Strategic Alliances, Shocks to Competition and Firm Performance

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Abstract

We document significant variation in alliance activity over time and find that shocks to competition rather than capital market conditions explain this variation. We then show that firms with low cash flow, high cash holdings and a high level of investments are likely to form strategic alliances in industries subject to competition shocks. Further, cash flow growth and investments improve following a strategic alliance. This improvement in performance, however, is concentrated in private firms. Our results suggest that strategic alliances are an important means of restructuring following shocks to product market competition especially for private firms.

1. Introduction

Strategic alliances are common vehicles for organizing between-firm collaborations to spur growth by sharing resources. There has been increasing interest in the financial literature in studying these collaborations and acknowledging their financial and strategic importance (e.g. Lerner et al. (2003); Robinson (2008); Bodnaruk et al. (2013)). Little is known, however, about how market competitions would affect the incentives of firms to form strategic alliances and whether it can explain the time-variation in intra-firm collaboration activity and its outcomes. This paper extends this literature across a few dimensions: 1) by studying country-level variation in the alliance activity and 2) by analyzing its firm-level outcomes.

It is well documented in the literature that major economic activities such as takeovers and leveraged buyouts vary widely over time and a number of competing explanations have been proposed and tested for these fluctuations (e.g., Harford (2005); Axelson et al. (2013); Haddad et al. (2017)). In this paper, using cross-country data, we first document significant variation in alliance activity over time. In a sample of 39 European countries over fifteen years 1999-2014, the number of corporate alliances reached 850 in 2006, peaked at 900 in 2013 and decreased to less than 175 in 2014. Then we take an initial step towards understanding these fluctuations. We consider capital market conditions and shocks to competition. Our sample period includes financial crises and cross-border import penetration in multiple countries, which provides rich data to study the impact of these factors on alliance formation.

Our country-level results show that shocks to competition rather than capital market conditions are likely to explain alliance activity, providing support for the view that outside competitive pressure may foster firm collaboration. We use China import penetration as an exogenous shock to competitive intensity and find a positive relation between the changes in China

imports and alliance intensity in a country. We do not find evidence that alliances are used as a substitute form of financing when capital market conditions are poor. And we find only limited support for the redistribution view: during hot IPO markets, firms are somewhat more likely to form strategic alliances, but this result does not hold in all specifications.

Next, we rely on firm-level data to provide insights into alliance formation in response to competition shocks and its outcomes. Rather than test hypotheses based on particular theories, our primary goal here is to deepen our understanding of strategic alliances by developing a rich set of facts describing the characteristics and performance of alliance firms. Our sample includes both public and private firms, thus allowing us to investigate an impact of alliance formation across different listing types. Notably, we find that private firms are important alliance participants; about 75% of corporate alliances in our sample involve private firms.

We find that larger firms with low cash flow and high cash holdings are more likely to form alliances. These findings suggest that alliance firms might be the most affected by the shocks and high cash holdings allow such firms to restructure via strategic alliance consistent with the precautionary motive for holding cash. Private alliance firms also exhibit a high level of investment. High investment levels of these firms might also be indicative of their attempts to restructure. Indeed, Bloom, Draca and Reenen (2016) provide evidence consistent with firm restructuring following China import penetration and our results suggest that strategic alliances may facilitate such restructuring efforts.

The next set of findings shows how performance of alliance firms changes following the alliance formation in response to competition shocks. One potential concern in the existing literature is that conflicts of interest between alliance partners and agency problems may hinder alliance success (see, e.g., Doz (1988), Doz and Hamel (1998), Gulati (1995), Hamel et al. (1989),

Kogut (1988), Pisano (1989, 1991) and Arping and Troege (2002)). Using fixed effects models with a set of control firms, we find evidence that cash flow growth and investments improve following a strategic alliance in industries subject to competitive pressures. The improvement in performance, however, is mainly concentrated in private firms. For private firms, strategic alliances might be more important as a means of restructuring than for public firms given private firms' limited access to external funds. While for public firms, agency problems may hinder alliance success.

We also analyze whether the degree of the competition shock is related to firm performance following alliance formation. Interestingly, we find that improvement in firm performance is concentrated in industries with low or moderate levels of China import penetration. In industries with high level of competition shocks, even strategic alliances do not seem to offer a valuable solution.

This paper contributes to the literature that studies variations in firm organizational structure over time. Harford (2005) shows that industry shocks drive clustering in takeover activity, but the impact depends on capital market conditions in explaining merger waves. Axelson et al. (2013) emphasize economy-wide credit conditions in explaining buyout activity, while Haddad et al. (2017) document, instead, that buyout activity responds to changes in the equity risk premium. We show that shocks to competition rather than capital market conditions are likely to explain alliance activity. Our findings underscore the importance of product market competition in explaining firms' organizational structure.

This paper is also related to the literature on the anticompetitive effects of strategic alliances. For example, Chen and Ross (2000) study the alliance as a tool for entry deterrence that reduces competition in an industry. In contrast, we consider performance of strategic alliance

partners following shocks to competition and suggest that the alliances might be used as a tool to restructure the business. To that end, our findings contribute to the literature that studies the relation between competition and productivity growth (e.g., Agion et al. (2005), Bloom et al. (2014)) and support the view that between-firm collaboration is one of the potential ways for firms facing intensive competition to facilitate growth.

This paper extends the literature that studies strategic alliances more broadly. Robinson (2008) and Palia et al. (2008) investigate why firms sometimes prefer alliances over internally organized projects; while Robinson and Stuart (2006) and Lerner and Merges (1998) study allocation of control rights in strategic alliances. Chan et al. (1997); Johnson and Houston (2000); and McConnell and Nantell (1985) study stock price reactions to strategic alliances and document a positive announcement return. Our findings suggest that the positive reaction, at least partially, might be explained by the ability of alliance partners to withstand competitive pressure. Our findings further show that agency problems may deter the alliance success in the long-run and therefore alliances are likely to be more beneficial to private firms than public firms.

The rest of the paper is organized as follows. The next section performs country-level analysis of alliance activity and discusses macro-level factors as a potential determinant of alliance activity. Section 3 focuses on firm-level analysis and describes characteristics and performance of firms around alliance. Section 4 concludes.

2. Country-level analysis of alliance activity

In this section, we first discuss how shock to product market completion and capital market conditions, such as IPO activity and lending growth, may influence alliance activity. We then present our cross-country data and main country-level variables. Next we describe country-level

variation in alliance activity and examine its relation with shocks to competition and capital market conditions.

