Return Predictability in Firms with Complex Ownership Network

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First draft: November 20, 2017
This draft: March 22, 2020

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Abstract

In this study, using data from 23 developed markets, we examine all four possible cases of stock return predictability in ownership-linked firms (OLFs): parent-subsidiary, subsidiary-parent, subsidiary-subsidiary, and parent-parent. We find that the returns of OLFs predict returns of the focal firm for all four cases. In particular, a simple long/short portfolio strategy for firms sorted by the lagged monthly returns of OLFs yields the Fama and French (2018) value-weighted six-factor alpha of up to 113 bps per month. The underreaction of focal firms to OLF returns is best explained by active internal capital markets – a specific mechanism unique to OLFs.

JEL Classification: G11, G14, G15
Keywords: Cross-listing, Earnings surprises, Investors' inattention, Limits to arbitrage, Ownership complexity

1. Introduction

In contrast to the usual simple ownership of US firms – one parent (subsidiary) firm may have only one subsidiary (parent), publicly listed parent firms around the world tend to have a more complex ownership structure, where parent firms can have multi-layer and multi-country subsidiaries (La Porta et al., 1999; Bertrand and Sendhil, 2003). Investors with limited resources will find it difficult to decipher appropriate value-relevant information from these complex structured firms. For instance, a parent firm may influence its subsidiaries through capital, product, technology, or labor channels. Particularly, firms with ownership structure links frequently have significant internal capital market activities, which are not always optimal and value-enhancing (Stulz, 1990; Meyer et al., 1992; Lamont, 1997; Shin and Stulz, 1998). These features of firms with a complex ownership structure and their blurred valuation implications may result in delayed rather than immediate information diffusion into stock prices (Hong and Stein, 1999; 2007). In addition, information diffusion delays and the associated return predictability can exist not only across "vertical" (direct) firm ownership links such as subsidiary-parent or parent-subsidiary, but also across "horizontal" (indirect) firm ownership links such as subsidiary-subsidiary, when subsidiaries have a common parent firm, as well as parent-parent, when parent firms have a common subsidiary.

In this study, we investigate the return predictability among ownership-linked firms (OLFs) using a global data sample across 23 developed markets in the 2006-2018 period. Equipped with such sample of firms with complex ownership structure, we are able to examine and find stock return predictability in all four possible cases of ownership-network among OLFs: parent-subsidiary, subsidiary-parent, subsidiary-subsidiary, and parent-parent. Moreover, we propose two specific and unique to OLFs mechanisms for our findings, ownership complexity and active internal capital markets, and show that these two mechanisms, especially the latter, dominate the two generic ones – investors' inattention and limits to arbitrage (e.g., Li et al., 2016), in explaining the return predictability among OLFs.

We find that subsidiaries' information has a significant predictive ability for parent firm's future stock returns. Worldwide, the Fama and French (2018) six-factor alpha is on average 113 bps (t-statistic = 3.66) in month t between the value-weighted parent firms' portfolio with the highest monthly returns of ownership-weighted subsidiaries' portfolio in month $t-1$ and the value-weighted parent firms' portfolio with the lowest monthly returns of ownership-weighted subsidiaries' portfolio in month $t-1$. To test parent-subsidiary return predictability, we implement the following strategy. For each subsidiary i in month t, we calculate the control-weighted portfolio return of parent firms that own the subsidiary with at least 20% stakes. Next, we sort subsidiaries into quintile portfolios using returns earned by a portfolio of their parent firms in the previous month. We show that the lagged parent firms' portfolio return predicts the next month subsidiaries' return. Specifically, a portfolio long in subsidiaries, whose parent firms' showed the best performance in the prior month, and short in subsidiaries, whose parent firms' performed the worst in the prior month, yields the value-weighted monthly six-factor alpha of 77 bps (t-statistic = 2.54). Using the same approach, we also find that the same monthly alphas of subsidiary-subsidiary and parent-parent return predictability are 76 bps (t-statistic = 2.79) and 79 bps (t-statistic = 2.78), respectively.

The results of multivariate regression setting using the Fama-MacBeth framework and controlling for various firm characteristics show that the predictive relationship between past month returns of OLFs and next month returns of the focal firm retains its economic and statistical significance for all four types of ownership links. All four types of OLF return predictability exist in different sub-periods and across various geographic regions, with the lowest, though still very significant, predictability being observed in Japan. Furthermore, in line with Stambaugh et al.'s (2012) finding that stock return anomalies are higher (lower) during high (low) market-wide sentiment periods, we also observe that the OLF predictability is considerably higher in high market sentiment times. Finally, OLFs show predictability not only for firms' returns, but also for their fundamental performance metrics, such as the focal firm's growth in cash flows or profits, as well as for the focal firm's unexpected earnings.

To address potential endogeneity concerns, an important part of our empirical study is the analysis of OLF return predictability around the changes in the cross-firm ownership structure. To this end, we use the difference-in-difference method and a four-year time window that comprises two years before and after the event. Our expectation is that OLFs would exhibit return predictability only after the establishment of cross-firm ownership links. We identify our "treatment" group of firms based on all cases where a firm without an ownership link transitions into a firm with an ownership link. Furthermore, the "control" group of firms includes companies without ownership changes; these companies are matched with the treatment firms by industry and the following four firm characteristics: market capitalization, book-to-market ratio, asset growth, and gross profitability. In line with the expectations, our results reveal the existence of return predictability after changes in ownership only in the treatment group, i.e., for those firms that establish ownership links. Return predictability is absent in the control group both before and after the (pseudo) date of change in ownership links.

To explain the return predictability phenomenon in OLFs, we consider the following four underlying mechanisms. The first mechanism is the investors' limited attention (Huang, 2015; Lee et al., 2019; Ali and Hirshleifer, 2019). The second is the limits to arbitrage (Shleifer and Vishny, 1997). The third mechanism is the ownership complexity of focal firms, which may be treated as some kind of information uncertainty (Daniel et al. 1998; 2001; Hirshleifer, 2001). Finally, the fourth possible channel is the opaque internal information within the conglomerate, such as its active internal capital markets. For example, Berger and Ofek (1995) report that internal capital market activities, e.g., overinvestment and cross-subsidization, decrease information processing efficiency and lead to value discounts. Of the four mechanisms, the first two are generic mechanisms commonly used in the return predictability literature, while the latter two are mechanisms unique to the ownership network context and newly proposed in this study.

To test the relevance of the four aforementioned explanations, we consider a setting where focal firms place overseas listing. Baker et al. (2002) find that the transparency of firms increases after listing shares on foreign exchanges. Furthermore, Jiao and Sarkissian (2020) show that cross-listing increases foreign ownership of firms and their liquidity and contributes to a better price efficiency. Based on these findings, we expect more evidence of predictability for focal firms prior to cross-listing, i.e., when investors' knowledge about firms is relatively low and the cost of arbitrage is relatively high. In line with this prediction, we find that the OLF return predictability significantly drops after cross-listing. Then, the results of individual tests and horseraces among the above four potential reasons show that focal firms exhibit a slow price response to their OLF returns mainly due to the active internal capital markets.

Numerous studies confirm return predictability among firms with economic links. For instance, Cohen and Frazzini (2008) evaluate predictability between customers and suppliers. Huang (2015) and Finke and Weigert (2017) establish that foreign operation information gradually dilutes into stock prices of multinational firms. Cao et al. (2016) find that strategic alliance firm partners exhibits return predictability.[1] However, the nature of economic and ownership links is quite different. While economic links refer to the firm's supply chain network and reflect the firm's sales and operations activities, ownership links refer to the company's shareholding network, reflecting the company's investment and financing status. Along with direct economic and business activities, firms within the ownership network also have other complex and opaque relationships. For instance, internal capital market activities, such as overinvestment or cross-subsidization, can complicate investors' understanding of information from the firms linked through direct or indirect ownership.

Compared to firms with direct economic links, return predictability among firms with complex ownership network is much less understood. In this respect, Li et al. (2016) find that the lagged returns of US local subsidiaries (parent firms) can predict returns of US parent firms (subsidiaries). Ginglinger et al. (2018) document investor myopia to information from ownership-connected firms.[2] Our study differs from the aforementioned studies in several important dimensions. First, due to the mostly simple ownership structure of one subsidiary - one parent in their US data, Li et al. (2016) test only subsidiary-parent and parent-subsidiary return predictabilities. In contrast, equipped with the global sample of firms with complex

[1] Chan et al. (1997) document that there are several reasons for strategic alliance partnerships, such as distribution, licensing, marketing, R&D, systems integration, technology transfer, etc.

[2] In the US sample of Li et al. (2016), there are only 18 or 19 firms in each quintile portfolio to construct the anomaly, so the non-systematic risks in stock portfolio are not totally eliminated. In this study, we overcome this problem by using a much larger and richer global data sample, which allows us to obtain more accurate and reliable results. Ginglinger et al. (2018) use the 2015 static ownership linkage data to trace the previous 15 years of ownership links. This causes a survivor bias in their estimations.

ownership structure, where parent firms can have multi-layer and multi-country subsidiaries, we examine and find stock return predictability among OLFs for all four possible cases: subsidiary-parent, parent-subsidiary, subsidiary-subsidiary, and parent-parent. Second, Li et al. (2016) explain their results with two generic mechanisms—investors' inattention and limits to arbitrage that are commonly used in explaining almost all return anomalies. Conversely, in the present study, we use the rich global ownership structure data to show that the predictability among OLFs is best explained by internal capital market activities and, so to some extent, by the complexity of ownership links. Hence, these two newly proposed specific mechanisms, ownership complexity and internal capital markets, which are unique to OLFs, outperform the two generic mechanisms in Li et al. (2016). Furthermore, the two new mechanisms can deepen the understanding about the underlying driving forces of the return predictability among OLFs. Lastly, we provide a comprehensive analysis and results in both global and regional samples. Our multimarket data enable us to investigate whether or not there is predictability among OLFs. Indeed, the US simple ownership example—i.e., when US parent firms mostly have only one subsidiary—is not globally universal. Therefore, due to inclusion of both global and regional samples, our data and test results are more robust and reliable than those based on the small sample studied by Li et al. (2016) or the limited data in Ginglinger et al. (2018).

The rest of the paper is organized as follows. Section 2 describes the data and our empirical methodology. Section 3 reports our main empirical results, including univariate portfolio sort estimates, multivariate predictive regressions of focal firm returns and its fundamental performance metrics, as well as time-period, regional, and market sentiment subsample tests. In this section, we also analyze changes in the OLF return predictability in response to changes in ownership links. Section 4 discusses the underlying mechanisms to explain the OLF return predictability. Section 5 concludes.

2. Data and Methodology

2.1. Data

Our sample covers parent firms and subsidiaries from 23 developed markets. These markets, defined by Fama and French (2012; 2017), are as follows: two North American markets (Canada and the United States), sixteen European markets (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and United Kingdom), Japan, and four Asia-Pacific markets (Australia, Hong Kong, New Zealand, and Singapore). We collect price, volume, and return data for US firms from the Centre for Research in Security Prices (CRSP) and for non-US firms from Refinitiv Eikon. Institutional ownership data and analyst coverage for all firms in the sample come from FactSet Ownership and Refinitiv I/B/E/S, respectively. We also collect ownership links and shareholding percentages data from the merged Orbis-FactSet database.[3] To avoid market microstructure problems, stocks with prices below $5 are excluded from the analyses. We cover all industrial firms and exclude the financial sector (with two-digit NAICS code = 52). The sample period is from January 2006 to December 2018 and contains a total of 156 monthly observations. All stock returns are denominated in USD. To calculate monthly excess returns in all countries, we use the one-month US T-bill rate.[4]

Since we aim to examine the return predictability in ownership networks, there should be a reasonable cut-off for ownership stakes. La Porta et al. (2000) set at least 10% voting rights to define a large ownership stake, while Claessens et al. (2000) use a 20% cut-off. Following the latter study, we also use 20 percent of ownership as a cut-off.[5] To test the OLF return predictability from January 2006 to December 2018, we collect 13 annual time-varying ownership links from 2005 to 2017.

2.2. Four predictors of ownership-linked firms

The first regressor of interest is the one month lagged return of subsidiaries, $Sub_{i,t-1}$. It is

[3] We cross-validate the ownership links and shareholding data in Orbis and FactSet—the two main data sources that provide ownership links and shareholding percentages. Instead of using either one of these datasets, we merge them for the following reasons. While Orbis provides detailed parent firms and subsidiaries information for each focal firm, their shareholding percentages are not always numerical. Furthermore, although FactSet provides the main owner/parent firm to each focal firm, their shareholding percentages are numerical. Therefore, the merged dataset uses the advantages of both data sources. Following Kalemli-Ozcan et al. (2015), we decode non-numeric indicators of percentage shares owned by a parent firm.

[4] Our estimation results are similar if we use local currency returns and raw returns rather than excess returns.

[5] We also use the ownership cut-off levels of 10%, 15%, 25%, and 30%, but our main findings remain intact.

constructed as the ownership-weighted portfolio returns of all subsidiaries of parent firm i namely:

$$Sub_{i,t-1} = \sum_j Own_{i,j,t-1} \times R_{j,t-1}, \tag{1}$$

where $Own_{i,j,t-1}$ is parent firm i's ownership stake in subsidiary j in month $t-1$, $R_{j,t-1}$ is the subsidiary j's return in month $t-1$, while $Own_{i,j,t-1}$ is defined as:

$$Own_{i,j,t-1} = \frac{ShareHold_{i,j,t-1} \times Size_{j,t-1}}{\sum_j ShareHold_{i,j,t-1} \times Size_{j,t-1}},$$

where $ShareHold_{i,j,t-1}$ is parent firm i's shareholding percentages in subsidiary j in month $t-1$, and $Size_{j,t-1}$ is the market capitalisation of subsidiary j in month $t-1$. For example, suppose some parent firm P has two subsidiaries in its first layer, $S1$ and $S2$, while $S1$ also has a subsidiary $S11$ in its first layer. Then, $S11$ is the second-layer subsidiary for parent firm P. Then suppose that the market capitalizations of P, $S1$, $S2$, and $S11$ are 200 million, 100 million, 50 million, and 50 million, respectively. In addition, the parent firm P has shareholdings of 60% and 100% in $S1$ and $S2$, respectively, while $S1$ has a shareholding of 50% in $S11$. Said differently, P has a shareholding of 30% in $S11$. Then, the subsidiaries predictor, $Sub_{i,t-1}$, is calculated as:

$$Sub_{i,t-1} = \frac{60\% \times 100 \times R_{S1,t-1} + 100\% \times 50 \times R_{S2,t-1} + 30\% \times 50 \times R_{S11,t-1}}{60\% \times 100 + 100\% \times 50 + 30\% \times 50}.$$

The second regressor of interest is the one month lagged return of parent firms, $Par_{i,t-1}$. It is constructed as the control-weighted portfolio returns of all parent firms of subsidiary i, namely:

$$Par_{i,t-1} = \sum_j Control_{i,j,t-1} \times R_{j,t-1}, \tag{2}$$

where $Control_{i,j,t-1}$ is subsidiary i's stake controlled by parent firm j in month $t-1$, $R_{j,t-1}$ is parent firm j's return in month $t-1$, while $Control_{i,j,t-1}$ is defined as:

$$Control_{i,j,t-1} = \frac{ShareHold_{i,j,t-1}}{\sum_j ShareHold_{i,j,t-1}},$$

where $ShareHold_{i,j,t-1}$ is subsidiary i's shareholding percentages controlled by parent firm j in month $t-1$. For example, suppose some subsidiary S has two parent firms in the first layer, $P1$ and $P2$, while $P1$ also has a parent firm $P11$ in its first layer. Then, $P11$ is the second-layer parent firm for subsidiary S. Suppose that $P1$ holds a 30% stake in S, $P2$ holds 20% stakes of S, while $P11$ has a 50% shareholding in $P1$. Said differently, $P11$ has a shareholding of 15% in S. Then, the subsidiaries predictor, $Par_{i,t-1}$, is calculated as:

$$Par_{i,t-1} = \frac{30\% \times R_{P1,t-1} + 20\% \times R_{P2,t-1} + 15\% \times R_{P11,t-1}}{30\% + 20\% + 15\%}.$$

Finally, the third and fourth predictors are the one month lagged returns of sister subsidiaries and sister parent firms, $Sis\_Sub_{i,t-1}$ and $Sis\_Par_{i,t-1}$, respectively. They are constructed as simple value-weighted portfolio returns of all sister subsidiaries and all sister parent firms, respectively.

Table 1 reports the summary statistics for listed parent and subsidiaries from 23 developed markets. Firm characteristics include firm's market capitalization, book-to-market ratio, asset growth, gross profitability, and momentum. All variables are defined in the Appendix and are winsorized within each cross-section at 1% and 99% levels. Panel A presents the descriptive statistics of parent and subsidiary firms within their ownership links. The average numbers of parent firms and subsidiaries in our sample are 1,287 and 2,208, respectively. Each parent (subsidiary) firm has two subsidiaries (one parent firm) in the median. Similarly, the median number of sister subsidiaries (parent firms) is two (one). However, the maximum number of subsidiaries for a given parent firm is nine, while the maximum number of parent firms for a given subsidiary is four.

Panel B reports of Table 1 country-level statistics on the number of parent firms and subsidiaries, as well as the average number of sister subsidiaries and sister parent firms. The largest number of both parent firms and subsidiaries – 476 and 949, respectively – come from Japan. Firms from Japan also have the largest average number of both subsidiaries per parent firm and parent firms per subsidiary – 3.50 and 1.93, respectively.

Panel C of Table 1 reports the summary statistics of the above five firm characteristics for parent firms and subsidiaries. We can see that, on average, parent firms are on average more than six-fold larger than subsidiaries. The other four firm characteristics between parent firms and subsidiaries—except for average and median momentum which is more than 50% larger among subsidiaries than parent firms—are almost identical. This is consistent with the understanding than, due to less efficient pricing, smaller firms show a higher momentum than larger firms.

