market equity value to book equity value. Size is the log of market capitalization . Beta is estimated by running regression of stock returns on market returns for the previous 36 months. Illiquidity is defined as the average of the absolute value of stock return divided by dollar trading volume on a given day within month. Momentum is defined as cumulative return of months (-12, -2). Leverage is defined as the sum of long term debt and debt in current liabilities, all scaled by lagged assets. Cash Flow is defined as net income before extraordinary items, depreciation and amortization expenses, all scaled by lagged assets. Q is defined as market value of equity plus total assets, less book value of equity, all scaled by total assets. When R&D variable is missing, it is set to zero. R&D Dummy is set to one if R&D variable is missing, otherwise it is set to zero. R&D-to-Sales is defined as research and development expenditures scaled by sales. StateQ is defined as value-weighted Q of firms within each state. Asset is defined as 1/total assets. Ret is defined as annualized stock returns. The sample period is from 1980 to 2013. t-value is reported in Panel A and t-statistics, based on standard errors clustered at the industry level, are reported in parentheses in Panel B. Statistical significance is denoted by * ,**, and *** at the 10%, 5%, and 1% levels, respectively.

	Panel A: Stock Performance and AM Ratio									
	Full Sample		Credit Rating				KZ index			
Variable			Rating Below BBB-		Rating Above BBB-		Top 20%		Bottom 20%	
	Average	t-value	Average	t-value	Average	t-value	Average	t-value	Average	t-value
AM Ratio	0.000	0.97	0.000	1.10	0.000	-0.78	0.000	-0.25	0.000	-0.19
MB	-0.003	-4.69	-0.003	-4.73	0.000	0.05	-0.002	-3.80	0.000	-0.34
Size	-0.002	-3.57	-0.002	-3.93	-0.001	-1.84	-0.003	-4.09	-0.003	-5.11
Beta	0.001	0.50	0.001	0.52	0.000	0.27	0.001	0.61	0.003	2.30
Illiquidity	2.086	6.51	1.936	6.42	1.995	0.36	3.589	4.21	2.470	2.96
Momentum	0.003	2.17	0.003	2.68	0.003	1.22	0.002	0.75	0.002	1.40
Adjusted R^2	0.039		0.036		0.128		0.052		0.064	

Table 3.10 - Continued
AM Ratio and Firm Performance

	Panel B: Profitability									
	Full Sample		Credit Rating				KZ index			
			Rating Below BBB-		Rating Above BBB-		Top 20%		Bottom 20%	
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
AM Ratio	0.003**	0.003**	0.003*	0.003*	0.002***	0.001*	0.008	0.004	0.002	0.004
	(2.35)	(2.10)	(1.88)	(1.69)	(2.78)	(1.89)	(1.60)	(0.88)	(0.53)	(0.78)
Cash Flow	1.305***	1.263***	1.306***	1.275***	1.114***	1.012***	1.452***	1.352***	1.394***	1.427***
	(37.15)	(26.94)	(36.19)	(23.91)	(15.27)	(32.86)	(22.65)	(18.10)	(16.39)	(8.67)
Q	-0.013**	-0.004	-0.011	-0.001	-0.012*	-0.003**	-0.042***	-0.025**	0.007	0.025
	(-2.14)	(-0.57)	(-1.59)	(-0.16)	(-1.94)	(-2.37)	(-3.16)	(-2.32)	(0.39)	(0.99)
R&D Dummy	-0.014***		-0.019***		-0.001		-0.030**		-0.034	
	(-2.70)		(-2.89)		(-0.24)		(-2.50)		(-1.26)	
R&D-to-Sales	0.015***		0.012***		-0.246**		0.054***		0.020***	
	(3.79)		(4.97)		(-2.08)		(3.81)		(3.10)	
StateQ		0.006***		0.006***		-0.001		0.015**		0.010
		(3.30)		(2.82)		(-0.81)		(2.06)		(1.43)
Asset		-0.055		-0.031		-1.879***		-0.301		0.541
		(-0.36)		(-0.20)		(-3.15)		(-1.64)		(0.83)
Leverage		-0.003		0.001		-0.004		0.002		0.030
		(-0.41)		(0.11)		(-0.86)		(0.37)		(0.66)
Ret		-0.011		-0.014		0.001		-0.002		-0.062
		(-1.04)		(-1.08)		(0.67)		(-0.29)		(-1.21)
N	124848	111315	99684	87084	25164	24231	24967	22108	23469	20489
Adjusted R^2	0.236	0.214	0.239	0.216	0.461	0.713	0.440	0.488	0.131	0.115
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 3.11