A. Potential determinants of alliance activity

A1. Shock to Competition

Starting with Williamson (1968), the economic literature points to a potential link between alliance activity and competition (see, Arping and Troege (2002) for a summary). On one end, this literature suggests that shocks to competition may facilitate such collaboration between firms. Firms may form alliances in response to competitive pressure for at least two reasons. First, alliance partners may achieve cost efficiency through overcoming resource constraints (Powell, Koput, and Smith-Doerr (1996)). This cost reduction could make alliance partners more effective competitors in response to the competitive pressure. Second, alliances may allow for coordination of product market actions resulting in anti-competitive effects such as price collusion or entry deterrence (Chen and Ross (2000)). On the other end, this literature recognizes that fierce competition intensifies conflicts of interest and agency problems in alliances, which may deter alliance success and eventually hinder firm growth (Singh and Mitchell (1996, 2005)).

We use China import penetration as an exogenous shock to product market competition to investigate a potential link between alliance activity and competition.

A2. Equity market conditions

The link between clustering of equity market offerings in "hot issue" markets and alliance activity was first highlighted in the economic literature by Lerner et al. (2003). Theoreticians have long suggested that external financing is an important driver of organizational structure and managerial behavior. Lerner et al. (2003) apply this view and study the impact of access to external

equity market financing on strategic alliances between small biotechnology firms and larger corporations.

The authors propose that during periods when public financial markets are readily accessible, small firms (or firms with high information asymmetry or private firms) may be able to finance projects through either public equity issues or alliances. But during periods when equity issues are more difficult, such firms may have few alternatives to undertaking alliances. The partnering firms may have information that is not available to outside public investors and thus they participate in the strategic alliances for project development even at the times when equity issues are difficult. Thus, alliances within this framework could be viewed as a substitute for equity financing. Lerner et al. (2003) provide some evidence that in periods with little public equity issuances, biotechnology firms are more likely to fund projects through forming alliances rather than raising funds externally from financial markets.

We study the relation between intensity of IPO market and alliance activity in a broad setting using cross-industry and cross-country data.

A3. Credit market conditions

Credit market conditions may also affect alliance activity. The existing literature proposes two views on how credit market conditions may affect collaborations between two non-financial corporations: the substitution view and the redistribution view (see, for example, Love et al. (2007)). Both views were applied to trade credit but can be extended to alliances as well.

The substitution view suggests that when bank credit shrinks, firms take steps to mitigate the effects of this deficiency on project development and financing (Fishman and Love (2003)).

One possibility is to collaborate with other firms via a strategic alliance on project development. Thus, alliance activity should increase when credit market conditions are poor.

By contrast, the redistribution view suggests that alliance activity should decrease when credit market conditions are poor. The redistribution view implies that firms with better access to capital redistribute the credit they receive to more constrained firms via an alliance. However, for redistribution to take place, some firms first need to be able to raise external financing to pass on to other firms (Love et al. (2007)). In states of the economy when external sources of finance are scarce, there may be nothing left to redistribute through an alliance. Further, this view suggests that alliance activity may decrease not only when credit market conditions are poor but also when equity market conditions are poor.

Love et al. (2007) find supportive evidence for the redistribution view of firm collaboration while Petersen and Rajan (1997), Nilsen (2002) and Fishman and Love (2003) document findings consistent with the substitution view (using trade credit data).

We investigate a link between alliance activity and credit market conditions using data on lending growth.

B. Data, sample selection and variables

In this sub-section, we describe our data, discuss the sample selection procedure for the alliance firms, and present descriptive statistics for our base sample and variables.

B.1. Sample construction

We start with the Thompson SDC Platinum database to obtain information on corporate alliances. This database covers alliances across the world and includes, among other variables,

names of alliance partners, announcement date, country, industry as well as listing status of the alliance partners. We require non-missing information across these variables. The dataset covers both corporate alliances that are formed without establishing a new entity, i.e., contract-based strategic alliances, and corporate alliances involving establishing a new entity, i.e., joint ventures. We focus on alliances that involve two partners and exclude multiple-partner alliance deals, which are uncommon.

We use the Bureau Van Dijk (BvD) database that provides annual financial statements of public and private firms in European countries to obtain alliance partners' accounting data. The version of the BvD database we use allows us to collect data from 1999 until 2014. One of the primary advantages of using European data is that we can exploit the detailed firm-level information on private firms. Unlike the U.S., in most European countries, every company with limited liability, independent of its listing status, is required to file accounting and financial statements to an official public body. As corporate alliances often involve private firms, using European data allows us to explore transactions with not only public companies but also private companies. We are able to obtain accounting data for privately held firms before and after alliance formation. In our sample construction, we require non-missing data on total assets.

We merge SDS data and BvD data using firm names and country. We use both manual and electronic matching to obtain a broad set of accurate matches. The final sample comprises of 8,405 alliances.

B.2. Descriptive statistics and country-level variables

Table 1 presents the distribution of alliances by deal type, year and country. Panel A shows 29% of alliances involve only private companies, while 46% involve both private and public companies. Thus about 75% of alliances involve at least one private company, which highlights

the importance of using data on private firms while studying alliance activity. A significant percentage of alliances is cross-border (79.25%); about 50% of corporate alliances are joint venture, and 34% are hi-tech alliances.

Panel B shows the deal distribution by country. Alliance firms are from 39 European countries with the largest number of deals coming from the U.K., about 30%.

Panel C shows significant time variation in alliance activity in Europe. As shown in Figure 1, the number of alliances has peaked in 2007 with 875 deals, then appears to be declining significantly in 2009 during global financial crisis with only 342 deals and then has increased again in 2013. While time-variation in M&A activity has been studied extensively in the literature (see, e.g., Mitchell and Mulherin (1996) and Harford (2005)), time-variation in alliance activity has received less attention despite its economic significance.

To better understand time-variation in alliance activity, we consider a set of country-level variables focusing on access to finance and competition. We use two variables to capture financing conditions in an economy. The first variable, *Lending Growth*, is designed to measure the availability of private credit such as bank loans to companies in a country in each year. We use the Bankscope data, provided by Bureau van Dijk, to obtain the information on gross loan amount granted by each bank in a country in a year. We then calculate the weighted average growth of gross loans of a country in each year by taking an average of the growth of gross loans over a year, weighted by total assets of each bank located in the country. This measure is similar to the measure used by Becker and Ivashina (2016) to estimate aggregate loan supply conditions.