3. Main Empirical Analysis

This section presents our main empirical analysis of stock return predictability in a complex ownership network. The goal is to examine cross-sectional variation in expected returns of OLFs in response to a common predictor. Starting with univariate portfolio sorts to show the existence of return predictability in OLFs, we then move to a multivariate framework using Fama-MacBeth regressions and conduct estimations on the entire data sample and on subsamples of specific time periods and geographic regions. We also demonstrate that the OLF predictability is present for focal firm's fundamental performance metrics. Finally, we find that, similar to other return anomalies, the OLF predictability is larger when market sentiment is high.

3.1. Univariate portfolio tests

First, using our global data sample, we examine in a univariate setting the existence of the following four OLF return predictability patterns: subsidiary-parent, parent-subsidiary, subsidiary-subsidiary, and parent-parent. To accomplish this in each month t, we rank parent firm (or subsidiary) returns based on the ranking of their subsidiaries' (or parent firms') portfolio returns in month $t-1$. Next, we classify parent firm (or subsidiary) stocks into five quintiles where Quintile 1 has the lowest lagged subsidiaries' (or parent firms') portfolio returns, while Quintile 5 has the highest lagged subsidiaries' (or parent firms') portfolio returns. Then, we report the value weighted and equal weighted portfolio returns of the lowest and highest quintiles as well as the hedged portfolio returns of Quintile 5 minus Quintile 1 (Q5–Q1) with the corresponding statistical significance level.

Table 2 reports the univariate test results based on risk-adjusted returns. In Panel A, we use a global version of the Fama and French (2015) five-factor model. Column 1 shows that the five-factor alpha (α_FF5) of parent firm stocks with the highest lagged one month returns of subsidiaries' portfolio is significantly higher than the corresponding values with the lowest lagged one month returns of subsidiaries' portfolio. The value-weighted parent firms' stocks in the highest quintile earn an average monthly α_FF5 of 30 bps, as compared to that of –83 (negative 83) bps for the value-weighted parent firms' stocks in the lowest quintile. The return spread is 113 bps, and it is significant at the 1% level. The equal-weighted portfolio return spread is 122 bps and has the same 1% significance level. In Columns 2-4, we find similar evidence for both value-weighted and equally-weighted portfolios of predictor firms' returns across the remaining three OLF return predictability directions. The value-weighted spread is 82 bps in the parent-subsidiary case, 73 bps in subsidiary-subsidiary case, and 88 bps in the parent-parent case.

In Panel B of Table 2, we use the Fama and French (2018) six-factor model to capture abnormal returns. The Fama and French (2018) six-factor model adds a momentum factor into the Fama and French (2015) five-factor model. After this change, the value-weighted and equal-weighted portfolio risk-adjusted returns (α_FF6) of the subsidiary-parent predictability become 113 bps and 126 bps, respectively. The value-weighted spreads for parent-subsidiary, subsidiary-subsidiary, and parent-parent OLF return predictability directions are 77 bps, 76 bps, and 79 bps per month, respectively. Therefore, the results in Table 2 demonstrate the existence of economically and statistically significant return predictability among firms with ownership links.[6]

3.2. Multivariate regressions

In this section, we use Fama and MacBeth (1973) cross-sectional regressions to analyze

[6] In the Internet Appendix, we also report univariate test results using risk-adjusted returns as in Table 2, but with the Burt and Hrdlicka (2020) adjustment. For this analysis, we use portfolio returns computed from idiosyncratic returns of OLFs, rather than their raw returns to sort focal firms into quintile portfolios at time t. This adjustment does not considerably affect our results.

whether stock return predictability within ownership networks remains robust after controlling for major risk factors and different firm characteristics. The stock level's Fama-MacBeth regression consists of the following two steps. In the first step, we use cross-sectional regression in each month as following:

$$ret_{i,t} = \lambda_{0,t} + \lambda_{1,c,t} + \lambda_{2,d,t} + \lambda_{3,t}\, OLF_{i,t-1} + \lambda_{4,t}{}'\, \boldsymbol{X}_{i,t-1} + \varepsilon_{i,t}, \quad (3)$$

where $ret_{i,t}$ is the excess return of focal firm's stock i in month t; $\lambda_{1,c,t}$ is a country-specific dummy variable, equal to one if focal firm i is from country c and zero otherwise; $\lambda_{2,d,t}$ is a industry-specific dummy variable, equal to one if focal firm i is in industry d and zero otherwise (using two-digit NAICS codes); $OLF_{i,t-1}$ is the lagged return of the OLF predictor, i.e., $Sub_{i,t-1}$, $Par_{i,t-1}$, $Sis\_Sub_{i,t-1}$, and $Sis\_Par_{i,t-1}$ in different specifications (see Section 2.2). The vector of controls, $\boldsymbol{X}_{i,t-1}$, includes $Ln(Size)$, the natural logarithm of firm size (Banz, 1981); $Ln(B/M)$, the natural logarithm of book-to-market equity ratio (Basu, 1983); Mom, the cumulative return of stock i from month $t-12$ to $t-2$ (Jegadeesh and Titman, 1993); $R_{i,t-1}$, the stock return of focal firm i in month $t-1$ (Jegadeesh, 1990; Lo and MacKinlay, 1990); *Turnover*, the number of shares traded divided by the number of shares outstanding during a day, averaged over the past twelve months (Rouwenhorst, 1999); asset growth (AG), the year-over-year growth rate of total assets (Cooper et al., 2008); gross profitability (GP), the revenue minus cost of goods sold scaled by assets (Novy-Marx, 2013); and Ind_Mom, industry momentum (Moskowitz and Grinblatt, 1999). we use the Newey-West adjustment with six lags to calculate our standard errors.[7]

Table 3 presents the test results based on the multivariate regressions, including the point estimates, their absolute *t*-statistics, and the number of observations and the adjusted R-squared. Panel A shows estimations across four types of the OLF predictability directions based on focal firms' excess returns as the dependent variable. The results in this panel demonstrate that all four OLF predictors—namely, $Sub_{i,t-1}$, $Par_{i,t-1}$, $Sis\_Sub_{i,t-1}$, and $Sis\_Par_{i,t-1}$—are positive and statistically significant at the 1% level for their respective dependent variables, i.e., the excess returns of parent, subsidiary, sister subsidiary and sister parent firms. Of note, the

[7] The choice of the lag length from 1 to 12 does not influence the significance of any of the tests.

predictive power of all four lagged OLF returns is not subsumed by control variables.

Panels B and C of Table 3 show similar estimations using risk-adjusted returns as dependent variables. The risk-adjusted returns (alphas) for focal firm i in month t are computed as the difference between focal firm i's excess return and its expected factor returns based on the Fama and French (2015) five-factor model in Panel B and the Fama and French (2018) six-factor model in Panel B in month t, α_FF5, and α_FF6, respectively. In our estimations, we use regional risk factors, Mkt, Smb, Hml, Rmw, Cma, and Mom from Kenneth French's website. Following Fama and French (1992), Cao et al. (2016), and Finke and Weigert (2017), we calculate factor loadings for each focal firm by using a time-series regression over the entire sample period.[8] For the sake of conciseness, in these two panels, we omit reporting the estimates of control variables. The overall results are similar to those shown in Panel A. Again, all four OLF predictors— $Sub_{i,t-1}$, $Par_{i,t-1}$, $Sis\_Sub_{i,t-1}$, and $Sis\_Par_{i,t-1}$—are positive and significant at the 1% level prediction ability for the risk-adjusted returns (α_FF5, and α_FF6) of parent, subsidiary, sister subsidiary, and sister parent firms. Interestingly, the magnitude of corresponding point estimates is only marginally smaller than those in Panel A for excess returns. Thus, similar to the results of univariate tests, the multivariate regressions setting also provides evidence of a strong predictive effect of the lagged returns of ownership-linked firms for stock returns of focal firms, both excess and risk-adjusted.[9]

3.3. Sub-period and regional tests

This section further examines the existence of the documented OLF return predictability effect across time periods and geographic region. To this end, we use univariate portfolio sorts and six-factor alphas of focal firms, α_FF6. Table 4 reports the test results. Panel A of Table 4 shows the abnormal returns of four OLF return predictability strategies using our global dataset

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8 We obtain similar results using rolling estimates.

9 In the Internet Appendix, we report the results of univariate and multivariate tests of OLF return predictability for the sample of firms from 26 emerging markets. To alleviate the concern that that ownership links simply pick up customer-supplier relations, we also repeat these tests on the sample of financial sector firms. Our test results are similar to those in Tables 2-3.

on the following two time periods: January 2006—June 2012 and July 2012—December 2018. In the first period, the value-weighted (equal-weighted) portfolio alphas of the four strategies—i.e., the Q5-Q1 spreads for subsidiary-parent, parent-subsidiary, subsidiary-subsidiary, and parent-parent ownership links—are 127 bps (141 bps), 78 bps (109 bps), 80 bps (112 bps), and 84 bps (99 bps) per month, respectively. The alphas of four strategies are all significant at the 1% level. In the second period, the value-weighted (equal-weighted) portfolio alphas of the same four strategies are 101 bps (111 bps), 69 bps (96 bps), 72 bps (101 bps), and 73 bps (89 bps) per month, respectively. Except for one case, the alphas of all four strategies in all cases are again significant at the 1% level. The only occurrence of 5% significance is recorded for the value-weighted parent-subsidiary alpha in the second sub-period. Overall, we find very similar results between the two time periods in both economic and statistical terms, which implies a high consistency of the observed OLF return predictability phenomenon over time.

Panels B to E of Table 4 show the six-factor alphas of four OLF return predictability strategies across five geographic regions based on the focal firms' locations. There regions are Global excluding the United States, Japan, Asia-Pacific, Europe, and North America. In Panel B, for the subsidiary-parent return predictability, we observe that, although the α_FF6 values in various regions differ in magnitude, they all are statistically significant. Furthermore, the results show that North America has the highest alphas, 134 bps (value-weighted) and 153 bps (equal-weighted), while Japan has the lowest, 81 bps (value-weighted) and 92 bps (equal-weighed). In Panel C, we look at regional abnormal return patterns of parent-subsidiary return predictability. Again, with one exception, all focal firms' alphas are significant at the 1% or 5% levels. The lowest predictability is again found for Japan based on value-weighted portfolio returns—50 bps with 10% significance. Panels D and E report regional abnormal returns of return predictability between sister subsidiaries and between sister parent firms, respectively. The Q5-Q1 spread for six-factor alphas of subsidiary-subsidiary predictability in different regions ranges from 53 bps to 122 bps, while that for these alphas of parent-parent predictability ranges from 57 bps to 108 bps. Across all estimations, the statistical significance of the Q5-Q1 spread in Panels D and E is high (at least the 5% level).

3.4. Market-wide sentiment and OLF return predictability

It is common knowledge that return anomalies reflect investors' subjective beliefs or sentiment. For instance, Stambaugh et al. (2012) convincingly demonstrate that abnormal stock returns associated with various cross-sectional anomalies are considerably larger in high investor sentiment periods. This result is attributed to the presence of both binding short-selling constraints and optimistic investors' biases. In this study, following previous research, we use Baker and Wurgler's (2006) market-wide sentiment index to examine whether the abnormal returns of OLFs behave similar to other documented cross-sectional anomalies, and whether they vary with changes in investors' sentiment.[10]

Table 5 shows the returns of four OLF investment strategies in different market-wide sentiment periods. We again use univariate portfolio sort tests; however, only the abnormal return estimates of Q5-Q1 difference portfolios are reported. As in earlier tests, we report the results for both value-weighted and equally-weighted portfolios of the corresponding predictor firm returns. In Panel A of Table 5, we observe that focal firms' Fama and French (2015) five-factor alphas are higher in the high sentiment period and lower in the low sentiment period. In high sentiment periods, α_FF5 of four strategies are strongly significant at the 1% level and large in magnitude for value-weighted portfolios—ranging from 111 bps for the subsidiary-subsidiary strategy to 147 bps for the subsidiary-parent strategy. However, in low sentiment periods, α_FF5 of four strategies are insignificant or only weakly significant and small in magnitude, ranging from 24 bps to 76 bps for value-weighted portfolios. In Panel B of Table 5, we use the six-factor abnormal returns, α_FF6. The test results are very similar to those in Panel A. These results of these tests indicate that the documented four OLF return anomalies behave similar to other existing cross-sectional anomalies of stock returns.

3.5. Forecasting fundamental performance metrics

[10] While the sentiment index of Baker and Wurgler (2006) is for the US market, it can be considered to be a good proxy for investor sentiments across most if not all developed markets, since these markets are believed to be financially integrated (e.g., De Santis and Gerard, 1997). Moreover, Baker et al. (2012) find that the US sentiment can predict the cross-section of stock returns in other countries linked to the United States through capital flows.

This section aims to understand whether predictability exists not only for OLF stock returns, but also for their business (operating) performance metrics related to firm expected cash flows, such as the growth in cash flows or profit, and earnings.[11] Said differently, we are interested in establishing whether firms with ownership links are fundamentally interrelated.

Table 6 shows the estimation results. The dependent variables are the market-adjusted cash flow growth and profit growth. The control variables are the same as those in Table 3. Furthermore, along with country and industry fixed effects, in the regressions in Table 6, we also include the year fixed effects. The standard errors are clustered by year. Due to space constraints, the coefficients on control variables and fixed effects are not reported. All variables are measured at the end of each calendar year and are winsorized at the 1% and 99% levels. To facilitate our interpretation, all variables are cross-sectionally standardized to have zero mean and unit variance

Panel A of Table 6 reports the tests for predicting cash flow growth of focal firms, ΔCF. In this case, we regress the annual cash flow growth of focal firms on both the contemporaneous and lagged one year average cash flow growth of their OLF across the following four possible categories: $Sub\_\Delta CF_t$, $Par\_\Delta CF_t$, $Sis\_Sub\_\Delta CF_t$, and $Sis\_Par\_\Delta CF_t$. Panel B of Table 6 shows the test results for predicting profit growth of focal firms, ΔP. Here, we regress the annual profit growth of focal firms on both the contemporaneous and lagged one year average profit growth of their OLF—namely, $Sub\_\Delta P_t$, $Par\_\Delta P_t$, $Sis\_Sub\_\Delta P_t$, and $Sis\_Par\_\Delta P_t$. All estimated coefficients, both contemporaneous and predictive, across both panels are significant at least at the 1% or 5% level. Therefore, the test results in Table 6 suggest that OLF are fundamentally related to each other, and there are multidimensional performance links among such firms.

Another fundamental determinant of future cash flows of firms is firm earnings. Accordingly, we test whether OLF can predict standardized unexpected earnings (SUEs) of focal firms. Of note, since SUEs capture unanticipated changes in the focal firm's earnings and are not return-based, the results of this test are not confounded by the measurement error in or

[11] In the Internet Appendix, we also demonstrate that OLF exhibit predictability for focal firms' ROA, as well as their revenues and sales.

the omission of risk factors.

In Table 7, we examine whether OLF returns can forecast the focal firm's future SUEs using the Fama-MacBeth regression setting. Panel A reports the overall results for one-quarter predictability for four OLF investment strategies. The dependent variable is $SUE_{i,t}$, the unexpected earnings of focal firm i at time t. The independent variable of interest is the one-quarter lagged return of OLFs. This variable is computed from the preceding three months. Along with standard firm controls from Table 3 and country and industry fixed effects, we also include the focal firm's own lagged SUEs (up to four quarters). All independent variables are distributed to deciles ranging from zero to one. The dependent variable is winsorized in the cross-section at the 1% and 99% level. The results show that returns of OLFs predict focal firms' future unexpected earnings. This evidence further confirms that the lagged returns of OLFs anticipate the directional changes of focal firm fundamentals and, therefore, can drive earnings announcement returns.

In Panels B-E of Table 7, we report the results of testing the unexpected earnings predictability over longer periods, i.e., up to four quarters ahead. Therefore, the dependent variable in these panels is $SUE_{i,t+k}$ of the focal firm, where k = 0, 1, 2, 3. The results show that, for all four possible cross-firm ownership links, all coefficients of lagged returns of OLFs are positive; yet, from Quarter 1 to Quarter 4, their economic and statistical significance decreases, suggesting the forecasting power decays over time. These results indicate that OLF return predictability is consistent with a gradual information diffusion of cash flows, and it is unlikely to be related to changes in the underlying risk structure of firms. In Section 3.6, we discuss the results of an in-depth analysis of the main drivers of predictability in OLFs.

3.6. Ownership link changes

In this section, we address the endogeneity concerns that could influence our OLF predictability findings. For instance, the reason why OLFs exhibit predictability may not a specific ownership structure, but some omitted firm characteristics, general low level of information transparency in our sample firms, and so forth. To this end, we examine whether there are any changes in the ability of OLFs to forecast returns of focal firms in a particular setting—specifically, the one where we can follow the *same* firms before the establishment of their ownership links and after the formation of such links. For this analysis, we use the difference-in-difference (DiD) methodology and a four-year time window consisting of two years before and after the ownership link event.

The advantage of this setting is that it enables the evaluation of time lags in information updating of the exact same firms, when they transition from being ownership-de-linked to being ownership-linked. Our expectation is that, if a focal firm has no ownership links with companies that later become ownership-linked to it, then the lagged portfolio returns on these companies have a weak or no predictability for the focal firm's future returns. The OLF return predictability arises only when the same companies become interlinked through ownership.

We identify all cases where a firm without any ownership links transforms into a firm with at least one ownership link. These firms form our sample of real-focal firms or the treatment group for each ownership link. Consequently, we define $Treatment$ as a dummy variable, which is set to one if a focal firm has undergone through such transition and zero otherwise. In addition, we define $Postlink$ as a dummy variable, which equals one after the establishment of ownership links and zero otherwise. We include observations within two years prior to the change in firm ownership links and those within two years after the change.

For each real-focal firm, we select one pseudo-focal firm in the control group prior to the change in ownership links. The procedure consists of four steps. First, we choose pseudo-focal firms in the same industry (two-digit NAICS code) as the real-focal firm in two years prior to the change in ownership links. Second, we select ten most similar pseudo-focal firms to a given real-focal firm in two years prior to the change in ownership links based on the average ranking of the following four firm characteristics: size, book-to-market ratio, asset growth, and gross profitability. Third, we run the Fama-MacBeth regressions and compare the OLF predictive coefficients for the control group of firms with those of the "treatment" group within two years prior to the status change. We use the same OLFs to predict returns of both pseudo-focal and real-focal firms. Finally, we select the most similar OLF predictive coefficient firms as matched pseudo-focal firms for each real-focal firm.