Tech Bust Effects

This table reports panel regressions of firms located in the states that are substantially affected by the tech bust. MB is defined as the log of market equity value to book equity value. Stock return is defined as the monthly excess returns. Affected State is defined as one if the average proportion of tech stocks held by financial institutions of a state is ranked at top the 10% among all the states, zero otherwise. We compare the MB and stock returns of the top 10% states with all the rest states, and the bottom ranked 10%, 20%, and 30% states. IT Bubble is set to one if the time period is between 2000 to 2002. When R&D variable is missing, it is set to zero. R&D Dummy is set to one if R&D variable is missing, otherwise it is set to zero. R&D-to-Sales is defined as research and development expenditures scaled by sales. ROE is defined as net income divided by lagged book equity. Size is the log of market capitalization . Beta is estimated by running regression of stock returns on market returns for the previous 36 months. Illiquidity is defined as the average of the absolute value of stock return divided by dollar trading volume on a given day within month. Momentum is defined as cumulative return of months (-12, -2). We control for year (month) and industry fixed effects. The sample period is from 1990 to 2008. The sample excludes tech stocks and industries highly correlated with tech industry. t-statistics, based on standard errors clustered at the industry level, are reported in parentheses. Statistical significance is denoted by *, ** , and *** at the 10%, 5%, and 1% levels, respectively.

	Panel A: MB			
	Top 10% States VS			
	The Rest States	Bottom 10% States	Bottom 20% States	Bottom 30% States
Variable	(1)	(2)	(3)	(4)
Affected States*IT Bubble	-0.169**	-0.200**	-0.172*	-0.190**
	(-2.53)	(-2.40)	(-2.05)	(-2.35)
R&D Dummy	-0.174***	-0.203	-0.202**	-0.218***
	(-8.37)	(-1.60)	(-2.28)	(-4.16)
R&D-to-Sales	0.004***	0.031***	0.033***	0.024***
	(3.22)	(3.24)	(3.37)	(3.38)
ROE	0.001***	0.086**	0.071*	0.003
	(21.14)	(2.71)	(1.79)	(0.97)
N	34314	2834	4902	8661
Adjusted R^2	0.098	0.183	0.148	0.137
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes

Table 3.11 - Continued
Tech Bust Effects

	Panel B: Stock Return			
	Top 10% States VS			
	The Rest States	Bottom 10% States	Bottom 20% States	Bottom 30% States
Variable	(1)	(2)	(3)	(4)
Affected States*IT Bubble	-0.008***	-0.012***	-0.013***	-0.012***
	(-3.74)	(-3.70)	(-4.10)	(-4.14)
MB	-0.004***	-0.004***	-0.005***	-0.005***
	(-6.96)	(-3.25)	(-3.83)	(-4.15)
Size	-0.001***	-0.002***	-0.002***	-0.002***
	(-7.38)	(-4.65)	(-5.01)	(-4.74)
Beta	0.001**	-0.001	0.000	0.001
	(2.42)	(-0.65)	(0.23)	(0.94)
Illiquidity	0.649***	0.650	0.410***	0.495***
	(4.04)	(0.92)	(14.19)	(4.61)
Momentum	0.003***	0.004*	0.003***	0.001
	(3.28)	(2.09)	(3.08)	(0.81)
N	376830	30376	52768	94571
Adjusted R^2	0.079	0.093	0.079	0.069
Month FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes

Appendix Table 3.1
Variable Definitions

This table reports variable definitions.