The second variable is *IPO Activity* related to the state of public equity financing in a country in a year. IPO activity is the log number of IPOs in a country and we use the SDS database to obtain the number of IPOs for our sample countries.

To capture exogenous impact on the level of competition in a country, we use China import penetration. This variable is a one-year change in Chinese imports in a country, which is in turn calculated using a mean percentage of Chinese imports across four-digit NACE codes in a country. The data are from the Comext dataset provide by Eurostat.[1]

Panel D of Table 1 presents correlations for our main country-level variables and GDP growth. *IPO Activity* is positively correlated with China imports, the coefficient is 0.2116; and it has a low correlation with *Lending Growth*, the coefficient is only -0.0641. *Lending Growth*, however, seems to have a relatively high correlation with GDP Growth, the coefficient is 0.2328.

C. Country-level empirical analysis

We start our analysis with examining country-level factors that may potentially explain variation in alliance activity. To check how much financial market conditions and market competition variables capture the variation in alliance activities, in Figure 2, we first report the bin-scatter plots of the number of alliances related to our main three macro variables. We construct ten bins based on each macro-level variable, including *China Import, IPO Activity*, and *Lending Growth*, and plot the average number of alliance activities using a country-year panel. Country fixed effects are absorbed. Thus, the plot would represent the within-country variation. We observe a stark positive relation of alliance activities with China import and IPO activities, but the lending growth does not seem to explain the time-series variation in alliance activities much.

Next we test the explanatory power of macroeconomic conditions in a regression setting. We first aggregate strategic alliance activity for each country by announcement year and create a

[1] We would like to thank Sandra Mortal for sharing these data with us.

country-year panel. Then, we run a series of Poisson regressions, where the dependent variable is the number of alliances that involves any firm in a country as one of the alliance partners in specific year, and examine which macro-level variables would explain the time-series variation in alliance activity.

Results are presented in Table 2. Panel A reports results using China import penetration. Specification 1 reports results of a parsimonious regression relating China import to the number of alliances in a country. The coefficient on China import is positive and statistically significant at the 10% level suggesting that the shock to the competition is associated with more alliances. Specification 2 reports results including country dummies, thus controlling for other time-invariant country-level variables that may explain alliance formation. The coefficient on China import remains positive and statistically significant. Finally, Specification 3 also includes country and year dummies to controlling for unobservable time-invariant country effects and time trends in alliance formation. The coefficient on China import is 25.9, and it is statistically significant at the 1% level. In terms of economic significance, this finding suggests that a country with an increase in China import by one standard deviation is predicted to have 2.82 more alliances.

Panel B reports the results using IPO activity. Across all three specifications, the coefficient on IPO activity is positive and statistically significant, although the significance level drops from 1% to 10% in the last specification. Findings in Specification 3 suggest that an increase in IPO activity by one standard deviation is associated with 11.58 more alliances. Generally, the findings in this panel, seems to indicate that public equity financing cycles matter for alliance activity. Periods characterized by high IPO activity are associated with more strategic alliances. This is different from the findings in Lerner et al. (2003) who document a negative relation between equity financing cycles and alliance activity. Specifically, they find that in periods characterized by little

public market activity, biotechnology firms appear to be at least modestly more likely to fund R&D through alliances rather than internal funds. The finding, however, is consistent with the redistribution view of alliance formation that firms are less likely to fund projects through alliances when access to external capital is more difficult.

Panel C reports results using lending growth. Specification 1 shows that the coefficient on *Lending Growth* is negative and statistically significant at the 10% level. However, in specifications 2 and 3 the coefficients on *Lending Growth* are statistically insignificant; indicating that the availability of credit has no impact on alliance activity. This contrasts with the view that strategic alliances are a substitute form of financing when bank credit is not readily available.

Finally, Panel D reports results using all three country-level variables. The coefficients on *Lending Growth* are statistically insignificant in all three specifications. In specification 2, the coefficients of both China import and IPO activity are statistically significant, suggesting that both equity market conditions and shock to competition may explain alliance activity. In specification 3, only the coefficient on China import is statistically significant, highlighting importance of shock to competition in explaining alliance activity. Our country-level analyses imply that firms may form alliances in an attempt to mitigate negative impact from an increase in product market competition.

3. Firm-level analysis

In this section, we take a close look at the relation between competition intensity and alliance activity by analyzing firms that form alliances in industries subject to competitive

pressures. To that end, we perform our main analysis focusing on the industries from our sample which experience China import penetration.

A. Control group

Our analysis of firms that form alliances in industries subject to competition shocks requires a benchmark sample of firms that do not form alliances. One of the important advantages of using a European sample is that we can identify a large sub-set of such firms, both public and private. We use the following procedure to construct the control sample of firms. This procedure ensures that the sample of firms that form alliances is not too small relative to controls to make the empirical analysis meaningful. For each alliance firm, we find control firms from the same country, with the same listing status and from the same industry with the difference in total assets less than 30% as of one year prior to the alliance announcement. Among all the matched firms, we choose up to five control firms that have the smallest difference in total assets. For most of the deals, we use the 3-digit U.S. SIC code as an industry specification, but for the alliance firms for which we are not able to find any matched firms, we use the 2-digit industry specification instead. This procedure selects a large sub-set of firms that are comparable to alliance firms in size and industry but allows comparison on other firm characteristics. Our sample includes 4,256 alliance firms and 23,980 controls.

Finally, we construct firm-year panel data for the target and control firms in our sample. We require each firm-year observation to have non-missing total assets. The final panel dataset has 343,063 firm-year observations.

B. Main variables

We use cash flow, normalized by total assets, to measure firm profitability. We use sales growth to proxy for growth opportunities and leverage to analyze capital structure decisions. We use cash, normalized by total assets, to investigate cash polices. As the Amadeus database does not have a capital expenditure variable, we calculate capital investment as a change in tangible fixed assets plus depreciation normalized by tangible fixed assets in previous year. All variables are winsorized at the 1% tail, but because of extreme outliers, sales growth and investment variables are winsorized at 5% for the upper tail. Appendix A1 describes the definition of all variables.

C. Empirical analysis and results

In this section, we conduct an empirical analysis of performance of alliance firms prior to and after the alliance to provide further insight into these important transactions.