Panel A of Table 8 reports the differences between real- and pseudo-focal firms for each of their four firm characteristics plus the corresponding estimate of the OLF predictive coefficient prior to the event date. We report these differences for all four types of ownership links with their respective t-statistics. In addition, we record the number of real and pseudo-focal firms for each ownership link. The results show that, across Panel A, all differences in characteristics between the "treatment" and "control" firm groups are small and insignificant. Therefore, we can safely conclude that the two groups are similar to each other before ownership link changes in focal firms.

Furthermore, Panel B of Table 8 depicts our DiD test results on the OLF return predictability before and after changes in firm ownership links. The dependent variable is the monthly excess return of real- and pseudo-focal firms. The regressor of interest is the triple interaction term between the lagged monthly return on one of the four OLF predictors (i.e., $Sub_{i,t-1}$, $Par_{i,t-1}$, $Sis\_Sub_{i,t-1}$, or $Sis\_Par_{i,t-1}$) and $Treatment$ and $Postlink$ dummy variables. The set of controls includes the corresponding OLF predictor returns, the above two dummy variables, and other variables from Table 3. In line with our expectations, the test results for all four types of firm ownership indicate that, when a firm establishes ownership links, its corresponding OLF predictor becomes statistically significant at the 1% level. The largest economic magnitude is observed for the post-event subsidiary-parent predictability. In contrast, there is no evidence of predictability among treatment firms prior to the formation of ownership links. In its turn, the return predictability is completely absent in the control group of firms—both before and after the event date.

Figure 1 visualizes the results in Table 8 and depicts OLF predictive coefficients of real-focal firms and pseudo-focal firms before and after the establishment of ownership links. The figure has four plots for each of the four types of ownership links. The event window contains 24 months before and after the event month. We depict the monthly estimates of predictor coefficients for treatment and controls groups, as well as their mean values over the 24-month period before and after the event. The plots show that, before the event date, the coefficients on all four OLF predictors for both treatment and control groups of firms are effectively zero. After the formation of ownership links, the treatment firms experience a positive shift in OLF predictability. Therefore, these findings suggest that linked firms have predictive power only after they become factually connected through ownership.

4. Explaining Return Predictability in OLFs

This section reports the results of our analysis of four non-mutually exclusive mechanisms that could potentially explain the documented return predictability in firms with ownership links and identify the most dominant ones among them. These four mechanisms include: (1) investors' inattention; (2) limits to arbitrage; (3) ownership complexity; and (4) active internal capital markets. However, we start by reporting the results of our analysis of the differences in the OLF return predictability before and after cross-listing events. It is common knowledge that cross-listings can enhance the visibility of firms; in turn, firm visibility is ultimately related to investors' attention level, stock price efficiency and, accordingly, to the ease or difficulty of arbitrage, investors' perception of firm's ownership complexity, and their knowledge about internal capital market activities. We then run our statistical tests for each explanatory mechanism and horse-race them to determine their relative importance.

4.1. Cross-listing placements

In this section, we introduce a transparency shock—i.e., cross-listing—to test whether the change in firm visibility influences return predictability in OLFs. This setting makes it possible to examine the extent of this predictability for the exact *same* firms without cross-listing and with cross-listing and provide some preliminary evidence on the reasonableness of the four mechanisms of return predictability in OLFs outlined in Section 4. There is substantial evidence that firms can experience a significant transparency increase after listing their shares overseas (Baker et al., 2002; Lang et al., 2003; Ahearne et al., 2004). Furthermore, Jiao and Sarkissian (2020) find that cross-listings increase foreign ownership of firms, thereby improving the firms' liquidity and positively contributing to stock price efficiency. Therefore, we expect to see more evidence of return predictability in OLFs prior to cross-listing, i.e., when focal firms are less visible to global investors.

To test this prediction, we again use the DiD methodology and a four-year time window consisting of two years before and after the cross-listing event. We define a listing firm as a focal firm that is headquartered in its domestic market and cross-lists its shares in some foreign markets. We collect cross-listing data from the Sarkissian and Schill public database,[12] worldwide stock exchanges, and the CRSP database for foreign listings in the United States.[13] These firms form our treatment group for each ownership link. We define a dummy variable $Treatment$, which equals one if a focal firm has a cross-listing and zero otherwise. Next, we define $Postlist$ as a dummy variable, which equals one in any month after the issuance of cross-listing and zero otherwise. We include observations within two years prior to and after cross-listing.

For each cross-listed focal firm, we select one non-cross-listed focal firm in the control group prior to the listing placement. The procedure comprises the following four steps (see also Section 3.6). First, we choose non-cross-listed focal firms, which have OLFs within two years prior to the listing event. Second, we select ten most similar non-cross-listed focal firms with the cross-listed focal firm within two years prior to cross-listing based on the average ranking of four firm characteristics: market capitalization, book-to-market ratio, asset growth, and gross profitability. Third, we again run the Fama-MacBeth regressions and compare the OLF predictive coefficients for the control firm group with those of the "treatment" group within two years prior to the cross-listing event. Finally, we select the most similar OLF predictive coefficient's firms as matched non-cross-listed focal firms.

Panel A of Table 9 reports the differences between cross-listed and non-cross-listed focal firms for each of their four firm characteristics, along with the corresponding estimate of the OLF predictive coefficient prior to cross-listing. Similar to the results in Table 8, these

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[12] See http://sergei-sarkissian.com/data.html.

[13] The largest three host markets for foreign listings in our sample of OLFs are the United States, the United Kingdom, and France with 105, 21, and 14 placements, respectively. The largest three home markets are Canada with 51 cross-listings, the United Kingdom with 23 cross-listings, and Australia and the United States with 20 cross-listings each.

differences and their respective t-statistics in Table 9 are shown for all four types of ownership links. In addition, we report the number of cross-listed and non-cross-listed firms for each ownership link. All differences in characteristics between the “treatment” and “control” groups are statistically insignificant, implying that the two firm groups are similar to each other before cross-listing placements of focal firms.

Panel B of Table 9 shows the results of our DiD tests on the OLF return predictability before and after cross-listing. The dependent variable is the monthly excess return of focal firms. The regressor of interest is the triple interaction term between the lagged monthly return on one of the four OLF predictors (i.e., $Sub_{i,t-1}$, $Par_{i,t-1}$, $Sis\_Sub_{i,t-1}$, or $Sis\_Par_{i,t-1}$) and $Treatment$ and $Postlist$ dummy variables. Similar to the results in Table 8, control variables in Table 9 include the corresponding OLF predictor returns, the above two indicators, as well as firm characteristics from Table 3. Supporting our expectations, the results of our DiD tests for all four types of firm ownership links show the OLF return predictability in the treatment group of focal firms significantly decreases in the years following the cross-listing. The largest economic magnitude is again observed for the pre-listing subsidiary-parent predictability.

Figure 2 visualizes the estimation results from Table 9. The figure has four plots for each of four types of ownership links and shows the OLF predictive coefficients before and after cross-listing of focal firms. The event window covers 24 months before and after the cross-listing month. We again depict the monthly estimates of predictor coefficients for treatment and controls groups, along with their mean values over the 24-month period before and after the event. The figure shows that before cross-listings, the coefficients on all four OLF predictors for both firm groups are positive and similar to each other. After the cross-listing event, the treatment firms experience a negative shift in OLF predictability. In contrast, return predictability in the control (non-cross-listed) group of ownership-linked firms after the pseudo-cross-listing event is very close to that before the event.

Taken together, the results in Table 9 and Figure 2 show that the return predictability in OLFs exists in an environment with a low firm visibility, and it decreases as investors learn and know more about companies. In effect, these results reflect the applicability of all four potential explanations—namely, investors' inattention, limits to arbitrage, ownership complexity, and active internal capital markets — for the return predictability evidence in firms with ownership links. The results of our statistical tests in Section 4.2 provide further detail on the relative importance of each of the suggested mechanisms.

4.2. Four mechanisms of the OLF return predictability

First, if investors' limited attention plays an important role for our OLF return predictability, we expect it to be stronger when investors have a lower attention. To test this prediction, we use the following three variables to capture investors' inattention to focal firms commonly used in the literature: lower residual institutional ownership, smaller size, and lower analyst coverage (e.g., Huang, 2015; Lee et al., 2019; Ali and Hirshleifer, 2019). We compute the residual institutional ownership by orthogonalizing the institutional ownership of the focal firm with respect its market capitalization. To obtain a less noisy measure of investors' inattention, we construct the composite investors' inattention (CII) metric by averaging the rankings of the reciprocal of residual institutional ownership, the reciprocal of firm size, and the reciprocal of the number of analysts. We define a dummy variable $High\_CII$ to be equal unity if the CII is above the median and zero otherwise.

Second, in a frictionless market, predictable stock returns are arbitraged away. However, due to high limits to arbitrage (Shleifer and Vishny, 1997), some mispricing may not completely be ruled out. When stocks have high arbitrage implementation costs, we expect a stronger return predictability effect, since sophisticated institutional investors may find it unprofitable to trade in mispriced securities. We use three common variables to capture high limits to arbitrage in equity markets: idiosyncratic volatility, equity volatility, and turnover (Ang et al., 2006; 2009; Augustin et al., 2020). We compute idiosyncratic volatility as the residuals' standard deviation based on the regression of daily stock returns on the Fama and French (1993) three-factor model in the previous month (requiring at least 10 daily returns). To obtain a less noisy measure of the limits to arbitrage, we construct the composite limits to arbitrage (CLA) metric by averaging the rankings of idiosyncratic volatility, equity volatility, and turnover. We define a dummy variable $High\_CLA$ to be equal unity if the CLA is above the median and zero otherwise.

Third, Chan et al. (1996) find that price continuation results from a gradual response to information. Furthermore, Daniel et al. (1998; 2001) and Hirshleifer (2001) find that behavioral biases increase when investors' face a more information uncertainty. Similarly, the more complex is the process of information gathering from OLFs, the longer is the response to information, and the stronger must be the OLF return predictability. Therefore, we consider three proxies of ownership complexity. The first measure uses the number of OLFs for a given focal firm, the second – the number of foreign OLFs for a given focal firm, and the third – the number of different industry OLFs for a given focal firm. We create the composite ownership complexity (COC) metric by averaging the rankings of three ownership complexity proxies. We define a dummy variable $High\_COC$ to be equal unity if the COC is above the median and zero otherwise.

Finally, the fourth possible mechanism of the OLF return predictability is the existence of internal capital markets (ICM). Since cash flows from a parent firm or one of its subsidiaries can be used to fund investment needs in other ownership-linked subsidiaries or parent firms, the speed of investors' response to information of OLFs may depend on the existence of ICM. However, these investments may not necessarily be value-enhancing for the company. For instance, several previous studies show that a parent firm may subsidize one loss-making subsidiary by transferring funds from more profitable subsidiaries (e.g., Stulz, 1990; Meyer et al., 1992; Lamont, 1997; Shin and Stulz, 1998). Furthermore, Berger and Ofek (1995) find that ICM activities, such as overinvestment and cross-subsidization, can decrease information processing efficiency in a group and lead to firm value discounts. Then, Lamont and Polk (2001) find that firms with larger value discounts have higher subsequent returns. Therefore, even if the parent firm's investors are conscious of all its ownership links, these investors may still be skeptical about whether a positive cash flow announcement for one subsidiary constitutes a positive piece of information for the parent firm. Accordingly, our hypothesis is that the more active is the ICM of the parent firm (or subsidiary), the more severe is the lag in incorporating information into the subsidiary's (or parent firm's) price and, therefore, the stronger is the OLF return predictability.

We use the Shin and Stulz (1998) methodology to determine whether the ICM is active. We consider only stocks with complete ownership links over the 36-month period. First, we examine subsidiary-parent and parent-parent return predictabilities. In this case, a parent firm has different subsidiaries. Shin and Stulz (1998) find that, since it is easier to fund subsidiaries with small capital expenditures relative to the firm's total investment budget, small subsidiaries benefit more from an efficient ICM. Therefore, we test the parent firm's smallest subsidiary's financing effect in the ICM.[14] For the smallest subsidiary i of parent firm j, we run the following time-series regression over 36 months:

$$\frac{I_{i,j,t}}{TA_{j,t-1}} = \alpha_{0,j} + \beta_{1,j}\frac{C_{not\ i,j,t}}{TA_{j,t-1}} + \beta_{2,j}\frac{S_{i,j,t-1} - S_{i,j,t-2}}{S_{i,j,t-2}} + \beta_{3,j}\frac{C_{i,j,t}}{TA_{j,t-1}} + + \beta_{4,j}q_{i,j,t-1} + \epsilon_{j,t}, \quad (4)$$

where $I_{i,j,t}$ is the gross investment of subsidiary i of parent firm j in month t; $TA_{j,t-1}$ is the book value of the total assets of firm j in month $t-1$; $C_{not\ i,j,t}$ is the sum of cash flows of all subsidiaries of parent firm j except that of subsidiary i in month t; $S_{i,j,t-1}$ is the sales of subsidiary i of parent firm j in month $t-1$; $C_{i,j,t}$ is the cash flow of subsidiary i of parent firm j in month t; and $q_{i,j,t-1}$ is Tobin's q for subsidiary i of parent firm j in month $t-1$.

Second, we examine parent-subsidiary and subsidiary-subsidiary return predictabilities. In this case, one subsidiary may have different parent firms. Therefore, we run the following time-series regression for each subsidiary i over 36 months:

$$\frac{I_{i,t}}{TA_{i,t-1}} = \alpha_{0,i} + \beta_{1,i}\frac{C_{not\ i,j,t}}{TA_{i,t-1}} + \beta_{2,i}\frac{S_{i,t-1} - S_{i,t-2}}{S_{i,t-2}} + \beta_{3,i}\frac{C_{i,t}}{TA_{i,t-1}} + + \beta_{4,i}q_{i,t-1} + \epsilon_{i,t}, \quad (5)$$

where $I_{i,t}$, $TA_{i,t-1}$, $C_{not\ i,j,t}$, $S_{i,t-1}$, $C_{i,t}$, and $q_{i,t-1}$ are defined similar to above for each subsidiary i. The standard errors in the above two regressions are Newey-West adjusted to

[14] Our estimations with the parent firm's largest subsidiary lead to similar results in the follow-up tests. The results are available upon request.

correct for heteroskedasticity and autocorrelation. Following Shin and Stulz (1998), we consider an ICM to be "active" if β_1 in Eq. (7) and (8) is significant at the 5% level.[15] We define a dummy variable $High\_ICM$ to be equal unity if the ICM is active and zero otherwise.

Table 10 reports our test results based on the Fama-MacBeth regressions. It includes four panels (Panel A-D) for each of the four types of ownership-linked return predictability. Each panel has five columns. Columns 1-4 in each panel reflect the testing outcome of the four possible explanatory mechanisms for the OLF predictability individually using our metrics of composite investors' inattention, composite limits of arbitrage, composite ownership complexity, and active internal capital markets. We report only the coefficients on interactive terms between each OLF predictor, $OLF_{i,t-1}$, (i.e., $Sub_{i,t-1}$, $Par_{i,t-1}$, $Sis\_Sub_{i,t-1}$, or $Sis\_Par_{i,t-1}$) and our four dummy variables indicating above the median values of our four explanatory mechanisms metrics, i.e., $High\_CII$, $High\_CLA$, $High\_COC$, and $High\_ICM$, as well as the coefficients on the corresponding non-interactive OLF predictors themselves. The results show that the slopes on all interactive $OLF_{i,t-1}$ terms across all panels are significant at the 5% level. Moreover, the slopes on the interactive $OLF_{i,t-1}$ terms are significant at the 1% level for one, two, four, and four panels for $High\_CII$, $High\_CLA$, $High\_COC$, and $High\_ICM$, respectively. This indicates that all four mechanisms appear to be relevant in explaining the empirical finding of the OLF predictability in a complex ownership network.

Next, to understand the relative importance of each of the above four mechanisms that may be responsible for the OLF return predictability, in Columns 5 of Panels A-D of Table 10, we horse race all four possible mechanisms against each other in a joint estimation again using the Fama-MacBeth setting. The results show that the coefficients on the interactive term $OLF_{i,t-1} \times High\_ICM$ are all positive and retain their 1% significance in a joint estimation. The point estimates corresponding to the other mechanisms either become substantially weaker or completely lose their statistical significance. Nevertheless, some explanation of our predictability results may be related to ownership complexity: the point estimates on $OLF_{i,t-1} \times High\_COC$ are significant at the 10% level in Column 5 across all four panels.

[15] We also use alternative definition of "active" ICM set at the 1% and 10% significance levels if β_1 in Eq. (4) and (5), however, this change does not affect our results. The results are available upon request.

Overall, our test results show that the two specific mechanisms newly proposed in our study – ownership complexity and active internal capital markets, tend to be more powerful than the two generic mechanisms commonly used in the existing literature – investors' inattention and limits to arbitrage. Particularly, the existence of active internal capital markets among firms with ownership links appears to be the most important explanation of the OLF return predictability. This finding distinguishes the source of predictability in firms with ownership links from that of other cross-firm return anomalies, which are usually explained by low investor attention or high arbitrage costs.

5. Conclusion

In this study, using the data from 23 developed markets, we document the existence of return predictability in OLFs. Specifically, we demonstrate that the lagged one month returns of OLFs can predict the next month returns of focal firms. Four trading strategies—namely, parent-subsidiary, subsidiary-parent, subsidiary-subsidiary, and parent-parent—generate abnormal returns that are not subsumed by risk factors or firm characteristics. For instance, based on univariate portfolio sorts, the Fama and French (2018) six-factor alpha is 113 bps per month for the spread between the value-weighted portfolio return of parent firms with the best performing ownership-weighted subsidiaries and that of parent firms with the worst performing ownership-weighted subsidiaries in the previous month. This pattern holds across different time periods and geographic regions. The predictability of returns in OLFs is larger at times of high market sentiment, similar to those of other cross-sectional stock return anomalies. Our results also illustrate that, in complex ownership networks, the predictability exists not only for focal firms' returns, but also for such fundamental performance measures as their cash flow growth, profit growth, and their earnings.