Variable	Definition
HKS Ratio	The total book value of all firms located in state i to the aggregate income of all households located in state i
R&D Dummy	One if R&D variable is missing, zero otherwise
R&D-to-Sales	Research and development expenditures scaled by sales
ROE	Net income divided by lagged book equity
Cash Flow	Net income before extraordinary items, depreciation and amortization expenses, all scaled by lagged assets
Q	Market value of equity plus total assets, less book value of equity, all scaled by total assets;
StateQ	Value-weighted Q of firms within each state
Asset	1/total assets
Ret	Annualized stock returns
Leverage	The sum of long term debt and debt in current liabilities, all scaled by lagged assets
Size	The log of firm market capitalization
Illiquidity	The average of the absolute value of stock return divided by dollar trading volume on a given day in a given month
Momentum	Cumulative return of months (-12, -2)
Beta	Estimated by running regression of stock returns on market returns for the previous 36 months on a monthly rolling basis
Income Change	The difference of the ratio of the personal income per capita to the total personal income per capital of a firm's new location 1 year after relocation and of a firm's old location 1 year before relocation
Tax Change	The difference of tax rates between new location and old location

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Working Papers

"Local Institutional Investors and Stock Prices" **Job Market Paper**

"Insider Trading, Informativeness, and Price Efficiency Around the World" with Lilian Ng and Qinghai Wang,

"Risk Taking and Performance of Bond Mutual Funds" with Lilian Ng and Qinghai Wang

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- York University, Brown Bag Seminar, Toronto, Canada, Spring 2016

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- Financial Management Association International Annual Meeting, Las Vegas, NV, Fall 2016 (Presenter)

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Discussant

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Selected Abstract

"Local Institutional Investors and Stock Prices" Job Market Paper

We study whether and how the geographic mismatch of investors and public firms affects corporate policies, firm valuation and firm performance. Both the U.S. money managing industry and public firms are clustered geographically, but there is considerable misalignment between the two. In this paper, we study whether and how the geographic mismatch between investors and public firms affects corporate financial policies, firm valuation, and firm performance. We measure the investor-firm misalignment at the state level based on the ratio of the aggregate asset under management (AUM) of institutions in a state to the total market capitalization of public firms in the same state (AM Ratio). We find that firm valuation is high when firms are located in states with high AM Ratios and the effects are stronger for firms with higher level of equity dependence. We show that a greater presence of local institutional investors mitigates the financial constraints of local firms. Firms in high AM Ratio states invest more but their investments are less dependent on internal cash flow. These firms are more likely to issue equity while local institutions hold more of the newly issued equity. The high firm valuation in the high AM Ratio states seems to be persistent, but can be affected by shocks to the money managing industry.

"Risk Taking and Performance of Bond Mutual Funds" with Lilian Ng and Qinghai Wang, First Year Paper

This paper investigates the risk exposures of bond mutual funds and how risk-taking behavior affects bond fund performance. Bond mutual funds often outperform their respective benchmark bond indexes, but underperform after adjusting for bond market risk factors. We show that risk-taking behavior helps to explain the different performances of bond funds with and without controlling for the risk factors. Results suggest that risk taking leads to higher returns relative to benchmarks in normal credit risk periods, but lower returns in high credit risk periods, and that risk taking is persistent and is primarily driven by poor long-term past performance. Finally, we also find weak evidence that risk-taking funds attempt to conceal their risky bets at mandatory disclosure. The results also indicate that fund investors typically do not differentiate the skill and risk components of fund performance in their investment decisions, thereby inducing bond funds to take risky bets and to affect flows of new money.

"Insider Trading, Informativeness, and Price Efficiency Around the World" with Lilian Ng and Qinghai Wang

This paper examines insider trading activities and their informativeness across 44 countries with varying levels of insider trading regulations. While insider trades, particularly insider purchases, earn abnormal profits in most of the markets we study, insider trading is significantly less informative in countries without active enforcement of insider trading regulations. Examining insider trading around corporate earnings announcements, we find that insiders trade more before earnings announcements and that stock prices react less to earnings news in countries without active enforcement than in those with active enforcement. Based on the first comparison of insider trading activities under different regulation regimes, our results support the view that effective insider trading regulation promotes price efficiency. Without active enforcement, insider trading not only crowds out market information acquisition and reduces stock price efficiency, but also renders insider trading itself less informative.