C.1. Pre-alliance analysis: What type of firms form alliances in industries subject to competition shock?

We start our empirical analysis of alliance formation by examining characteristics of alliance firms prior to the transactions. To do so, we compare alliance firms to a set of control firms.

In Table 3, we use univariate analysis to compare the characteristics of alliance firms to those of control firms as of the most recent year prior to the transaction. Panel A reports results for the full sample, while Panel B reports results for private firms and Panel C reports results for public firms.

Alliance firms are notably larger with mean total assets of 7,124.8 million dollars versus 414.7 million dollars for control firms. This difference exists for both private and public firms.

Private alliance firms seem to have lower cash flow than the control firms but higher sales growth and capital investments. This is not the case for public firms. Public alliance firms seem to have higher cash flow than the control firms but lower sales growth and lower capital investments. These preliminary results seem to suggest that the response to the competition shock may differ across public and private firms.

C.1.1. Regression analysis

We employ a probit regression as a baseline model, where the dependent variable is an indicator variable for alliance firms. In particular, we use the following specification:

$$\textit{Probability(Alliance)} = f(\textit{log assets, profitability, cash, leverage, sales growth, investments, country \& year fixed effects}) \quad (1)$$

The sample includes the most recent available accounting data prior to the acquisition. In addition to the main explanatory variables, we include country and year dummies to control for unobservable country effects and time trends that may affect the alliance transactions. Standard errors are clustered at the firm level. The number of observations varies across specifications depending on the availability of independent variables included in the regression. We report marginal effects from the probit regressions.[2]

Table 4 presents results of the probit regressions. We continue to find that larger firms tend to form alliances. Alliance firms also have lower cash flow but higher cash holdings and this is the case for both public and private firms. Low cash flows of alliance firms compared to comparable firms indicate that they might be largely affected by the heightened competitive pressure and experienced declined profit margin, forced to find alternative way for growth. Our finding on the high cash holdings of alliance firms suggests that as firms face the competitive shock, liquidity

[2] While we report results of the probit regressions, the findings do not change if we use logit regressions instead.

conditions are necessary to be an attractive alliance partner. Ample cash holdings may help these firms to restructure via alliance, consistent with the precautionary motive for cash holdings.

We observe the notable differences remaining regarding characteristics of alliance firms between public and private firms. Private alliance firms have higher sales growth and investments than controls while public alliance firms do not differ from controls on these dimensions. High sales growth and investment levels of private alliance firms suggest that these firms are better positioned to restructure following the competition shocks. Indeed, Bloom, Draca and Van Reenen (2016) provide evidence consistent with firm restructuring following China import penetration and strategic alliances may facilitate such restructuring. For private firms, strategic alliances might be more important as a means of restructuring than for public firms given private firms' limited access to external funds.

For comparison purposes, Appendix A2 reports results using alliance firms from industries not subject to China import penetration. We use the same procedure as above in constructing the sample of control firms. There are some notable differences. Unlike the alliance firms subject to competition shock, we find that alliance firms do not differ from controls in terms of cash flow, sales growth or capital investments.

C.2. Post-alliance analysis

Empirical evidence documented in the previous section suggest that strategic alliances might be used as a means of restructuring following shocks to competition and they might be more important for private firms than public firms to deal with the competitive pressure. In this section, we take a look at firm performance following alliance formation to provide insights on the impact

of strategic alliance and their potential benefits. To that end, we compare performance of alliance firms and the control group following alliance formation. As discussed above, the Amadeus data allow us to analyze post-alliance performance of both public and private firms to investigate whether there is evidence on performance improvement.

Table 5 reports the summary statistics on firm characteristics of alliance and control firms two years before and after the alliance. Notably both alliance and control firms experience a decline in cash holdings, sales growth and capital investments around alliance formation, which is expected as indicative evidence of the significant pressure from China imports.

C.2.1. Panel regressions

Further, we analyze the effect of alliance firms' performance in a panel regression framework. We run a series of OLS regressions, where the dependent variables are cash flow, cash flow growth, cash holdings, leverage, sales growth, and capital investment, with the following specification:

Firm Performance = f (AFTER, AFTER×Alliance, log assets, firm & year fixed effects) (3)

To control for any firm-specific unobservable factors that would affect performance and investment, all regressions include firm and year fixed effects.[3] The coefficient on the AFTER variable, an indicator of observations after the alliance, represents whether firm performance significantly changes around alliance formation after controlling for unobservable time-invariant characteristics of the firms. The coefficient of AFTER*x*Alliance captures the difference in performance between alliance and non-alliance firms following alliance formation.

[3] Our results are also robust to including GDP or GDP growth as additional control variables.

Results of this analysis are reported in Table 6. Panel A reports results for the full sample, while Panel B and Panel C report results for the sub-samples of private and public firms, respectively. Our main variable of interest is the interaction term between *AFTER* and *Alliance*. The coefficients on the interaction term, AFTER×Alliance, are positive and statistically significant for leverage and capital investment in Panel A. The improvement in capital investment is economically significant. The results suggest that the investments of alliance firms are higher by about 0.024 following alliance formation than the investment of the control firm. Given that the average capital investments of control firms following alliances is 0.33, this effect on investment is equivalent to about a 7.3% increase.

Alliance firms also increase leverage. This result is consistent with Chen, King, and Wen (2015) who find that debtholders view alliances positively and thus alliance formation may allow firms to get access to additional debt financing.

Next, we turn to private firm alliances in Panel B. The notable difference from the full sample results is the significant increase in cash flow growth for the alliance firms, by about 19%. Thus, alliances seem to allow private firms to improve performance in industries subject to competition shocks. This is not the case for public firms, where there is not much improvement in firm performance following alliance formation, consistent with the literature that argues that potential conflicts of interest and agency problems may hinder alliance success. In fact, the increase in capital investment documented in Panel A is seemed to be mainly driven by private firm alliances.

Appendix A3 reports results for alliance firm in industries not subject to China import penetration. In contrast to the results in Table 6, there is not much improvement in the performance for such firms following alliances.