An important part of our analysis, which is based on the difference-in-difference methodology, is the investigation of the impact of changes in the ownership structure of OLFs on their return predictability. In this case, we look at the OLF predictability before and after the formation of ownership links among the same parent firms and their subsidiaries. In line with the expectation, we observe the existence of return predictability only after the establishment of direct ownership links between firms.

In terms of interpretation of our findings of OLF return predictability, we consider four possible mechanisms: two generic ones commonly used in the literature – investors' inattention and limits to arbitrage, and two specific ones newly proposed in this study – ownership complexity and active internal capital markets. As an early evidence of the suitability of those four explanations to our results, we study the OLF predictability before and after the issuance of cross-listings by focal firms. In support of our intuition, we find that the return predictability in OLFs is much larger prior to cross-listing, i.e. when the visibility and informational transparency of firms is relatively low. In contrast to other studies, the results of our subsequent tests reveal the dominant role of active internal capital markets, and, to a certain extent, the ownership complexity as the underlying drivers of return predictability among firms with a complex ownership network.

References

Ahearne, A., Griever, W., and Warnock, F. (2004). Information costs and home bias: An analysis of U.S. holdings of foreign equities. *Journal of International Economics*, 62, 313-336.

Ali, U., and Hirshleifer, D. (2019). Shared analyst coverage: Unifying momentum spillover effects. *Journal of Financial Economics*, forthcoming.

Ang, A., Hodrick, R. J., Xing, Y., and Zhang, X. (2006). The cross-section of volatility and expected returns, *Journal of Finance*, 61, 259–299.

Ang, A., Hodrick, R. J., Xing, Y., and Zhang, X. (2009). High idiosyncratic volatility and low returns: international and further U.S. evidence, *Journal of Financial Economics*, 91, 1–23.

Augustin, P., Jiao, F., Sarkissian, S., and Schill, M. (2020) Cross-listings and the dynamics between credit and equity returns, *Review of Financial Studies*, 33, 112-154.

Baker, H. K., Nofsinger, J. R., and Weaver, D. G. (2002). International cross-listing and visibility. *Journal of Financial and Quantitative Analysis*, 37, 495-521.

Baker, M., and Wurgler, J. (2006). Investor sentiment and the cross-section of stock returns. *Journal of Finance*, 61, 1645-1680.

Baker, M., and Wurgler, J., and Yuan, Y. (2012). Global, local, and contagious investor sentiment. *Journal of Financial Economics*, 104, 272-287.

Banz, R. W. (1981). The relationship between return and market value of common stocks, *Journal of Financial Economics*, 9, 3–18.

Barber, B. M., Terrance, O., and Zhu, N. (2008). Do retail trades move markets? *Review of Financial Studies*, 22, 151-186.

Basu, S. (1983). The relationship between earnings' yield, market value and return for NYSE com- mon stocks: further evidence, *Journal of Financial Economics* 12, 129–156.

Berger, P. and Ofek, E. (1995). Diversification's effect on firm value. *Journal of Financial Economics* 37, 39-65.

Bertrand, M., and Sendhil, M. (2003). Pyramids. *Journal of the European Economic Association*, 1, 478-483.

Cao, J., Tarun, C., and Chen, L. (2016). Alliances and return predictability. *Journal of Financial and Quantitative Analysis*, 51, 1689-1717.

Chan, L. K., Jegadeesh, N., and Lakonishok, J. (1996). Momentum strategies. *Journal of Finance*, 51, 1681–1713.

Chan, S. H., Kensinger, J. W., Keown, A. J., and Martin, J. D. (1997). Do strategic alliances create value? *Journal of Financial Economics*, 46, 199-221.

Claessens, S., Simeon, D., and Lang, L. HP. (2000). The separation of ownership and control in East Asian corporations. *Journal of Financial Economics*, 58, 81-112.

Cohen, L., and Frazzini, A. (2008). Economic links and predictable returns. *Journal of Finance*, 63, 1977-2011.

Cooper, M. J., Gulen, H., and Schill, M. J. (2008). Asset growth and the cross-section of stock returns. *Journal of Finance*, 63, 1609-1651.

Daniel, K., Hirshleifer, D., and Subrahmanyam, A. (1998). Investor psychology and security market over- and under-reactions. *Journal of Finance*, 53, 1839–1886.

Daniel, K., Hirshleifer, D., and Subrahmanyam, A. (2001). Overconfidence, arbitrage, and equilibrium asset pricing. *Journal of Finance*, 56, 921–965.

De Santis, G., and Gerard, B., (1997). International asset pricing and portfolio diversification with time-varying risk. *Journal of Finance*, 52, 1881-1912.

Fama, E. F. and French, K. R. (1992). The cross-section of expected stock returns, *Journal of Finance*, 47, 472–465.

Fama, E. F. and French, K. R. (1993). Common risk factors in the returns on stocks and bonds, *Journal of Financial Economics*, 33, 3–56.

Fama, E. F. and French, K. R. (2015). A five-factor asset pricing model, *Journal of Financial Economics*, 116, 1–22.

Fama, E. F., and French, K. R. (2018). Choosing factors. *Journal of Financial Economics*, 128(2), 234-252.

Fama, E. F. and MacBeth, J. D. (1973). Risk, return, and equilibrium: empirical tests, *Journal of Political Economy*, 81, 607–636.

Finke, C., and Weigert, F. (2017). Does foreign information predict the returns of multinational firms worldwide? *Review of Finance*, 21, 2199–2248.

Ginglinger, E., Camille, H., and Luc, R. (2018). Are investors aware of ownership connections? ECGI Working Paper No. 525/2017.

Hirshleifer, D. (2001). Investor psychology and asset pricing. *Journal of Finance*, 56, 1533–1596.

Hong, H. and Stein, J. C. (2007). Disagreement and the stock market. *Journal of Economic Perspectives*, 21, 109–128.

Huang, X. (2015). Thinking outside the borders: investors' underreaction to foreign operations information. *Review of Financial Studies*, 28, 3109-3152.

Jegadeesh, N. (1990). Evidence of predictable behavior of security returns, *Journal of Finance*, 45, 881–898.

Jegadeesh, N., and Titman, S. (1993). Returns to buying winners and selling losers: implications for stock market efficiency, *Journal of Finance*, 48, 65–91.

Jiao, F., and Sarkissian, S. (2020). Global liquidity provision and risk sharing. *Journal of Financial and Quantitative Analysis*, forthcoming.

Kalemli-Ozcan, S., Sorensen, B., Villegas-Sanchez, C., Volosovych, V., and Yesiltas, S. (2015). How to construct nationally representative firm level data from the ORBIS global database. NBER Working Paper No. w21558.

La Porta, R., Lopez-de-Silanes, F., and Shleifer, A. (1999). Corporate ownership around the world. *Journal of Finance*, 54, 471-517.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., and Vishny, R. (2000). Investor protection and corporate governance. *Journal of Financial Economics*, 58, 3-27.

Lamont, O. A. (1997). Cash flow and investment: Evidence from internal capital markets. *Journal of Finance*, 52, 83-109.

Lamont, O. A., and Polk, C. (2001). The diversification discount: Cash flows versus returns. *Journal of Finance*, 56, 1693-1721.

Lang, M., Lins, K., and Miller, D. (2003). ADRs, analysts, and accuracy: Does cross listing in the U.S. improve a firm's information environment and increase market value? *Journal of Accounting Research*, 41, 317-345.

Lee, C. M., Sun, S. T., Wang, R., and Zhang, R. (2019). Technological links and predictable returns. *Journal of Financial Economics*, 132, 76-96.

Li, J., Tang, Y., and Yan, A. (2016). Corporate equity ownership and expected stock returns. Working Paper, Fordham University.

Lo, A. W. and MacKinlay, A. C. (1990). When are contrarian profits due to stock market overreaction? *Review of Financial Studies*, 3, 175–205.

Menzly, L., and Ozbas, O. (2010). Market segmentation and cross-predictability of returns. *Journal of Finance*, 65, 1555-1580.

Meyer, M., Milgrom, P., and Roberts, J. (1992). Organizational prospects, influence costs, and ownership changes. *Journal of Economics & Management Strategy*, 1, 9-35.

Moskowitz, T., and Grinblatt, M. (1999). Do industries explain momentum? *Journal of Finance*, 54, 1249-1290.

Novy-Marx, R. (2013). The other side of value: The gross profitability premium. *Journal of Financial Economics*, 108, 1-28.

Rouwenhorst, K. G. (1999). Local return factors and turnover in emerging stock markets. *Journal of Finance*, 54, 1439–1464.

Shin, H. H., and Stulz, R. M. (1998). Are internal capital markets efficient? *Quarterly Journal of Economics*, 113, 531-552.

Shleifer, A., and Vishny, R. W. (1997). The limits of arbitrage. *Journal of Finance*, 52, 35-55.

Stambaugh, R. F., Yu, J., and Yuan, Y. (2012). The short of it: Investor sentiment and anomalies. *Journal of Financial Economics*, 104, 288-302.

Stulz, R. (1990). Managerial discretion and optimal financing policies. *Journal of Financial Economics*, 26, 3-27.

Appendix: Variable Definitions and Data Sources

Variable	Description	Source	Frequency
$Sub_{i,t-1}$	Parent firm i's ownership-weighted portfolio returns of subsidiaries in month $t-1$	CRSP, Eikon, FactSet, Orbis	Monthly
$Par_{i,t-1}$	Subsidiary i's control-weighted portfolio returns of parent firms in month $t-1$	CRSP, Eikon, FactSet, Orbis	Monthly
$Sis\_Sub_{i,t-1}$	Subsidiary i's value-weighted portfolio returns of its sister subsidiaries in month $t-1$	CRSP, Eikon, FactSet, Orbis	Monthly
$Sis\_Par_{i,t-1}$	Parent firm i's value-weighted portfolio returns of its sister parent firms in month $t-1$	CRSP, Eikon, FactSet, Orbis	Monthly
$R_{i,t}$	Focal firm i's return in month t	CRSP, Eikon, FactSet, Orbis	Monthly
$ret_{i,t}$	Focal firm i's excess return in month t over a one-month US T-bill rate	K. French Data	Monthly
Ln(Size)	Log market capitalization	CRSP, Compustat, Eikon	Monthly
Ln(B/M)	Log book value at the end of December over the market capitalization in month *t*-1	CRSP, Eikon, Compustat	Monthly
Mom	Focal firm's cumulative return over *t*-12 to *t*-2 months	CRSP, Eikon	Monthly
Turnover	# of daily shares traded over # of shares outstanding at the day end, averaged over the past 12 months	CRSP, Eikon	Monthly
Ind_Mom	The value-weighted industry return of the focal firm	CRSP, Eikon K. French Data	Monthly
AG	Asset growth – an annual growth rate of total assets	CRSP, Compustat, Eikon	Monthly
GP	Gross profitability – the revenue minus cost of goods sold scaled by assets	CRSP, Eikon, Compustat	Monthly
ResInstOwn	The residual percentage of shares held by institutions, orthogonalized by firm's market capitalization	CRSP, Eikon, FactSet	Monthly
# Analysts	Number of analysts following a firm	CRSP, Compustat, Eikon, I/B/E/S	Monthly
IVol	Standard deviation of the Fama and French (1993) regression residuals of daily stock returns past month	CRSP, Compustat, Eikon, K. French Data	Monthly

Table 1: Descriptive statistics

This table shows the summary statistics for all publicly listed parent and subsidiary firms from 23 developed markets between January 2006 and December 2018. All financial firms (two-digit NAICS code = 52) and stocks with prices less than $5 at the portfolio formation date are excluded. Firm characteristics include market capitalization (Size), book-to-market ratio (B/M), asset growth (AG), gross profitability (GP), and Momentum (Mom). All variables are defined in the Appendix and winsorized within each cross-section at 1% and 99% levels. Panel A reports the summary statistics of parent and subsidiary firms within their ownership links, Panel B – country statistics, and Panel C – the summary statistics of firm characteristics for parent firms and subsidiaries.

Panel A: Sample description

	Mean	SD	Min	Med	Max
Number of parent firms	1,287	108	1,021	1,193	1,575
Number of subsidiaries	2,208	201	1,630	2,087	2,818
Number of subsidiaries per focal firm	2.58	1.97	1	2	9
Number of parent firms per focal firm	1.42	1.11	1	1	4
Number of sister subsidiaries per focal firm	2.40	1.81	1	2	6
Number of sister parent firms per focal firm	1.30	0.97	1	1	4

Panel B: Country statistics

	Total number of		Average number of		Average number of sister	
	Parent firms	Subsidiaries	Subsidiaries	Parent firms	Subsidiaries	Parent firms
Australia	58	95	1.33	1.00	1.00	N/A
Austria	5	8	2.20	1.25	2.00	1.50
Belgium	16	23	2.13	1.17	2.00	1.08
Canada	43	72	2.51	1.39	2.33	1.27
Denmark	5	8	2.20	1.25	2.13	1.50
Finland	4	5	2.00	1.20	2.00	1.00
France	132	217	2.47	1.36	2.30	1.24
Germany	83	144	2.61	1.44	2.43	1.32
Greece	7	9	1.86	1.00	1.00	N/A
Hong Kong	96	169	2.65	1.46	2.47	1.34
Ireland	3	3	1.33	1.00	1.00	N/A
Italy	10	14	2.20	1.21	2.00	1.50
Japan	476	949	3.50	1.93	3.26	1.76
Netherlands	18	28	2.33	1.29	2.20	1.19
New Zealand	3	3	1.33	1.00	1.00	N/A
Norway	29	46	2.41	1.33	2.25	1.22
Portugal	7	10	2.14	1.20	2.00	1.50
Singapore	82	105	1.91	1.06	1.79	N/A
Spain	16	25	2.31	1.28	2.18	1.18
Sweden	40	76	2.85	1.57	2.66	1.44
Switzerland	38	54	2.13	1.19	1.99	1.08
UK	26	36	1.31	1.00	1.00	N/A
USA	90	109	1.26	1.00	1.00	N/A

Table 1 (continued)

Panel C: Firm characteristics

Parent firm	Mean	SD	Min	Med	Max
Size ($ bln)	18.56	32.73	2.46	17.85	49.31
B/M	0.75	0.93	0.16	0.56	1.62
Asset Growth (AG)	0.15	0.38	-0.65	0.09	6.30
Gross Profitability (GP)	0.41	0.25	-0.91	0.38	1.22
Momentum (Mom)	0.15	0.55	-0.95	0.07	12.45
Subsidiary	**Mean**	**SD**	**Min**	**Med**	**Max**
Size ($ bln)	2.95	8.45	0.59	3.07	14.50
B/M	0.69	0.64	0.14	0.45	1.53
Asset Growth (AG)	0.22	0.38	0.00	0.15	1.41
Gross Profitability (GP)	0.46	0.37	-0.45	0.43	1.29
Momentum (Mom)	0.23	0.65	-0.98	0.12	15.26

Table 2: Univariate portfolio sorts

This table shows the results of value- and equal-weighted univariate portfolio sorts for four types of return predictabilities in ownership-linked firms (OLFs): parent-subsidiary, subsidiary-parent, subsidiary-subsidiary, and parent-parent. The sample includes firms from 23 developed markets from January 2006 to December 2018. All financial firms and stocks with prices less than $5 at the portfolio formation date are excluded. Panel A reports abnormal returns for the lowest (Q1) and highest (Q5) quintile portfolios as well as the Q5-Q1 difference portfolio using the Fama and French (2015) five-factor model. Panel B reports abnormal returns for lowest and highest quintile portfolios as well as the Q5-Q1 difference portfolio using the Fama and French (2018) six-factor model. The risk-adjusted abnormal returns (alphas) are computed based on the developed market factors from the K. French data library. The *t*-statistics are in parentheses and the standard errors are Newey-West adjusted with six lags. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Fama and French (2015) five-factor alphas

	(1)	(2)	(3)	(4)
VW	Sub-Par	Par-Sub	Sub-Sub	Par-Par
Q1 (Low)	-0.83**	-0.49*	-0.45*	-0.52**
Q5 (High)	0.30*	0.33*	0.28	0.36*
Q5 – Q1	1.13***	0.82***	0.73***	0.88***
	(3.68)	(2.84)	(2.73)	(3.05)
EW				
Q1 (Low)	-0.89**	-0.70**	-0.63**	-0.61**
Q5 (High)	0.33*	0.45*	0.40*	0.43*
Q5 – Q1	1.22***	1.15***	1.03***	1.05***
	(3.97)	(3.99)	(3.85)	(3.63)

Panel B: Fama and French (2018) six-factor alphas

	(1)	(2)	(3)	(4)
VW	Sub-Par	Par-Sub	Sub-Sub	Par-Par
Q1 (Low)	-0.81**	-0.48*	-0.45*	-0.46*
Q5 (High)	0.32*	0.29	0.30*	0.33*
Q5 – Q1	1.13***	0.77**	0.76***	0.79***
	(3.66)	(2.54)	(2.79)	(2.78)
EW				
Q1 (Low)	-0.91**	-0.64**	-0.66**	-0.54**
Q5 (High)	0.35*	0.37*	0.44*	0.39*
Q5 – Q1	1.26***	1.01***	1.10***	0.93***
	(4.09)	(3.40)	(4.01)	(3.25)

Table 3: Multivariate regressions

This table shows the estimation results from cross-sectional Fama and MacBeth (1973) regressions for four trading strategies of ownership-linked firms (OLFs). The sample includes firms from 23 developed markets from January 2006 to December 2018. All financial firms and stocks with prices less than $5 at the portfolio formation date are excluded. The dependent variable in Panel A is the excess return of the focal firm, $ret_{i,t}$, in Panels B – the risk-adjusted return from the Fama and French (2015) five-factor model, α_FF5, and in Panel C – the risk-adjusted return from the Fama and French (2018) six-factor model, α_FF6. The risk-adjusted returns are computed based on the developed market factors from the K. French data library. The explanatory variables include the lagged one-month portfolio returns of OLFs ($Sub_{i,t-1}$, $Par_{i,t-1}$, $Sis\_Sub_{i,t-1}$, or $Sis\_Par_{i,t-1}$), firm size, $Ln(Size)$, book-to-market ratio, $Ln(B/M)$, focal firm's own lagged monthly return, $R_{i,t-1}$, medium-term price momentum, Mom, asset growth, AG, gross profitability, GP, stock turnover, $Turnover$, and industry momentum, Ind_Mom. All variables are defined in the Appendix, are based on the last non-missing available observation for each month t, and are winsorized at 1% and 99% levels. All regressions include country and industry (measured at two-digit NAICS codes) fixed effects, but their estimates are not shown. The absolute *t*-statistics are in parentheses and the standard errors are Newey-West adjusted with six lags. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Excess returns