Overall, our analyses on the performance change after forming strategic alliance suggest that strategic alliance provides firms with a way of sharing resources with partners in response to fierce product market competition. Alliance helps them invest more and improve cash flows compared to other peers in the same industry that do not form strategic alliance. In particular, we find that improvement in performance through collaboration would be mainly found in private firms. Better performance of alliance private firms is consistent with the view that access to diversified, public financing would help firms tolerate uncertainty on profitability in the presence of product market competition (see, e.g., Chod and Lyandres (2011) and Chemmanur and He (2011)). Our finding highlights the benefit of strategic alliances to take risky projects through collaboration, in particular, when firms are limited in their resources.

C.2.2. Panel Regressions and Additional Cross-Sectional Analysis

In this sub-section, we first take a closer look at relative performance of alliance firms and the competition intensity. Specifically, we link firm performance following alliance formation to the degree of such shock. We consider two alternative cut-offs: we first compare alliance firms in the bottom quartile of the competition shock to remaining alliance firms; we then compare alliance firms in the top quartile of the competition shock to the remaining alliance firms.

Results of this analysis are presented in Table 7. Panel A of Table 7 presents results for all firms, while Panels B and C present results for private and public firms, respectively. Interestingly, the improvement in firm performance following alliances seems to be more pronounced in industries with low or modest degree of competition shocks, i.e. the ones below the top quartile. As a new finding, Panel B shows that private firms that formed alliances in industries with the low level of shock to competition, the bottom quartile, experience improvement in sales growth following alliance formation. The coefficient for *AFTER×Alliance* is 0.2391 and it is highly

statistically significant, at the 1% level. As a new finding for public firms, Panel C shows that firms that form alliances in industries with low or modest level of shock to competition experience increase in cash holding and capital investments. For example, the coefficient for *AFTER*×*Alliance* is 0.0551 in case of cash holding and it is 0.0532 in case of capital investments in industries with low level of competition.

These findings of cross-sectional analyses based on the magnitude of the competition shocks suggest that strategic alliance would provide a channel through which firms facing intense competition stay profitable and improve. However, when competitive shocks extremely hit the industry hard enough, collaboration with other firms would not generate much room to perform better than industry peers that do not form alliances. We also note a possibility that in industries experiencing the large magnitude of import shocks firms might either find an alternative way to stay profitable or exit the industry by being acquired or default.

In Table 8, we perform additional cross-sectional tests and consider different deal types to provide further insights into alliance performance. Notably, the improvement in performance that we document is not driven by joint ventures or hi-tech alliances. Although, cross-border alliances exhibit some important differences as is evident by the increase in capital investments.

4. Conclusions

In this paper, we analyze strategic alliance using cross-country European data from 1999 until 2014. Our sample period includes the financial crisis and China import penetration thus providing rich data to study the impact of market conditions and shocks to competition on alliance formation. Further, our dataset includes firm financial information not only for public firms but

also for private firms. Private firms are important participants in these transactions; thus including private firms allows us to perform a comprehensive study of the performance of strategic alliances.

We document a set of results that are new to the literature. First, we document significant variation in alliance activity over time and show that shocks to completion rather than capital market conditions are likely to explain this variation. This finding stands in contrast to the literature that studies fluctuations in firm organizational structure such as M&As and LBOs over time. This literature documents that capital market conditions are important determinants of M&As and LBOs. Our findings underscore the importance of product market completion in explaining firms' organizational structure. Although, we do find some evidence that during hot IPO markets, firms are somewhat more likely to form strategic alliances consistent with the redistribution view.

We next show that firms that form alliances in industries subject to China import penetration display low cash flow but high cash holdings. These findings suggest that alliance firms are affected the most by the competitive shocks. High cash holdings, however, may help these firms to restructure via alliance, consistent with the precautionary motive for cash holdings. Private alliance firms also have high sales growth and investments.

Further, we find that private firms experience an increase in cash flow growth and capital investments following alliance formation. This is not the case for public firms, where there is not much improvement in firm performance following alliance formation, consistent with the literature that argues that potential conflicts of interest and agency problems may hinder alliance success. Interestingly, alliance firms also increase leverage. This result is consistent with Chen, King, and Wen (2015) who find that debtholders view alliance positively and thus alliance formation may allow firms to get access to additional debt financing. Overall, our results seem to suggest that

firms form alliances in an attempt to mitigate the negative impact from an increase in product market competition.

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Figure 1. Number of Alliance Deals by Announcement Year

This figure depicts the number of alliances, reported in SDC database, that involve any partners located in 39 European countries during the period of 2000-2014.

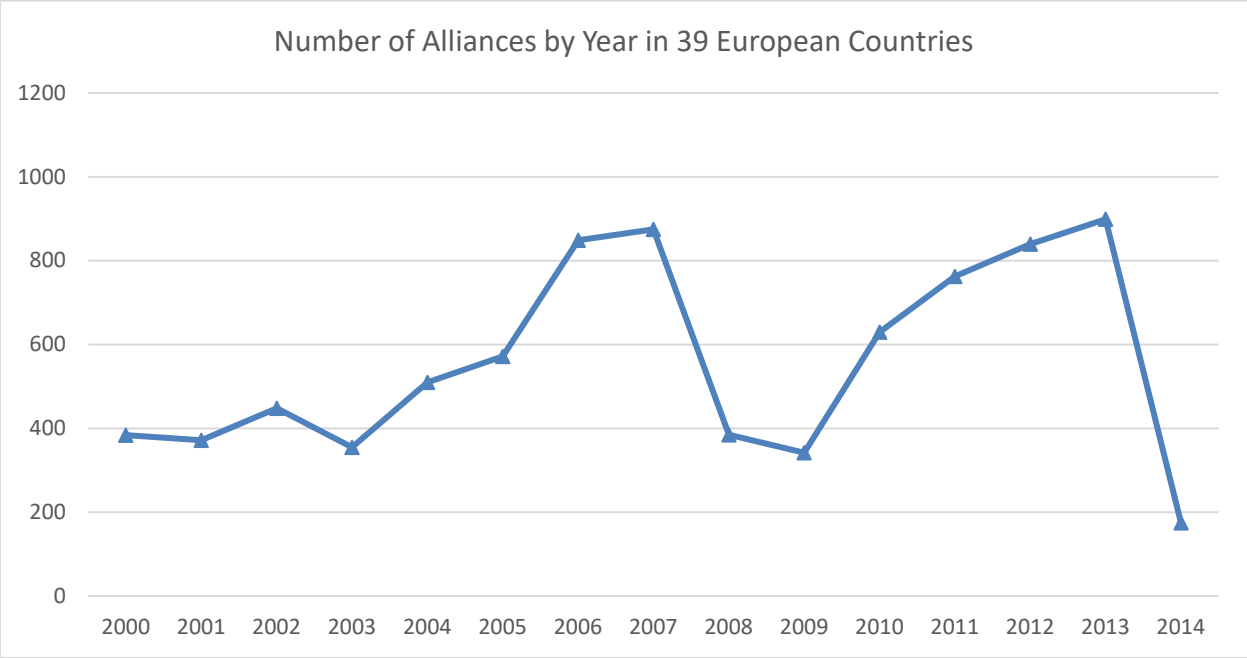
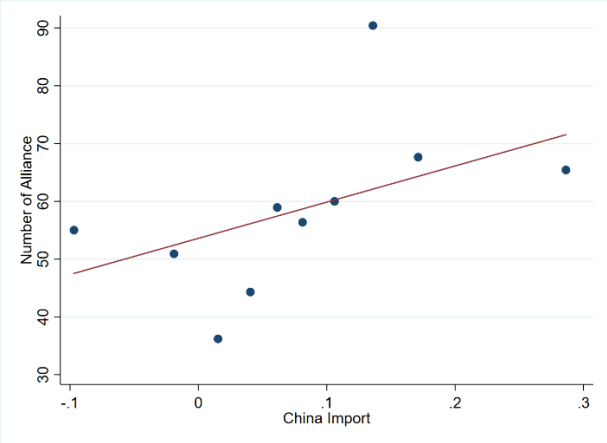


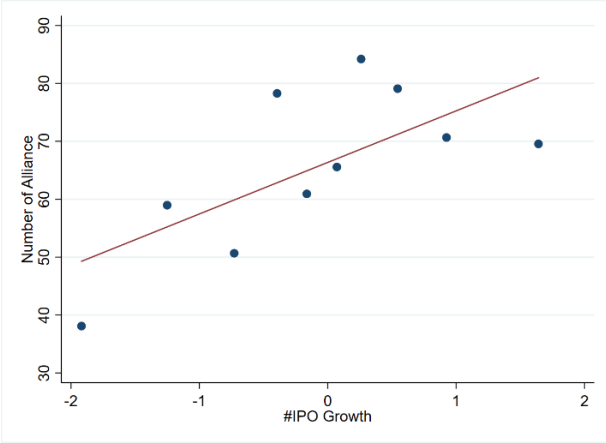
Figure 2. Shocks to Competition and Financing Condition and Alliance Activity

These figures report the bin-scatter plots of the number of alliance activity for year t (y axis) against the three macro-level variables (x axis): (a) the change in China import, (b) lending growth, and (c) the change in the number of IPOs in each country in year t-1. Country fixed effects are absorbed. The data include country-year observations during 1999-2014.

(a) China Import



(b) IPO Activity



(c) Lending Growth

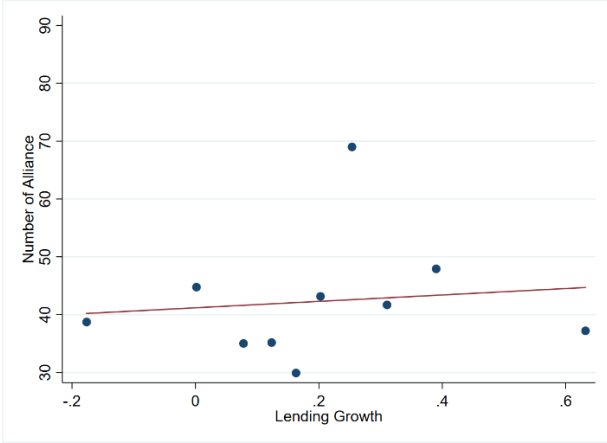


Table 1. Sample distribution

This table shows the distribution of the alliances in our sample by deal type in Panel A, by participants' country in Panel B, and by the announcement year in Panel C. The sample consists of corporate alliance deals in European countries in the 1999-2014 period that are matched to the BvD financial database. Variable descriptions are provided in Appendix A1.

Panel A. By deal type

Deal type	Mean	N
Private/Private Alliance	0.2907	8,405
Public/Private Alliance	0.4645	8,405
Public/Public Alliance	0.2449	8,405
Hi-Tech Alliance	0.3406	8,405
Join Venture	0.5020	8,405
Cross-Border Alliance	0.7925	8,405

Panel B. By participants country (Top 20)

Country	Number of Deals	Percent
UNITED KINGDOM	2,547	30.3
GERMANY	1,014	12.06
FRANCE	999	11.89
ITALY	555	6.6
SWEDEN	409	4.87
NETHERLANDS	367	4.37
RUSSIAN FEDERATION	325	3.87
SWITZERLAND	279	3.32
SPAIN	273	3.25
FINLAND	265	3.15
NORWAY	240	2.86
BELGIUM	212	2.52
DENMARK	205	2.44
IRELAND	130	1.55
AUSTRIA	93	1.11
GREECE	85	1.01
POLAND	50	0.59
HUNGARY	41	0.49
CZECH REPUBLIC	40	0.48
LUXEMBOURG	36	0.43

Panel C. By alliance year

Year of Alliance	No. of Deals	Percentage
1999	6	.07
2000	384	4.57
2001	372	4.43
2002	448	5.33
2003	355	4.22
2004	510	6.07
2005	572	6.81
2006	849	10.1
2007	875	10.41
2008	385	4.58
2009	342	4.07
2010	630	7.50
2011	763	9.08
2012	840	9.99
2013	899	10.7
2014	175	2.08
Total	8,405	100.00

Panel D. Summary statistics for country-level variables

	Mean	Median	Std. Dev.	Obs
China Import	0.0712	0.0628	0.1090	291
IPO Number	19.8792	6.000	41.8694	298
Lending Growth	0.1878	0.1317	0.2539	456

Panel E. Correlations for country-level variables

	China Import	IPO Activity	Lending Growth	GDP Growth
China Import	1.0000			
IPO Activity	0.2116	1.0000		
Lending Growth	-0.0641	0.0094	1.0000	
GDP Growth	0.0341	0.0901	0.2328	1.0000

Table 2. Shock to competition, access to finance and alliance activity: Country-level analysis