	(1)	(2)	(3)	(4)
DV: $ret_{i,t}$*100	Parent	Subsidiary	Subsidiary	Parent
$Sub_{i,t-1}$	4.78*** (3.05)			
$Par_{i,t-1}$		3.09*** (3.87)		
$Sis\_Sub_{i,t-1}$			2.32*** (3.03)	
$Sis\_Par_{i,t-1}$				1.29*** (3.58)
Ln(Size)	-0.21* (1.71)	-0.24*** (3.35)	-0.30*** (4.71)	-0.16** (2.10)
Ln(B/M)	0.40** (2.12)	0.22** (2.02)	0.13 (0.29)	0.22*** (2.65)
$R_{i,t-1}$	-4.92*** (3.27)	-1.49 (1.25)	-3.27*** (3.41)	-1.28** (1.99)
Mom	-0.60 (0.58)	1.63* (1.94)	-0.34 (0.72)	1.48* (1.78)
AG	-0.66** (2.45)	-0.05 (0.10)	-0.24 (1.32)	-0.94*** (3.42)
GP	0.04 (0.97)	0.47*** (2.91)	0.19 (1.17)	0.07 (1.27)
Turnover	-0.10** (2.09)	-0.22 (0.75)	-0.17** (2.06)	-0.76*** (2.94)
Ind_Mom	0.83* (1.76)	1.27** (2.14)	1.29** (2.48)	0.79* (1.70)
Country & Industry FEs	Y	Y	Y	Y
Obs.	200,772	344,448	212,869	76,695
R^2	0.12	0.12	0.10	0.08

Table 3 (continued)

Panel B: Fama and French (2015) five-factor alphas

	(1)	(2)	(3)	(4)
DV: $\alpha\_FF5_{i,t}$*100	Parent	Subsidiary	Subsidiary	Parent
$Sub_{i,t-1}$	3.53** (2.27)			
$Par_{i,t-1}$		2.05*** (2.68)		
$Sis\_Sub_{i,t-1}$			1.52** (2.08)	
$Sis\_Par_{i,t-1}$				0.98** (2.45)
Controls, Country & Industry FEs	Y	Y	Y	Y
Obs.	200,772	344,448	212,869	76,695
R^2	0.08	0.09	0.07	0.06

Panel C: Fama and French (2018) six-factor alphas

	(1)	(2)	(3)	(4)
DV: $\alpha\_FF6_{i,t}$*100	Parent	Subsidiary	Subsidiary	Parent
$Sub_{i,t-1}$	3.02** (1.98)			
$Par_{i,t-1}$		2.22*** (2.88)		
$Sis\_Sub_{i,t-1}$			1.44* (1.90)	
$Sis\_Par_{i,t-1}$				1.03*** (2.86)
Controls, Country & Industry FEs	Y	Y	Y	Y
Obs.	200,772	344,448	212,869	76,695
R^2	0.07	0.09	0.07	0.06

Table 4: Sub-period and regional tests of the OLF return predictability

This table shows the Fama and French (2018) six-factor abnormal returns for value- and equal-weighted univariate portfolio sorts of focal firms in sub-periods and in different regional samples for ownership-linked firms (OLFs). The sample includes firms from 23 developed markets from January 2006 to December 2018. All financial firms and stocks with prices less than \$5 at the portfolio formation date are excluded. The risk-adjusted returns are computed based on the developed market factors from the K. French data library. Panel A reports the abnormal returns in two equal sub-periods (January 2006 to June 2012 and July 2012 to December 2018) for the lowest and highest quintile portfolios and the Q5-Q1 difference portfolio based on four OLF trading strategies. In Panels B-E, we perform univariate portfolio sorts for four OLF strategies in different regions (Global ex USA, Japan, Asia-Pacific, Europe, and North America). The *t*-statistics are in parentheses and the standard errors are Newey-West adjusted with six lags. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Sub-period estimations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Sub-Par		Par-Sub		Sub-Sub		Par-Par	
VW	1st half	2nd half	1st half	2nd half	1st half	2nd half	1st half	2nd half
Q1 (Low)	-0.91**	-0.72**	-0.48*	-0.43*	-0.48*	-0.43*	-0.49*	-0.42*
Q5 (High)	0.36*	0.28*	0.29*	0.26*	0.32*	0.29*	0.35*	0.31*
Q5 – Q1	1.27***	1.01***	0.78***	0.69**	0.80***	0.72***	0.84***	0.73***
	(4.12)	(3.28)	(2.62)	(2.29)	(2.95)	(2.67)	(2.93)	(2.58)
EW								
Q1 (Low)	-1.01***	-0.79**	-0.68**	-0.60**	-0.67**	-0.61**	-0.57**	-0.52**
Q5 (High)	0.40*	0.31*	0.40*	0.36*	0.45*	0.40*	0.42*	0.37*
Q5 – Q1	1.41***	1.11***	1.09***	0.96***	1.12***	1.01***	0.99***	0.89***
	(4.54)	(3.61)	(3.65)	(3.23)	(4.12)	(3.76)	(3.47)	(3.10)

Panel B: Subsidiary-parent

	(1)	(2)	(3)	(4)	(5)
VW	Global ex USA	Japan	Asia-Pacific	Europe	North America
Q1 (Low)	-0.76**	-0.58**	-0.62**	-0.89**	-0.96**
Q5 (High)	0.29*	0.23	0.24	0.34*	0.38*
Q5 – Q1	1.06***	0.81***	0.87***	1.23***	1.34***
	(3.42)	(2.63)	(2.81)	(4.01)	(4.35)
EW					
Q1 (Low)	-0.87**	-0.66**	-0.69**	-1.02***	-1.10***
Q5 (High)	0.34*	0.26*	0.27*	0.40*	0.43*
Q5 – Q1	1.21***	0.92***	0.96***	1.42***	1.53***
	(3.90)	(2.96)	(3.14)	(4.57)	(4.96)

Table 4 (continued)

Panel C: Parent - Subsidiary

	(1)	(2)	(3)	(4)	(5)
VW	Global ex USA	Japan	Asia-Pacific	Europe	North America
Q1 (Low)	-0.49*	-0.31*	-0.51**	-0.47*	-0.38*
Q5 (High)	0.29*	0.19	0.30*	0.28*	0.23
Q5 – Q1	0.78** (2.57)	0.50* (1.68)	0.81*** (2.73)	0.75** (2.52)	0.61** (2.05)
EW					
Q1 (Low)	-0.70**	-0.46*	-0.71**	-0.68**	-0.55**
Q5 (High)	0.42*	0.27*	0.42*	0.40*	0.32*
Q5 – Q1	1.12*** (3.67)	0.73** (2.45)	1.13*** (3.76)	1.08*** (3.63)	0.87*** (2.92)

Panel D: Subsidiary - Subsidiary

	(1)	(2)	(3)	(4)	(5)
VW	Global ex USA	Japan	Asia-Pacific	Europe	North America
Q1 (Low)	-0.48*	-0.32*	-0.53**	-0.47*	-0.35*
Q5 (High)	0.32*	0.21	0.35*	0.32*	0.24
Q5 – Q1	0.81*** (3.00)	0.53** (1.96)	0.88*** (3.26)	0.79*** (2.91)	0.59** (2.16)
EW					
Q1 (Low)	-0.68**	-0.45*	-0.73**	-0.68**	-0.53**
Q5 (High)	0.46*	0.30*	0.49*	0.45*	0.36*
Q5 – Q1	1.14*** (4.21)	0.76*** (2.80)	1.22*** (4.51)	1.14*** (4.21)	0.89*** (3.27)

Panel E: Parent - Parent

	(1)	(2)	(3)	(4)	(5)
VW	Global ex USA	Japan	Asia-Pacific	Europe	North America
Q1 (Low)	-0.45*	-0.33*	-0.37*	-0.50**	-0.54**
Q5 (High)	0.33*	0.24	0.26*	0.37*	0.39*
Q5 – Q1	0.78*** (2.72)	0.57** (2.00)	0.64** (2.21)	0.87*** (3.03)	0.93*** (3.24)
EW					
Q1 (Low)	-0.53**	-0.39*	-0.44*	-0.59**	-0.63**
Q5 (High)	0.38*	0.28*	0.32*	0.42*	0.45*
Q5 – Q1	0.91*** (3.17)	0.67** (2.34)	0.76*** (2.67)	1.01*** (3.51)	1.08*** (3.76)

Table 5: Market-wide sentiment and the OLF return predictability

This table shows the abnormal returns for four trading strategies of ownership-linked firms (OLFs) in different market-wide sentiment periods. The sample includes firms from 23 developed markets from January 2006 to December 2018. All financial firms and stocks with prices less than $5 at the portfolio formation date are excluded. The whole sample period is divided into two equal sentiment sub-periods based on the market-wide sentiment index (Baker and Wurgler, 2006). The dependent variable in Panel A is the risk-adjusted return Fama and French (2015) five-factor model, α_FF5; in Panel B – the risk-adjusted return from the Fama and French (2018) six-factor model, α_FF6. The risk-adjusted returns are computed based on the developed market factors from the K. French data library. The whole sample period is divided into two equal sentiment sub-periods based on the market-wide sentiment index of Baker and Wurgler (2006). The t-statistics are in parentheses and the standard errors are Newey-West adjusted with six lags. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Fama and French (2015) five-factor alphas

	(1)	(2)	(3)	(4)
VW (Q5-Q1)	Sub-Par	Par-Sub	Sub-Sub	Par-Par
High Sentiment	1.47***	1.18***	1.11***	1.25***
Low Sentiment	0.57*	0.34	0.24	0.38
EW (Q5-Q1)				
High Sentiment	1.67***	1.61***	1.44***	1.47***
Low Sentiment	0.68**	0.63*	0.49*	0.52

Panel B: Fama and French (2018) six-factor alphas

	(1)	(2)	(3)	(4)
VW (Q5-Q1)	Sub-Par	Par-Sub	Sub-Sub	Par-Par
High Sentiment	1.52***	1.09***	1.15***	1.17***
Low Sentiment	0.62*	0.26	0.29	0.32
EW (Q5-Q1)				
High Sentiment	1.70***	1.46***	1.50***	1.33***
Low Sentiment	0.73**	0.53	0.57**	0.43

Table 6: Forecasting growth in cash flow and profits

This table shows panel regression results of the predictive power of ownership-linked firms (OLFs) for focal firms' two fundamental performance measures (F): cash flow growth (ΔCF) in Panel A and profit growth (ΔP) in Panel B. The sample includes firms from 23 developed markets from January 2006 to December 2018. All financial firms and stocks with prices less than \$5 at the portfolio formation date are excluded. Variables $Sub\_\Delta F_t$, $Par\_\Delta F_t$, $Sis\_Sub\_\Delta F_t$, and $Sis\_Par\_\Delta F_t$ are the average growth in each of the two performance measures for four types of OLFs. All variables are taken at the end of each calendar year and winsorized at 1% and 99% levels. Independent variables are cross-sectionally standardized to have zero mean and unit variance. Control variables are from Table 3 and are defined in the Appendix. All regressions include country (C), industry (I), and year (Y) fixed effects, but their estimates are not shown. The standard errors are clustered by year. The *t*-statistics are in parentheses. ** and *** denote statistical significance at the 5% and 1% levels, respectively.

Panel A: Predicting cash flow growth of focal firms

	Parent		Subsidiary		Subsidiary		Parent	
DV: ΔCF	*t*	*t* + 1	*t*	*t* + 1	*t*	*t* + 1	*t*	*t* + 1
$Sub\_\Delta CF_t$	0.494*** (8.28)	0.147*** (3.71)						
$Par\_\Delta CF_t$			0.216*** (6.88)	0.049*** (3.14)				
$Sis\_Sub\_\Delta CF_t$					0.179*** (5.39)	0.061*** (3.65)		
$Sis\_Par\_\Delta CF_t$							0.028*** (4.29)	0.006** (2.15)
ΔCF_t		0.306*** (4.67)		0.100*** (4.49)		0.154*** (5.01)		0.012** (2.46)
Controls, C, I & Y FEs	Y	Y	Y	Y	Y	Y	Y	Y
Obs.	16,731	15,444	28,704	26,496	17,739	16,374	6,391	5,899
R^2	0.17	0.15	0.14	0.12	0.12	0.11	0.12	0.11

Panel B: Predicting profit growth of focal firms

	Parent		Subsidiary		Subsidiary		Parent	
DV: ΔProfits	*t*	*t* + 1	*t*	*t* + 1	*t*	*t* + 1	*t*	*t* + 1
$Sub\_\Delta P_t$	0.575*** (8.49)	0.167*** (5.05)						
$Par\_\Delta P_t$			0.217*** (6.49)	0.072*** (2.97)				
$Sis\_Sub\_\Delta P_t$					0.134*** (5.33)	0.050*** (3.24)		
$Sis\_Par\_\Delta P_t$							0.084*** (4.17)	0.025** (2.54)
ΔP_t		0.421*** (5.37)		0.160*** (3.62)		0.114*** (3.65)		0.057*** (3.78)
Controls, C, I & Y FEs	Y	Y	Y	Y	Y	Y	Y	Y
Obs.	16,731	15,444	28,704	26,496	17,739	16,374	6,391	5,899
R^2	0.19	0.17	0.18	0.16	0.14	0.13	0.13	0.12

Table 7: Forecasting earnings surprises

This table shows the results of Fama-MacBeth regressions of the predictability of ownership-linked firms (OLFs) for standardized unexpected earnings (SUEs). The SUEs are calculated as the yearly change in quarterly earnings scaled by the standard deviation of unexpected earnings over the eight past quarters. The explanatory variables include the preceding three months portfolio returns of OLF ($Sub_{i,t-1}$, $Par_{i,t-1}$, $Sis\_Sub_{i,t-1}$, or $Sis\_Par_{i,t-1}$). All the independent variables are distributed to deciles and scaled from 0 to 1. The dependent variable is winsorized at 1% and 99% levels in the cross-section. All regressions include country and industry fixed effects, but their estimates are not shown. Panel A reports regression results for the next quarter's SUEs for four types of ownership links. The control variables include those from Table 3 as well as one- to four-quarter lags of the firm's own SUEs. Panels B-E report regression results of future SUEs for the next four fiscal quarters for each of the four types of ownership links. The *t*-statistics are in parentheses and the standard errors are Newey-West adjusted with four lags. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: One-quarter ahead forecast

	(1)	(2)	(3)	(4)
DV: $SUE_{i,t}$*100	Parent	Subsidiary	Subsidiary	Parent
$Sub_{i,t-1}$	0.60***			
	(2.75)			
$Par_{i,t-1}$		0.67***		
		(5.05)		
$Sis\_Sub_{i,t-1}$			0.36***	
			(2.61)	
$Sis\_Par_{i,t-1}$				0.46***
				(2.98)
Controls, Country & Industry FEs	Y	Y	Y	Y
Obs.	35,650	61,162	37,798	13,618
R^2	0.46	0.54	0.39	0.43

Table 7 (continued)

Panel B: Subsidiary - Parent

DV: $SUE_{i,t+k}$ k = 0,1,2,3	Quarter 1	Quarter 2	Quarter 3	Quarter 4
$Sub_{i,t-1}$	0.60*** (2.75)	0.50** (2.42)	0.33** (2.23)	0.22 (1.57)
Controls, Country & Industry FEs	Y	Y	Y	Y
Obs.	35,650	34,690	33,734	32,821
R^2	0.46	0.45	0.45	0.44

Panel C: Parent - Subsidiary

DV: $SUE_{i,t+k}$ k = 0,1,2,3	Quarter 1	Quarter 2	Quarter 3	Quarter 4
$Par_{i,t-1}$	0.67*** (5.05)	0.45*** (3.73)	0.25** (2.32)	0.14 (1.21)
Controls, Country & Industry FEs	Y	Y	Y	Y
Obs.	61,162	59,514	57,876	56,308
R^2	0.54	0.54	0.54	0.53

Panel D: Subsidiary - Subsidiary

DV: $SUE_{i,t+k}$ k = 0,1,2,3	Quarter 1	Quarter 2	Quarter 3	Quarter 4
$Sis\_Sub_{i,t-1}$	0.36*** (2.61)	0.25* (1.83)	0.16 (1.52)	0.04 (0.45)
Controls, Country & Industry FEs	Y	Y	Y	Y
Obs.	37,798	36,780	35,767	34,798
R^2	0.39	0.39	0.39	0.39

Panel E: Parent - Parent

DV: $SUE_{i,t+k}$, k = 0,1,2,3	Quarter 1	Quarter 2	Quarter 3	Quarter 4
$Sis\_Par_{i,t-1}$	0.46*** (2.98)	0.28* (1.70)	0.21 (1.60)	0.08 (0.77)
Controls, Country & Industry FEs	Y	Y	Y	Y
Obs.	13,618	13,252	12,887	12,537
R^2	0.43	0.42	0.42	0.42