This table reports results of the Poisson regression. The dependent variable is the number of corporate alliances in a country. The average marginal effects are reported. The sample consists of alliance deals in European countries in the 1999-2014 period that are matched to the BvD financial database. China import is a one-year change in Chinese imports in a country in the year prior to alliance announcement. IPO is the number of IPOs in a country a year prior to alliance announcement. Lending growth is the weighted average growth of gross loans within a country. Variable descriptions are provided in Appendix A1. Robust standard errors are in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. China imports

	(1)	(2)	(3)
China import	48.8575*	124.1996***	25.8977***
	(29.273)	(26.435)	(9.016)
Country dummies	No	Yes	Yes
Year dummies	No	No	Yes
Observations	265	265	265
Log pseudolikelihood	-15,019	-2,403	-870.5
Pseudo R-squared	0.00461	0.841	0.942
N Countries	26	26	26

Panel B. IPO activity

	(1)	(2)	(3)
IPO Activity	42.3848***	20.3479***	8.2863*
	(7.403)	(1.154)	(4.825)
Country dummies	No	Yes	Yes
Year dummies	No	No	Yes
Observations	279	279	279
Log pseudolikelihood	-5,746	-1,831	-1,219
Pseudo R-squared	0.607	0.875	0.917
N Countries	33	33	33

Panel C. Lending growth

	(1)	(2)	(3)
Lending growth	-37.2735*	12.0712	-15.5809
	(19.118)	(14.082)	(12.523)
Country dummies	No	Yes	Yes
Year dummies	No	No	Yes
Observations	425	425	425
Log pseudolikelihood	-20,074	-3,233	-1,585
Pseudo R-squared	0.0192	0.842	0.923
N Countries	34	34	34

Panel D. Combined

	(1)	(2)	(3)
China Import	-43.0072	59.7730*	34.8300***
	(43.665)	(34.566)	(12.199)
IPO Activity	51.0698***	22.9683***	0.3226
	(9.466)	(1.634)	(1.589)
Lending growth	-45.9356	2.5728	-5.0912
	(43.035)	(16.864)	(9.850)
Country dummies	No	Yes	Yes
Year dummies	No	No	Yes
Observations	195	195	195
Log pseudolikelihood	-4,540	-1,455	-717.3
Pseudo R-squared	0.618	0.878	0.940
N Countries	25	25	25

Table 3. Pre-alliance analysis: Means comparison

This table shows the means comparison of firm characteristics for alliance firms and their controls one year prior to alliance formation. The sample is limited to alliances formed in industries subject to China import penetration. Each alliance firm is matched to control firms from the same country in the same three-digit SIC industry code. Matched firms are required to have total assets greater than 1 million U.S. dollars and the difference in total assets is no greater than 30% one year prior to the alliance formation. The control group includes a maximum of five matched firms with the smallest difference in total assets. The differences in means are evaluated using a t-test. Variable descriptions are provided in Appendix A1. ***, **, and * represent the statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. All alliance partners

	Alliances		Controls		
	Obs.	Mean	Obs.	Mean	Diff
Total Assets	4,406	7124.875	24,890	414.752	6710.122***
Cash Flow	3,601	0.040	18,674	0.042	-0.003
Cash	4,259	0.128	23,134	0.135	-0.006*
Leverage	4,406	0.502	24,890	0.524	-0.022***
Log Sales Growth	2,493	-1.938	12,034	-1.890	-0.047
Capital Investments	2,809	0.338	13,898	0.354	-0.016*

Panel B. Private firms

	Alliances		Controls		
	Obs.	Mean	Obs.	Mean	Diff
Total Assets	2,101	1612.191	15,485	304.413	1307.778***
Cash Flow	1,675	0.036	10,692	0.072	-0.036***
Cash	1,993	0.117	13,896	0.115	0.001
Leverage	2,101	0.579	15,485	0.576	0.003
Log Sales Growth	1,138	-1.891	6,877	-2	0.109**
Capital Investments	1,301	0.363	8,676	0.328	0.035**

Panel C. Public firms

	Alliances		Controls		
	Obs.	Mean	Obs.	Mean	Diff
Total Assets	2,305	12149.668	9,405	596.422	11553.246***
Cash Flow	1,926	0.043	7,982	0.003	0.040***
Cash	2,266	0.139	9,238	0.164	-0.025***
Leverage	2,305	0.432	9,405	0.438	-0.006
Log Sales Growth	1,355	-1.977	5,157	-1.744	-0.233***
Capital Investments	1,508	0.317	5,222	0.396	-0.079***

Table 4. Pre-alliance analysis: Probit regressions

This table reports marginal effects from the probit regressions. The probability of alliance is estimated. The sample is limited to alliances formed in industries subject to China import penetration. Each alliance firm is matched to control firms from the same country in the same three-digit SIC industry code. Matched firms are required to have total assets greater than 1 million U.S. dollars and the difference in total assets is no greater than 30% one year prior to the alliance formation. The control group includes a maximum of five matched firms with the smallest difference in total assets. Variable descriptions are provided in Appendix A1. ***, **, and * represent the statistical significance at the 1%, 5%, and 10% levels, respectively.

	All firms	Private firms	Public firms
	(1)	(2)	(3)
Log Total Assets	0.0616***	0.0383***	0.0890***
	(0.004)	(0.004)	(0.007)
Cash Flow	-0.1590***	-0.1725***	-0.2518***
	(0.039)	(0.047)	(0.065)
Cash	0.1268***	0.0934***	0.1837***
	(0.035)	(0.036)	(0.066)
Leverage	0.0001	-0.0130	-0.0640
	(0.020)	(0.020)	(0.049)
Log Sales Growth	0.0031	0.0069*	-0.0004
	(0.004)	(0.004)	(0.006)
Capital Investments	0.0239**	0.0365***	0.0225
	(0.012)	(0.013)	(0.023)
Country dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Observations	9,829	5,665	4,136
Log pseudolikelihood	-3,754	-2,141	-1,517

Table 5. Changes in firm performance around alliance: Summary statistics

This table shows the summary statistics and regression estimations for changes in firm performance around the acquisition. Panel A presents summary statistics for the firm-level variables of the targets in our sample as a two-year average before and after the acquisitions. The difference in mean is evaluated with a t-test. Panel B reports the marginal effects from probit models estimating changes in target firm performance relative to control firms before and after the acquisitions. The sample includes target and control firms. The dependent variable equals one for target firms and zero for control firms. The firm-level variables are measured one year prior to the acquisition in columns (1) and (3) and one year after the acquisitions in columns (2) and (4). We report p-values for the difference in coefficients of each variable from the joint estimation of two probit models. All regressions include two-digit SIC industry code, target country, and year dummy variables. Standard errors are corrected for clustering the observations at the firm level and z-statistics are in parentheses. Variable descriptions are provided in Appendix A1. ***, **, and * represent the statistical significance at the 1%, 5%, and 10% levels, respectively.