Table 8: Impact of ownership link changes on the OLF return predictability

This table uses the difference-in-difference (DiD) method to test the return predictability before and after the establishment of ownership links within the same group of firms. The sample includes firms from 23 developed markets from January 2006 to December 2018. All financial firms and stocks with prices less than $5 at the portfolio formation date are excluded. We identify all cases in which a firm without any ownership links transforms into a firm with at least one ownership link. We include observations within two years before and within two years after the transition of ownership links. $Treatment$ is a dummy variable, which equals one if a focal firm has undergone through such transition and zero otherwise. $Postlink$ is a dummy variable, which equals one in any month after the establishment of ownership links and zero otherwise. For each real-focal firm, we select one pseudo-focal firm in the control group prior to the change in ownership links. It is a four-step procedure. First, we choose pseudo-focal firms which are in the same industry (two-digit NAICS code) as the real-focal firm in two years prior to the change in ownership links. Second, we select ten most similar pseudo-focal firms to a given real-focal firm in two years prior to the change in ownership links based on the average ranking of four firm characteristics: size, book-to-market ratio, asset growth, and gross profitability. Third, we run the Fama-MacBeth regressions and compare the OLF predictive coefficients for the control group of firms with those of the "treatment" group within two years prior to the status change. We use the same OLF to predict returns of both pseudo-focal and real-focal firms. Finally, we select most similar OLF predictive coefficient firms as matched pseudo-focal firms for each real-focal firm. This procedure gives us a total of 546 firms in the control sample. Panel A shows the ex-ante differences between the treatment and control groups of firms. Panel B shows DiD test results on the OLF return predictability before and after the changes in firm ownership links. The dependent variable is the monthly excess return of the (real- and pseudo-) focal firm, $ret_{i,t}$. The regressor of interest is the triple interaction term between the lagged monthly return on one of the four OLF predictors ($Sub_{i,t-1}$, $Par_{i,t-1}$, $Sis\_Sub_{i,t-1}$, or $Sis\_Par_{i,t-1}$) and $Treatment$ and $Postlink$ dummy variables. Control variables include the corresponding OLF predictor ($Sub_{i,t-1}$, $Par_{i,t-1}$, $Sis\_Sub_{i,t-1}$, or $Sis\_Par_{i,t-1}$), $Treatment$ and $Postlink$ dummy variables, as well as other controls from Table 3. All regressions include country and industry fixed effects, but their estimates are not shown. The absolute *t*-statistics are in parentheses and the standard errors are Newey-West adjusted with six lags. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Table 8 (continued)

Panel A: Ex-ante differences between treatment and control groups of firms

Subsidiary - Parent (102 Real – 124 Pseudo)	Difference	*t*-statistic
Size ($ bln)	1.62	(0.23)
BM	-0.09	(0.20)
AG	-0.01	(0.48)
GP	0.06	(0.10)
$Sub_{i,t-1}$	-0.24	(0.56)
Parent - Subsidiary (156 Real – 232 Pseudo)		
Size ($ bln)	0.24	(0.22)
BM	0.04	(0.15)
AG	0.02	(0.25)
GP	-0.05	(0.16)
$Par_{i,t-1}$	-0.28	(0.56)
Subsidiary - Subsidiary (97 Real – 143 Pseudo)		
Size ($ bln)	0.43	(0.24)
BM	0.04	(0.20)
AG	0.03	(0.47)
GP	-0.03	(0.36)
$Sis\_Sub_{i,t-1}$	-0.12	(0.27)
Parent - Parent (40 Real – 47 Pseudo)		
Size ($ bln)	1.82	(0.49)
BM	-0.08	(0.49)
AG	-0.02	(0.42)
GP	0.02	(0.31)
$Sis\_Par_{i,t-1}$	-0.11	(0.23)

Table 8 (continued)

Panel B: The effect of changes in ownership links on return predictability

	(1)	(2)	(3)	(4)
DV: $ret_{i,t}$*100	Parent	Subsidiary	Subsidiary	Parent
$Sub_{i,t-1}$ × *Treatment* × *Postlink*	3.72*** (2.59)			
$Par_{i,t-1}$ × *Treatment* × *Postlink*		2.39*** (3.55)		
$Sis\_Sub_{i,t-1}$ × *Treatment* × *Postlink*			1.36*** (2.65)	
$Sis\_Par_{i,t-1}$ × *Treatment* × *Postlink*				1.01*** (3.59)
$Sub_{i,t-1}$ × *Treatment*	-0.19 (0.38)			
$Par_{i,t-1}$ × *Treatment*		-0.18 (0.75)		
$Sis\_Sub_{i,t-1}$ × *Treatment*			-0.10 (0.35)	
$Sis\_Par_{i,t-1}$ × *Treatment*				-0.10 (0.84)
$Sub_{i,t-1}$ × *Postlink*	0.21 (0.88)			
$Par_{i,t-1}$ × *Postlink*		0.15 (0.53)		
$Sis\_Sub_{i,t-1}$ × *Postlink*			0.13 (0.57)	
$Sis\_Par_{i,t-1}$ × *Postlink*				0.14 (0.96)
$Sub_{i,t-1}$	1.16 (1.28)			
$Par_{i,t-1}$		1.22 (1.49)		
$Sis\_Sub_{i,t-1}$			0.75 (1.53)	
$Sis\_Par_{i,t-1}$				0.42 (1.05)
Controls, Country & Industry FEs	Y	Y	Y	Y
Obs.	10,812	18,548	11,462	4,130
R^2	0.08	0.07	0.05	0.04

Table 9: Impact of cross-listing on the OLF return predictability

This table uses the difference-in-difference (DiD) method to test the OLF return predictability before and after the cross-listing by the same firms with ownership links. The sample includes firms from 23 developed markets from January 2006 to December 2018. All financial firms and stocks with prices less than $5 at the portfolio formation date are excluded. We define as a listing firm a focal firm that is headquartered in its domestic market and cross-lists its shares in some foreign markets. The cross-listing data are from the Sarkissian and Schill public database, worldwide stock exchanges, and the CRSP database for foreign listings in the United States. We include observations within two years prior to cross-listing and two years after. $Treatment$ is a dummy variable, which equals one if a focal firm has a cross-listing and zero otherwise. $Postlist$ is a dummy variable, which equals one in any month after the issuance of cross-listing and zero otherwise. For each cross-listed focal firm, we select one non-cross-listed focal firm in the control group prior to the listing placement. This is a four-step procedure. First, we choose non-cross-listed focal firms, which have OLF within two years prior to the listing event. Second, we select ten most similar non-cross-listed focal firms with the cross-listed focal firm within two years prior to cross-listing based on the average ranking of four firm characteristics: size, book-to-market ratio, asset growth, and gross profitability. Third, we again run the Fama-MacBeth regressions and compare the OLF predictive coefficients for the control firm group with those of the "treatment" group within two years prior to the cross-listing event. At last, we select most similar OLF predictive coefficient's firms as matched non-cross-listed focal firms. This procedure gives us a total of 408 firms in the control sample. Panel A shows the ex-ante differences between the treatment and control groups of firms. Panel B shows DiD test results on the OLF return predictability before and after cross-listing. The dependent variable is the monthly excess return of the cross-listed and non-cross-listed focal firm, $ret_{i,t}$. The regressor of interest is the triple interaction term between the lagged monthly return on one of the four OLF predictors ($Sub_{i,t-1}$, $Par_{i,t-1}$, $Sis\_Sub_{i,t-1}$, or $Sis\_Par_{i,t-1}$) and $Treatment$ and $Postlist$ dummy variables. Control variables include the corresponding OLF predictor ($Sub_{i,t-1}$, $Par_{i,t-1}$, $Sis\_Sub_{i,t-1}$, or $Sis\_Par_{i,t-1}$), $Treatment$ and $Postlist$ dummy variables, as well as other controls from Table 3. All regressions include country and industry fixed effects, but their estimates are not shown. The absolute *t*-statistics are in parentheses and the standard errors are Newey-West adjusted with six lags. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Table 9 (continued)

Panel A: Ex-ante differences between treatment and control groups of firms

Subsidiary - Parent (69 Cross-listed – 93 Non-cross-listed)	Difference	*t*-statistic
Size ($ bln)	-3.11	(0.80)
BM	0.12	(0.75)
AG	0.03	(0.56)
GP	0.06	(0.89)
$Sub_{i,t-1}$	0.96	(0.72)
Parent - Subsidiary (105 Cross-listed – 173 Non-cross-listed)		
Size ($ bln)	0.32	(0.55)
BM	0.11	(0.60)
AG	0.03	(0.58)
GP	-0.06	(0.59)
$Par_{i,t-1}$	0.33	(0.48)
Subsidiary - Subsidiary (65 Cross-listed – 107 Non-cross-listed)		
Size ($ bln)	0.59	(0.90)
BM	0.07	(0.68)
AG	0.04	(0.67)
GP	-0.05	(0.80)
$Sis\_Sub_{i,t-1}$	0.51	(0.58)
Parent - Parent (27 Cross-listed – 35 Non-cross-listed)		
Size ($ bln)	-2.80	(0.52)
BM	0.09	(0.55)
AG	0.02	(0.59)
GP	0.07	(0.63)
$Sis\_Par_{i,t-1}$	0.25	(0.40)

Table 9 (continued)

Panel B: The effect of cross-listing on return predictability

	(1)	(2)	(3)	(4)
DV: $ret_{i,t}$*100	Parent	Subsidiary	Subsidiary	Parent
$Sub_{i,t-1}$ × *Treatment* × *Postlist*	-2.27** (2.02)			
$Par_{i,t-1}$ × *Treatment* × *Postlist*		-1.69*** (2.95)		
$Sis\_Sub_{i,t-1}$ × *Treatment* × *Postlist*			-1.03** (1.98)	
$Sis\_Par_{i,t-1}$ × *Treatment* × *Postlist*				-0.88*** (2.79)
$Sub_{i,t-1}$ × *Treatment*	1.13 (1.14)			
$Par_{i,t-1}$ × *Treatment*		0.38 (0.79)		
$Sis\_Sub_{i,t-1}$ × *Treatment*			0.41 (1.06)	
$Sis\_Par_{i,t-1}$ × *Treatment*				0.21 (1.27)
$Sub_{i,t-1}$ × *Postlist*	-1.02 (0.97)			
$Par_{i,t-1}$ × *Postlist*		-0.42 (0.84)		
$Sis\_Sub_{i,t-1}$ × *Postlist*			-0.39 (0.91)	
$Sis\_Par_{i,t-1}$ × *Postlist*				-0.18 (1.05)
$Sub_{i,t-1}$	4.33** (2.55)			
$Par_{i,t-1}$		2.52*** (3.39)		
$Sis\_Sub_{i,t-1}$			1.98** (2.53)	
$Sis\_Par_{i,t-1}$				1.14*** (3.02)
Controls, Country & Industry FEs	Y	Y	Y	Y
Obs.	7,722	13,248	8,188	2,950
R^2	0.07	0.06	0.05	0.04

Table 10: Mechanisms of the OLF return predictability

This table shows the tests four independent mechanisms and runs horse race tests to compare four mechanisms using Fama-MacBeth regressions by including the interaction terms between the lagged subsidiaries' returns, $Sub_{i,t-1}$, the lagged parent firms' returns, $Par_{i,t-1}$, the lagged sister subsidiaries' returns, $Sis\_Sub_{i,t-1}$, or the lagged sister parent firms' returns, $Sis\_Par_{i,t-1}$, and four dummy variables reflecting four competing mechanisms: (1) investors' inattention, (2) limits to arbitrage, (3) ownership complexity, and (4) active internal capital markets (ICM) at a time. We construct composite proxies for each of the first three mechanisms. The composite investors' inattention (CII) metric is the average rankings of the reciprocal of residual institutional ownership, the reciprocal of firm size, and the reciprocal of the number of analysts. We define a dummy variable $High\_CII$ to be equal unity if the CII is above the median and zero otherwise. The composite limits to arbitrage (CLA) metric is the average rankings of idiosyncratic volatility, equity volatility, and turnover. We define a dummy variable $High\_CLA$ to be equal unity if the CLA is above the median and zero otherwise. The composite ownership complexity (COC) metric is the average rankings of the number of OLFs, the number of foreign OLFs, and the number of different-industry OLFs. We define a dummy variable $High\_COC$ to be equal unity if the COC is above the median and zero otherwise. We follow Shin and Stulz (1998) to determine whether the ICM is active. We consider only stocks with complete ownership links over the 36-month period. For subsidiary-parent and parent-parent return predictabilities we run the following time-series regressions for each subsidiary of a parent firm over 36 months:

$$\frac{I_{i,j,t}}{TA_{j,t-1}} = \alpha_{0,j} + \beta_{1,j}\frac{C_{not\ i,j,t}}{TA_{j,t-1}} + \beta_{2,j}\frac{S_{i,j,t-1} - S_{i,j,t-2}}{S_{i,j,t-2}} + \beta_{3,j}\frac{C_{i,j,t}}{TA_{j,t-1}} + \beta_{4,j}q_{i,j,t-1} + \epsilon_{j,t},$$

where $I_{i,j,t}$ is the gross investment of subsidiary i of parent firm j; $TA_{j,t-1}$ is the book value of the total assets of firm j; $C_{not\ i,j,t}$ is the sum of the cash flow of all subsidiaries of parent firm j except that of subsidiary i; $S_{i,j,t-1}$ is the sales of subsidiary i of parent firm j; $C_{i,j,t}$ is the cash flow of subsidiary i of parent firm j; $q_{i,j,t-1}$ is Tobin's q for subsidiary i of parent firm j. For parent-subsidiary and subsidiary-subsidiary return predictabilities we run the following time-series regression for each subsidiary over 36 months:

$$\frac{I_{i,t}}{TA_{i,t-1}} = \alpha_{0,i} + \beta_{1,i}\frac{C_{not\ i,j,t}}{TA_{i,t-1}} + \beta_{2,i}\frac{S_{i,t-1} - S_{i,t-2}}{S_{i,t-2}} + \beta_{3,i}\frac{C_{i,t}}{TA_{i,t-1}} + \beta_{4,i}q_{i,t-1} + \epsilon_{i,t},$$

where $I_{i,t}$, $TA_{i,t-1}$, $C_{not\ i,j,t}$, $S_{i,t-1}$, $C_{i,t}$, and $q_{i,t-1}$ are defined similar to above for each subsidiary i. In both above regressions, the standard errors are Newey-West adjusted for heteroskedasticity and autocorrelation. We define ICM to be "active" if β_1 in the above two equations is significant at the 5% level and define a dummy variable $High\_ICM$ to be equal unity if the ICM is active and zero otherwise. All regressions also include the dummy variable itself and lagged control variables from Table 3 as well as country and industry fixed effects, but their estimates are not shown. The *t*-statistics are in parentheses and the standard errors are Newey-West adjusted with six lags. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Subsidiary-parent predictability

DV: $ret_{i,t}$*100	(1)	(2)	(3)	(4)	(5)
$Sub_{i,t-1}$	4.38**	4.41**	3.94**	4.14**	3.25*
	(2.36)	(2.42)	(2.03)	(2.16)	(1.84)
$Sub_{i,t-1} \times High\_CII$	2.59**				1.37
	(2.12)				(1.22)
$Sub_{i,t-1} \times High\_CLA$		3.36***			1.90
		(3.15)			(1.58)
$Sub_{i,t-1} \times High\_COC$			3.73***		2.01*
			(3.51)		(1.88)
$Sub_{i,t-1} \times High\_ICM$				4.68***	3.26***
				(6.04)	(4.29)
Controls, Country & Industry FEs	Y	Y	Y	Y	Y

Table 10 (continues)

Panel B: Parent-subsidiary predictability

DV: $ret_{i,t}$*100	(1)	(2)	(3)	(4)	(5)
$Par_{i,t-1}$	2.51*** (3.22)	2.84*** (3.44)	2.44*** (3.06)	2.44*** (3.12)	2.02** (2.21)
$Par_{i,t-1}$ × *High_CII*	1.71*** (2.81)				0.99 (1.50)
$Par_{i,t-1}$ × *High_CLA*		1.62** (2.34)			1.11 (1.59)
$Par_{i,t-1}$ × *High_COC*			1.84*** (2.83)		1.12* (1.79)
$Par_{i,t-1}$ × *High_ICM*				2.25*** (4.71)	1.67*** (3.30)
Controls, Country & Industry FEs	Y	Y	Y	Y	Y

Panel C: Subsidiary-subsidiary predictability

DV: $ret_{i,t}$*100	(1)	(2)	(3)	(4)	(5)
$Sis\ Sub_{i,t-1}$	1.94** (2.55)	2.04*** (2.67)	1.75** (2.44)	1.66** (2.32)	1.42* (1.84)
$Sis\_Sub_{i,t-1}$ × *High_CII*	1.81** (2.13)				0.99 (1.14)
$Sis\_Sub_{i,t-1}$ × *High_CLA*		1.83*** (2.70)			1.10 (1.61)
$Sis\_Sub_{i,t-1}$ × *High_COC*			2.08*** (3.22)		1.27* (1.79)
$Sis\_Sub_{i,t-1}$ × *High_ICM*				2.77*** (5.84)	1.88*** (3.93)
Controls, Country & Industry FEs	Y	Y	Y	Y	Y

Panel D: Parent-parent predictability

DV: $ret_{i,t}$*100	(1)	(2)	(3)	(4)	(5)
$Sis\_Par_{i,t-1}$	1.14*** (2.64)	1.28*** (2.77)	1.10*** (2.62)	1.09*** (2.60)	0.80** (2.17)
$Sis\_Par_{i,t-1}$ × *High_CII*	0.32** (2.30)				0.19 (1.25)
$Sis\_Par_{i,t-1}$ × *High_CLA*		0.28** (2.33)			0.15 (1.24)
$Sis\_Par_{i,t-1}$ × *High_COC*			0.49*** (2.88)		0.24* (1.71)
$Sis\_Par_{i,t-1}$ × *High_ICM*				0.57*** (4.53)	0.40*** (3.54)
Controls, Country & Industry FEs	Y	Y	Y	Y	Y

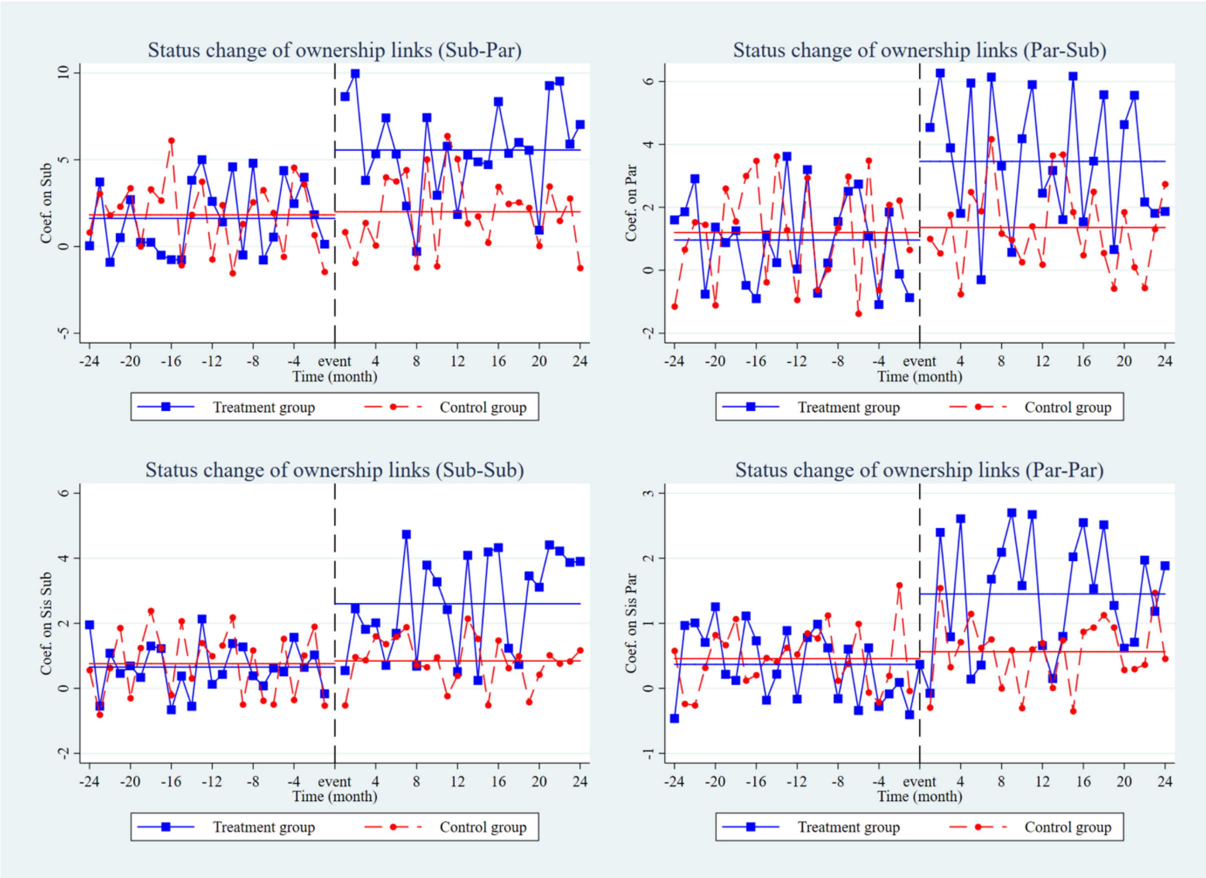

Figure 1: Predictive coefficients of OLF before and after ownership links

This figure shows the predictive OLF coefficients to real- and pseudo-focal firms before and after the change in ownership links based on Table 8 estimations, as well as their mean values before and after the event. The sample includes firms from 23 developed markets from January 2006 to December 2018. All financial firms and stocks with prices less than $5 at the portfolio formation date are excluded. We identify all cases in which a firm without any ownership links transforms into a firm with at least one ownership link. This firms form our "Treatment" group for each ownership link (blue solid line with squares). For each real-focal firm, we select one pseudo-focal firm in the control group prior to the change in ownership links. It is a four-step procedure. First, we choose pseudo-focal firms which are in the same industry as the real-focal firm in two years prior to the change in ownership links. Second, we select ten most similar pseudo-focal firms to a given real-focal firm in two years prior to the change in ownership links based on the average ranking of four firm characteristics: size, book-to-market ratio, asset growth, and gross profitability. Third, we run the Fama-MacBeth regressions and compare the OLF predictive coefficients for the control group of firms with those of the "Treatment" group within two years prior to the status change. We use the same OLF to predict returns of both pseudo-focal and real-focal firms. Finally, we select most similar OLF predictive coefficient firms as matched pseudo-focal firms for each real-focal firm. This procedure gives us the "Control group" for each ownership link (red dashed line with circles). The shown coefficients from top left to right bottom plots are the point estimates of $Sub_{i,t-1}$, $Par_{i,t-1}$, $Sis\_Sub_{i,t-1}$, and $Sis\_Par_{i,t-1}$, respectively, from Table 8.

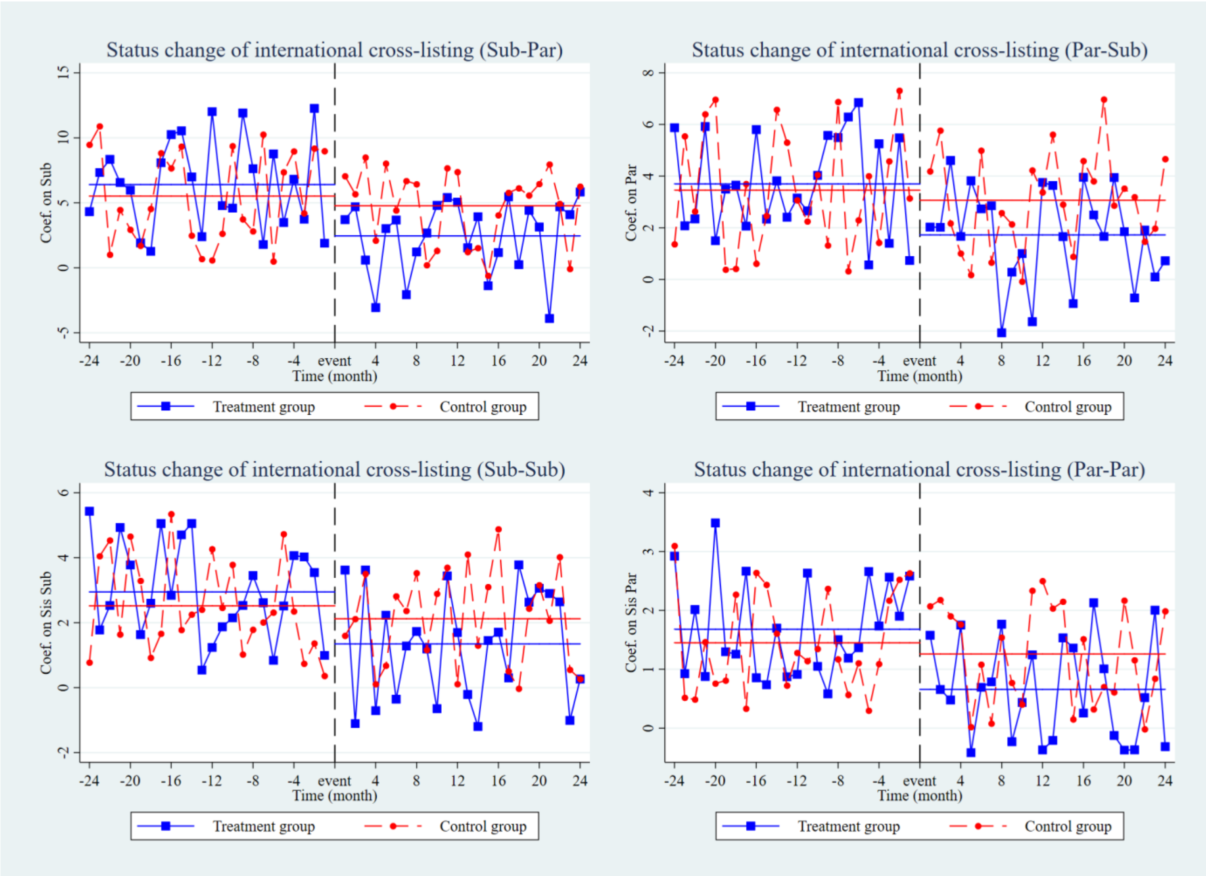

Figure 2: Predictive coefficients of OLF before and after cross-listing

This figure shows the predictive OLF coefficients to cross-listed and non-cross-listed focal firms before and after cross-listing based on Table 9 estimations as well as their mean values before and after the event. The sample includes firms from 23 developed markets from January 2006 to December 2018. All financial firms and stocks with prices less than \$5 at the portfolio formation date are excluded. We define as a listing firm a focal firm that is headquartered in its domestic market and cross-lists its shares in some foreign markets. The cross-listing data are from the Sarkissian and Schill public database, worldwide stock exchanges, and the CRSP database for foreign listings in the United States. This firms form our "Treatment" group for each ownership link (blue solid line with squares). For each cross-listed focal firm, we select one non-cross-listed focal firm in the control group prior to the listing placement. This is a four-step procedure. First, we choose non-cross-listed focal firms, which have OLF within two years prior to the listing event. Second, we select ten most similar non-cross-listed focal firms with the cross-listed focal firm within two years prior to cross-listing based on the average ranking of four firm characteristics: size, book-to-market ratio, asset growth, and gross profitability. Third, we again run the Fama-MacBeth regressions and compare the OLF predictive coefficients for the control firm group with those of the "Treatment" group within two years prior to the cross-listing event. At last, we select most similar OLF predictive coefficient's firms as matched non-cross-listed focal firms. This procedure gives us the "Control group" for each ownership link (red dashed line with circles). The shown coefficients from top left to right bottom plots are the point estimates of $Sub_{i,t-1}$, $Par_{i,t-1}$, $Sis\_Sub_{i,t-1}$, and $Sis\_Par_{i,t-1}$, respectively, from Table 9.

Return Predictability in Firms with Complex Ownership Network

(Internet Appendix)

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Table A.1 shows the univariate test results based on risk-adjusted returns as in Table 2 with the Burt and Hrdlicka (2020) adjustment. To construct this table, we use portfolio returns computed from idiosyncratic returns of ownership-linked firms (OLFs) rather than their raw returns to sort focal firms into quintile portfolios at time t. In Panel A, we use the abnormal returns from the Fama and French (2015) five-factor model, α_FF5, while in Panel B – from the Fama and French (2015) six-factor model, α_FF6. We observe that the magnitudes of both types of alphas across both panels are slightly smaller than the corresponding values reported in Table 2. However, all Q5-Q1 spread portfolio returns are significant at 5% or 1% levels. These results reveal that the information derived from the raw returns of firms with OLFs is mostly orthogonal to the firms' common exposure to asset pricing factor returns.

Table A.2 is similar to Table 6 and reports panel regression results of the predictive power of OLFs for focal firms' third fundamental performance measure – growth in return on assets (ROA). We regress the market-adjusted annual ROA growth of focal firms on both the contemporaneous and lagged one year average ROA growth of their OLF across four possible categories, $Sub\_\Delta ROA_t$, $Par\_\Delta ROA_t$, $Sis\_Sub\_\Delta ROA_t$, and $Sis\_Par\_\Delta ROA_t$. The control variables are the same as in Table 3 and include the focal firm's size, book-to-market ratio, own lagged monthly return, momentum, asset growth, gross profitability, stock turnover, and industry momentum. All regressions include country, industry, and year fixed effects. The standard errors are clustered by year. We observe that, similar to Table 6, all slope coefficients, both contemporaneous and predictive, are significant at 1% or 5% levels. Therefore, our results imply that OLF are related to each other through ROA as well.

Tables A.3 and A.4 show that OLF returns can forecast revenue and sales surprises of the focal firm, respectively. The setting of these tables is similar to that of Table 7. Panel A reports the overall results for one-quarter predictability for four OLF investment strategies. The dependent variable in Table A.3 is $SUR_{i,t}$ – the unexpected revenue of focal firm i at time t, while that in Table A.4 is $SUS_{i,t}$ – the unexpected sales of focal firm i at time t. The independent variable of interest is the one-quarter lagged return of OLFs, computed from the preceding three months. Besides standard firm controls form Table 3 and country and industry fixed effects, we also include the focal firm's own corresponding lagged standardized unexpected measure (up to four quarters). All independent variables are distributed to deciles ranging from zero to one. The dependent variable is winsorized in the cross-section at 1% and 99%. We find that the returns of OLFs predict focal firms' future unexpected revenue and sales.

In Panels B through E of Table A.3 (Table A.4), we test the unexpected revenue (sales) predictability over longer periods – up to four quarters ahead. The dependent variable in these panels is $SUR_{i,t+k}$ or $SUS_{i,t+k}$ of the focal firm, where k = 0, 1, 2, 3. We find that all coefficients of lagged returns of OLF, for all four possible cross-firm ownership links in all panels, are positive, but their economic and statistical significance, as in Table 7-B, decreases from Quarter 1 to Quarter 4, that is, the forecasting power decays over time.

Tables A.5 and A.6 show the results of OLF return predictability tests in emerging markets using univariate portfolio sorts and Fama-MacBeth regressions, respectively. The estimations are conducted using the Fama and French five-factor and six-factor alphas. Emerging markets includes 26 markets from the K. French's data library, namely: Argentina, Brazil, Chile, China, Colombia, Czech Republic, Egypt, Greece, Hungary, India, Indonesia, Malaysia, Mexico, Pakistan, Peru, Philippines, Poland, Qatar, Russia, Saudi Arabia, South Africa, South Korea, Taiwan, Thailand, Turkey, and United Arab Emirates. As can be seen in Table A.6, OLFs generate significant Q5–Q1 alpha spread in emerging markets. Note that these abnormal returns are larger in magnitude than the corresponding spreads in developed markets in Table 2. This is expected given the lower efficiency of emerging markets. These results reveal that the OLF return predictability is a common phenomenon in global markets.

A reader might suggest that firm's ownership links could pick up the alliances between suppliers and customers. Therefore, the observed return predictability in OLFs may simply reflect of the predictability phenomenon observed in Cohen and Frazzini (2008) between supplier and customer firms. Due to the scarcity of international data on customer-supplier relations, we address this concern by repeating our estimations on a sample of financial firms from 23 developed markets. These firms differ from those in all other industries by the lack of explicit economic linkages. Tables A.7 and A.8 show the results of OLF return predictability tests among financial firms using univariate portfolio sorts and Fama-MacBeth regressions, respectively. The estimations are again shown for the Fama and French five-factor and six-factor alphas. Our results in economic and statistical terms are very similar to those in Tables 2 and 3. Therefore, we can conclude that explicit economic links among firms with ownership links do not impact the OLF return predictability evidence.

References:

Burt, A., and Hrdlicka, C. M. (2020). Where does the predictability from sorting on returns of economically linked come from? *Journal of Financial and Quantitative Analysis*, forthcoming.

Cohen, L., and Frazzini, A. (2008). Economic links and predictable returns. *Journal of Finance*, 63.4: 1977-2011.

Fama, E. F. and French, K. R. (2015). A five-factor asset pricing model, *Journal of Financial Economics*, 116, 1–22.

Fama, E. F., and French, K. R. (2018). Choosing factors. *Journal of Financial Economics*, 128(2), 234-252.

Table A.1: Univariate portfolio sorts after correcting bias

This table shows the calendar-time portfolio returns using the Burt and Hrdlicka (2020) adjustment for value- and equal-weighted univariate portfolio sorts for four types of return predictabilities in ownership-linked firms (OLFs): parent-subsidiary, subsidiary-parent, subsidiary-subsidiary, and parent-parent. The sample includes firms from 23 developed markets from January 2006 to December 2018. All financial firms and stocks with prices less than $5 at the portfolio formation date are excluded. To construct this table, we use portfolio returns computed using OLF idiosyncratic returns rather than their raw returns to sort focal firms into quintile portfolios. Panel A reports abnormal returns for the lowest (Q1) and highest (Q5) quintile portfolios as well as the Q5-Q1 difference portfolio using the Fama and French (2015) five-factor model. Panel B reports abnormal returns for lowest and highest quintile portfolios as well as the Q5-Q1 difference portfolio using the Fama and French (2018) six-factor model. The risk-adjusted abnormal returns (alphas) are computed based on the developed market factors from the K. French data library. The *t*-statistics are in parentheses and the standard errors are Newey-West adjusted with six lags. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Fama and French (2015) five-factor alphas

	(1)	(2)	(3)	(4)
VW	Sub-Par	Par-Sub	Sub-Sub	Par-Par
Q1 (Low)	-0.64**	-0.43*	-0.36*	-0.48*
Q5 (High)	0.23	0.29	0.22	0.33*
Q5 – Q1	0.87***	0.72**	0.58**	0.81***
	(2.81)	(2.47)	(2.20)	(2.82)
EW				
Q1 (Low)	-0.68**	-0.60**	-0.51**	-0.56**
Q5 (High)	0.25	0.40*	0.32*	0.39*
Q5 – Q1	0.94***	1.00***	0.84***	0.95***
	(3.04)	(3.45)	(3.13)	(3.28)

Panel B: Fama and French (2018) six-factor alphas

	(1)	(2)	(3)	(4)
VW	Sub-Par	Par-Sub	Sub-Sub	Par-Par
Q1 (Low)	-0.62**	-0.40*	-0.38*	-0.43*
Q5 (High)	0.24	0.24	0.25	0.32*
Q5 – Q1	0.86***	0.64**	0.64**	0.75***
	(2.81)	(2.17)	(2.34)	(2.65)
EW				
Q1 (Low)	-0.68**	-0.56**	-0.54**	-0.50**
Q5 (High)	0.27	0.33*	0.36*	0.36*
Q5 – Q1	0.95***	0.89***	0.90***	0.86***
	(3.09)	(2.96)	(3.29)	(3.02)

Table A.2: Forecasting ROA growth

This table shows panel regression results of the predictive power of ownership-linked firms (OLFs) for focal firms' ROA growth (ΔROA). The sample includes firms from 23 developed markets from January 2006 to December 2018. All financial firms and stocks with prices less than $5 at the portfolio formation date are excluded. Variables $Sub\_\Delta ROA_t$, $Par\_\Delta ROA_t$, $Sis\_Sub\_\Delta ROA_t$, and $Sis\_Par\_\Delta ROA_t$ are the average ROA growth for four types of OLFs. All variables are calculated at the end of each calendar year and winsorized at 1% and 99% levels. Independent variables are cross-sectionally standardized to have zero mean and unit variance. Control variables are from Table 3 and are defined in the Appendix. All regressions include country (C), industry (I), and year (Y) fixed effects, but their estimates are not shown. The standard errors are clustered by year. The *t*-statistics are in parentheses. ** and *** denote statistical significance at the 5% and 1% levels, respectively.

	Parent		Subsidiary		Subsidiary		Parent	
DV: ΔROA	*t*	*t* + 1	*t*	*t* + 1	*t*	*t* + 1	*t*	*t* + 1
$Sub\_\Delta ROA_t$	0.553*** (7.99)	0.140*** (4.74)						
$Par\_\Delta ROA_t$			0.210*** (6.74)	0.052*** (3.48)				
$Sis\_Sub\_\Delta ROA_t$					0.126*** (4.89)	0.030*** (2.96)		
$Sis\_Par\_\Delta ROA_t$							0.012*** (4.08)	0.005** (2.50)
ΔROA_t		0.281*** (4.92)		0.121*** (4.13)		0.070*** (3.42)		0.010*** (2.76)
Controls, C, I & Y FEs	Y	Y	Y	Y	Y	Y	Y	Y
Obs.	16,731	15,444	28,704	26,496	17,739	16,374	6,391	5,899
R^2	0.16	0.14	0.15	0.13	0.13	0.11	0.12	0.10

Table A.3: Forecasting revenue surprises

This table shows the results of Fama-MacBeth regressions of the predictability of ownership-linked firms (OLFs) for standardized unexpected revenues (SURs). The SURs are calculated as the yearly change in quarterly revenues scaled by the standard deviation of unexpected revenues over the eight past quarters. The explanatory variables include the preceding three months portfolio returns of OLFs ($Sub_{i,t-1}$, $Par_{i,t-1}$, $Sis\_Sub_{i,t-1}$, or $Sis\_Par_{i,t-1}$). All the independent variables are distributed to deciles and scaled from 0 to 1. The dependent variable is winsorized at 1% and 99% levels in the cross-section. The control variables include those from Table 3 as well as one- to four-quarter lags of the firm's own SURs. All regressions include country and industry fixed effects, but their estimates are not shown. Panel A reports regression results for the next quarter's SURs for four types of ownership links. Panels B-E report regression results of future SURs for the next four fiscal quarters for each of the four types of ownership links. The *t*-statistics are in parentheses and the standard errors are Newey-West adjusted with four lags. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: One-quarter ahead forecast

	(1)	(2)	(3)	(4)
DV: $SUR_{i,t}$ *100	Sub-Par	Par-Sub	Sub-Sub	Par-Par
$Sub_{i,t-1}$	1.48***			
	(2.78)			
$Par_{i,t-1}$		1.33***		
		(5.59)		
$Sis\_Sub_{i,t-1}$			0.96***	
			(3.22)	
$Sis\_Par_{i,t-1}$				1.35***
				(3.69)
Controls, Country & Industry FEs	Y	Y	Y	Y
Obs.	35,650	61,162	37,798	13,618
R^2	0.41	0.55	0.33	0.41

Table A.3 (continued)

Panel B: Subsidiary - Parent

DV: $SUR_{i,t}$	Quarter 1	Quarter 2	Quarter 3	Quarter 4
$Sub_{i,t-1}$	1.48*** (2.78)	1.15** (2.35)	0.85 (1.46)	0.53 (0.91)
Controls, Country & Industry FEs	Y	Y	Y	Y
Obs.	35,650	34,690	33,734	32,821
R^2	0.41	0.40	0.38	0.35

Panel C: Parent - Subsidiary

DV: $SUR_{i,t}$	Quarter 1	Quarter 2	Quarter 3	Quarter 4
$Par_{i,t-1}$	1.33*** (5.59)	1.05*** (4.44)	0.64** (2.43)	0.31 (1.48)
Controls, Country & Industry FEs	Y	Y	Y	Y
Obs.	37,798	36,780	35,767	34,798
R^2	0.33	0.31	0.30	0.28

Panel D: Subsidiary - Subsidiary

DV: $SUR_{i,t}$	Quarter 1	Quarter 2	Quarter 3	Quarter 4
$Sis\_Sub_{i,t-1}$	0.96*** (3.22)	0.66** (2.01)	0.37 (1.18)	0.16 (0.47)
Controls, Country & Industry FEs	Y	Y	Y	Y
Obs.	37,798	36,780	35,767	34,798
R^2	0.33	0.31	0.30	0.28

Panel E: Parent - Parent

DV: $SUR_{i,t}$	Quarter 1	Quarter 2	Quarter 3	Quarter 4
$Sis\_Par_{i,t-1}$	1.35*** (3.69)	0.82** (2.45)	0.43 (1.32)	0.19 (0.58)
Controls, Country & Industry FEs	Y	Y	Y	Y
Obs.	13,618	13,252	12,887	12,537
R^2	0.41	0.39	0.39	0.35

Table A.4: Forecasting sales surprises

This table shows the results of Fama-MacBeth regressions of the predictability of ownership-linked firms (OLFs) for standardized unexpected sales (SUSs). The SUSs are calculated as the yearly change in quarterly sales scaled by the standard deviation of unexpected sales over the eight past quarters. The explanatory variables include the preceding three months portfolio returns of OLFs ($Sub_{i,t-1}$, $Par_{i,t-1}$, $Sis\_Sub_{i,t-1}$, or $Sis\_Par_{i,t-1}$). All the independent variables are distributed to deciles and scaled from 0 to 1. The dependent variable is winsorized at 1% and 99% levels in the cross-section. The control variables include those from Table 3 as well as one- to four-quarter lags of the firm's own SUSs. All regressions include country and industry fixed effects, but their estimates are not shown. Panel A reports regression results for the next quarter's SUSs for four types of ownership links. Panels B-E report regression results of future SUSs for the next four fiscal quarters for each of the four types of ownership links. The *t*-statistics are in parentheses and the standard errors are Newey-West adjusted with four lags. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: One-quarter ahead forecast

	(1)	(2)	(3)	(4)
DV: $SUS_{i,t}$ *100	Sub-Par	Par-Sub	Sub-Sub	Par-Par
$Sub_{i,t-1}$	1.15**			
	(2.37)			
$Par_{i,t-1}$		1.18***		
		(5.25)		
$Sis\_Sub_{i,t-1}$			0.66**	
			(2.10)	
$Sis\_Par_{i,t-1}$				1.01***
				(3.36)
Controls, Country & Industry FEs	Y	Y	Y	Y
Obs.	35,650	61,162	37,798	13,618
R^2	0.52	0.47	0.33	0.46

Table A.4 (continued)

Panel B: Subsidiary - Parent

DV: $SUS_{i,t}$	Quarter 1	Quarter 2	Quarter 3	Quarter 4
$Sub_{i,t-1}$	1.15**	0.91**	0.66	0.42
	(2.37)	(1.99)	(1.29)	(0.82)
Controls, Country & Industry FEs	Y	Y	Y	Y
Obs.	35,650	34,690	33,734	32,821
R^2	0.52	0.50	0.46	0.42

Panel C: Parent - Subsidiary

DV: $SUS_{i,t}$	Quarter 1	Quarter 2	Quarter 3	Quarter 4
$Par_{i,t-1}$	1.18***	0.87***	0.49**	0.29
	(5.25)	(4.09)	(2.17)	(1.49)
Controls, Country & Industry FEs	Y	Y	Y	Y
Obs.	61,162	59,514	57,876	56,308
R^2	0.47	0.42	0.41	0.39

Panel D: Subsidiary - Subsidiary

DV: $SUS_{i,t}$	Quarter 1	Quarter 2	Quarter 3	Quarter 4
$Sis\_Sub_{i,t-1}$	0.66**	0.44	0.20	0.12
	(2.10)	(1.37)	(0.82)	(0.27)
Controls, Country & Industry FEs	Y	Y	Y	Y
Obs.	37,798	36,780	35,767	34,798
R^2	0.33	0.31	0.29	0.27

Panel E: Parent - Parent

DV: $SUS_{i,t}$	Quarter 1	Quarter 2	Quarter 3	Quarter 4
$Sis\_Par_{i,t-1}$	1.01***	0.63**	0.31	0.19
	(3.36)	(2.26)	(1.12)	(0.35)
Controls, Country & Industry FEs	Y	Y	Y	Y
Obs.	13,618	13,252	12,887	12,537
R^2	0.46	0.43	0.41	0.37

Table A.5: Univariate portfolio sorts in emerging markets

This table shows the emerging market results of value- and equal-weighted univariate portfolio sorts for four types of return predictabilities in ownership-linked firms (OLFs): parent-subsidiary, subsidiary-parent, subsidiary-subsidiary, and parent-parent. There are 26 emerging markets in K. French' data library: Argentina, Brazil, Chile, China, Colombia, Czech Republic, Egypt, Greece, Hungary, India, Indonesia, Malaysia, Mexico, Pakistan, Peru, Philippines, Poland, Qatar, Russia, Saudi Arabia, South Africa, South Korea, Taiwan, Thailand, Turkey, United Arab Emirates. The sample period is from January 2006 to December 2018. All financial firms and stocks with prices less than $5 at the portfolio formation date are excluded. Panel A reports abnormal returns for the lowest (Q1) and highest (Q5) quintile portfolios as well as the Q5-Q1 difference portfolio using the Fama and French (2015) five-factor model. Panel B reports abnormal returns for lowest and highest quintile portfolios as well as the Q5-Q1 difference portfolio using the Fama and French (2018) six-factor model. The risk-adjusted abnormal returns (alphas) are computed based on the developed market factors from the K. French data library. The *t*-statistics are in parentheses and the standard errors are Newey-West adjusted with six lags. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Fama and French (2015) five-factor alphas

	(1)	(2)	(3)	(4)
VW	Sub-Par	Par-Sub	Sub-Sub	Par-Par
Q1 (Low)	-0.98**	-0.54**	-0.53**	-0.71**
Q5 (High)	0.37*	0.45*	0.34*	0.43*
Q5 – Q1	1.35***	0.99***	0.86***	1.14***
	(4.44)	(3.52)	(3.23)	(3.91)
EW				
Q1 (Low)	-1.12***	-0.96**	-0.92**	-0.77**
Q5 (High)	0.37*	0.61**	0.56**	0.58**
Q5 – Q1	1.49***	1.57***	1.49***	1.34***
	(4.71)	(5.43)	(5.52)	(4.71)

Panel B: Fama and French (2018) six-factor alphas

	(1)	(2)	(3)	(4)
VW	Sub-Par	Par-Sub	Sub-Sub	Par-Par
Q1 (Low)	-1.02***	-0.72**	-0.61**	-0.65**
Q5 (High)	0.39*	0.36*	0.38*	0.42*
Q5 – Q1	1.41***	1.08***	0.99***	1.08***
	(4.55)	(3.47)	(3.65)	(3.76)
EW				
Q1 (Low)	-1.24***	-0.79**	-0.97**	-0.74**
Q5 (High)	0.43*	0.54**	0.52**	0.46*
Q5 – Q1	1.68***	1.33***	1.49***	1.20***
	(5.34)	(4.56)	(5.33)	(4.13)

Table A.6: Multivariate regressions in emerging markets

This table shows the estimation results from cross-sectional Fama and MacBeth (1973) regressions for four trading strategies of ownership-linked firms (OLFs) in emerging markets. There are 26 emerging markets in K. French' data library: Argentina, Brazil, Chile, China, Colombia, Czech Republic, Egypt, Greece, Hungary, India, Indonesia, Malaysia, Mexico, Pakistan, Peru, Philippines, Poland, Qatar, Russia, Saudi Arabia, South Africa, South Korea, Taiwan, Thailand, Turkey, United Arab Emirates. The sample period is from January 2006 to December 2018. All financial firms and stocks with prices less than $5 at the portfolio formation date are excluded. The dependent variable in Panel A is the risk-adjusted return from the Fama and French (2015) five-factor model, α_FF5; in Panel B – the risk-adjusted return from the Fama and French (2018) six-factor model, α_FF6. The explanatory variables include the lagged one-month portfolio returns of OLFs ($Sub_{i,t-1}$, $Par_{i,t-1}$, $Sis\_Sub_{i,t-1}$, or $Sis\_Par_{i,t-1}$) as well as all other controls from Table 3, i.e., firm size, book-to-market ratio, focal firm's own lagged monthly return, medium-term price momentum, asset growth, gross profitability, stock turnover, and industry momentum. All variables are defined in the Appendix, are based on last non-missing available observation for each month t and are winsorized at 1% and 99% levels. All regressions include country and industry fixed effects, but their estimates are not shown. The absolute t-statistics are in parentheses and the standard errors are Newey-West adjusted with six lags. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Fama and French (2015) five-factor alpha

	(1)	(2)	(3)	(4)
DV: $\alpha\_FF5_{i,t}$*100	Parent	Subsidiary	Subsidiary	Parent
$Sub_{i,t-1}$	6.52*** (3.45)			
$Par_{i,t-1}$		4.22*** (4.13)		
$Sis\_Sub_{i,t-1}$			3.10*** (3.98)	
$Sis\_Par_{i,t-1}$				2.04*** (4.08)
Controls, Country & Industry FEs	Y	Y	Y	Y
Obs.	43,458	72,910	47,600	18,160
R^2	0.15	0.14	0.12	0.09

Panel B: Fama and French (2018) six-factor alpha

	(1)	(2)	(3)	(4)
DV: $\alpha\_FF6_{i,t}$*100	Parent	Subsidiary	Subsidiary	Parent
$Sub_{i,t-1}$	5.47*** (3.14)			
$Par_{i,t-1}$		4.50*** (4.84)		
$Sis\_Sub_{i,t-1}$			2.95*** (2.77)	
$Sis\_Par_{i,t-1}$				2.09*** (4.33)
Controls, Country & Industry FEs	Y	Y	Y	Y
Obs.	43,458	72,910	47,600	18,160
R^2	0.14	0.13	0.11	0.08

Table A.7: Univariate portfolio sorts for financial sector firms

This table shows the financial sector results of value- and equal-weighted univariate portfolio sorts for four types of return predictabilities in ownership-linked firms (OLFs): parent-subsidiary, subsidiary-parent, subsidiary-subsidiary, and parent-parent. There are 23 developed markets from January 2006 to December 2018. Stocks with prices less than $5 at the portfolio formation date are excluded. Panel A reports abnormal returns for the lowest (Q1) and highest (Q5) quintile portfolios as well as the Q5-Q1 difference portfolio using the Fama and French (2015) five-factor model. Panel B reports abnormal returns for lowest and highest quintile portfolios as well as the Q5-Q1 difference portfolio using the Fama and French (2018) six-factor model. The risk-adjusted abnormal returns (alphas) are computed based on the developed market factors from the K. French data library. The *t*-statistics are in parentheses and the standard errors are Newey-West adjusted with six lags. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Fama and French (2015) five-factor alphas

	(1)	(2)	(3)	(4)
VW	Sub-Par	Par-Sub	Sub-Sub	Par-Par
Q1 (Low)	-0.61**	-0.37*	-0.32*	-0.39*
Q5 (High)	0.21	0.25	0.20	0.26
Q5 – Q1	0.82***	0.61**	0.52**	0.65**
	(2.91)	(2.18)	(2.07)	(2.41)
EW				
Q1 (Low)	-0.64**	-0.52**	-0.44*	-0.43*
Q5 (High)	0.24	0.34*	0.28*	0.31*
Q5 – Q1	0.88***	0.85***	0.72***	0.74***
	(3.04)	(3.15)	(2.99)	(2.89)

Panel B: Fama and French (2018) six-factor alphas

	(1)	(2)	(3)	(4)
VW	Sub-Par	Par-Sub	Sub-Sub	Par-Par
Q1 (Low)	-0.59**	-0.34*	-0.32*	-0.34*
Q5 (High)	0.24	0.21	0.21	0.24
Q5 – Q1	0.83***	0.55*	0.53**	0.58**
	(2.84)	(1.96)	(2.19)	(2.21)
EW				
Q1 (Low)	-0.68**	-0.46*	-0.48*	-0.38*
Q5 (High)	0.25	0.28*	0.31*	0.28*
Q5 – Q1	0.93***	0.73***	0.80***	0.66**
	(3.10)	(2.63)	(3.04)	(2.54)

Table A.8: Multivariate regressions for financial sector firms

This table shows the estimation results from cross-sectional Fama and MacBeth (1973) regressions for four trading strategies of ownership-linked firms (OLFs) in the financial sector. There are 23 developed markets from January 2006 to December 2018. Stocks with prices less than $5 at the portfolio formation date are excluded. The dependent variable in Panel A is the risk-adjusted return from the Fama and French (2015) five-factor model, α_FF5; in Panel B – the risk-adjusted return from the Fama and French (2018) six-factor model, α_FF6. The explanatory variables include the lagged one-month portfolio returns of OLFs ($Sub_{i,t-1}$, $Par_{i,t-1}$, $Sis\_Sub_{i,t-1}$, or $Sis\_Par_{i,t-1}$) as well as all other controls from Table 3, i.e., firm size, book-to-market ratio, focal firm's own lagged monthly return, medium-term price momentum, asset growth, gross profitability, stock turnover, and industry momentum. All variables are defined in the Appendix, are based on last non-missing available observation for each month t, and are winsorized at 1% and 99% levels. All regressions include country and industry fixed effects, but their estimates are not shown. The absolute *t*-statistics are in parentheses and the standard errors are Newey-West adjusted with six lags. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Fama and French (2015) five-factor alpha

	(1)	(2)	(3)	(4)
DV: $\alpha\_FF5_{i,t}$*100	Parent	Subsidiary	Subsidiary	Parent
$Sub_{i,t-1}$	2.71* (1.91)			
$Par_{i,t-1}$		1.54** (2.20)		
$Sis\_Sub_{i,t-1}$			1.15* (1.72)	
$Sis\_Par_{i,t-1}$				0.71** (2.21)
Controls, Country & Industry FEs	Y	Y	Y	Y
Obs.	26,421	46,722	23,488	8,120
R^2	0.06	0.06	0.05	0.04

Panel B: Fama and French (2018) six-factor alpha

	(1)	(2)	(3)	(4)
DV: $\alpha\_FF6_{i,t}$*100	Parent	Subsidiary	Subsidiary	Parent
$Sub_{i,t-1}$	2.41* (1.70)			
$Par_{i,t-1}$		1.72** (2.36)		
$Sis\_Sub_{i,t-1}$			1.11 (1.59)	
$Sis\_Par_{i,t-1}$				0.80** (2.37)
Controls, Country & Industry FEs	Y	Y	Y	Y
Obs.	26,421	46,722	23,488	8,120
R^2	0.05	0.07	0.05	0.04