	Alliances					Controls				
	BEFORE		AFTER			BEFORE		AFTER		
	Obs.	mean	Obs.	mean	Difference	Obs.	mean	Obs.	mean	Difference
Cash Flow	5,743	0.0507	5,716	0.0451	-0.0056	27,778	0.0465	27,519	0.0433	-0.0032**
Cash Flow Growth	5,071	-0.1373	5,441	-0.1421	-0.0048	23,889	-0.1444	26,164	-0.2116	-0.0673**
Cash	6,743	0.1305	6,658	0.1211	-0.0095***	33,030	0.1382	32,835	0.1318	-0.0065***
Leverage	6,958	0.4951	6,895	0.5081	0.0130***	35,299	0.5191	35,263	0.5090	-0.0101***
Log Sales Growth	4,028	-1.9204	3,843	-2.1129	-0.1925***	17,710	-1.8531	16,962	-2.0334	-0.1802***
Capital Investment	4,503	0.3312	4,715	0.3121	-0.0191**	20,594	0.3639	22,180	0.3299	-0.0340***

Table 6. Changes in firm performance before and after alliances: Panel regression

This table shows the panel OLS regression estimations for changes in firm performance around alliance announcement. The sample includes firm-year observations ten years around the alliance announcement. *AFTER* is equal one for the years after the alliance and zero otherwise. Standard errors are corrected for clustering at the firm level and robust standard errors are in parentheses. Variable descriptions are provided in Appendix A1. ***, **, and * represent the statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. All firms

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variables:	Cash Flow	Cash Flow Growth	Cash	Leverage	Log Sales Growth	Capital Investments
AFTER	0.0010	-0.0248	-0.0027	-0.0064**	-0.0866***	-0.0259***
	(0.002)	(0.033)	(0.002)	(0.003)	(0.025)	(0.004)
AFTER x Alliance	-0.0046	-0.0127	-0.0007	0.0448***	0.0423	0.0239**
	(0.005)	(0.069)	(0.009)	(0.010)	(0.079)	(0.011)
Log(Total Assets)	0.0298***	-0.0132	-0.0156***	-0.0154***	0.0619***	0.0602***
	(0.003)	(0.040)	(0.002)	(0.004)	(0.017)	(0.005)
Firm dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	203,386	179,405	237,680	253,742	129,506	156,636
Adjusted R-squared	0.425	0.016	0.597	0.645	0.244	0.220

Panel B. Private firms

Dependent variables:	(1) Cash Flow	(2) Cash Flow Growth	(3) Cash	(4) Leverage	(5) Log Sales Growth	(6) Capital Investments
AFTER	-0.0022	-0.0300	0.0013	-0.0061*	-0.1097***	-0.0312***
	(0.002)	(0.043)	(0.002)	(0.003)	(0.024)	(0.005)
AFTER x Alliance	0.0014	0.1873**	-0.0052	0.0426***	0.0700	0.0246**
	(0.006)	(0.079)	(0.004)	(0.009)	(0.050)	(0.012)
Log Total Assets	0.0211***	-0.0004	-0.0114***	0.0025	0.0623***	0.0472***
	(0.003)	(0.043)	(0.002)	(0.004)	(0.017)	(0.005)
Firm dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	108,100	94,980	127,160	140,471	66,115	89,082
Adjusted R-squared	0.393	0.017	0.637	0.666	0.214	0.200

Panel C. Public firms

Dependent variables:	(1) Cash Flow	(2) Cash Flow Growth	(3) Cash	(4) Leverage	(5) Log Sales Growth	(6) Capital Investments
AFTER	0.0032	-0.0029	-0.0108***	0.0021	-0.0753*	-0.0185**
	(0.003)	(0.051)	(0.004)	(0.004)	(0.042)	(0.007)
AFTER x Alliance	-0.0142	-0.1889*	0.0101	0.0294*	0.0262	0.0163
	(0.009)	(0.109)	(0.015)	(0.015)	(0.127)	(0.019)
Log Total Assets	0.0377***	-0.0322	-0.0185***	-0.0366***	0.0568**	0.0748***
	(0.005)	(0.066)	(0.004)	(0.007)	(0.028)	(0.010)
Firm dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	95,286	84,425	110,520	113,271	63,391	67,554
Adjusted R-squared	0.444	0.015	0.551	0.575	0.271	0.245

Table 7. Changes in firm performance before and after alliances: Panel regression

This table shows the panel OLS regression estimations for changes in firm performance around alliance announcement. The sample includes firm-year observations ten years around the alliance announcement. *AFTER* is equal one for the years after the alliance and zero otherwise. Each specification also includes total assets, firm and year dummies. Standard errors are corrected for clustering the observations at the firm level and robust standard errors are in parentheses. Variable descriptions are provided in Appendix A1. ***, **, and * represent the statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. All firms

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variables:	Cash Flow	Cash Flow Growth	Cash	Leverage	Log Sales Growth	Capital Investments
Import dummy for above 25 percentile						
AFTER	0.0018	-0.0104	-0.0110***	0.0057	-0.0883**	-0.0306***
	(0.004)	(0.061)	(0.004)	(0.006)	(0.041)	(0.008)
AFTER x Alliance	-0.0069	-0.0742	0.0268**	0.0647***	0.0174	0.0481**
	(0.011)	(0.108)	(0.011)	(0.024)	(0.189)	(0.022)
AFTER x Alliance x ChinaImportHigh	0.0017	0.0721	-0.0408**	-0.0249	0.0611	-0.0331
	(0.012)	(0.145)	(0.020)	(0.025)	(0.199)	(0.026)
Observations	141,356	125,491	156,622	165,129	85,599	107,030
Adjusted R-squared	0.429	0.011	0.597	0.628	0.230	0.235
Import dummy for above 75 percentile						
AFTER	0.0033	-0.0007	-0.0066**	-0.0015	-0.1240***	-0.0311***
	(0.003)	(0.045)	(0.003)	(0.004)	(0.036)	(0.006)
AFTER x Alliance	-0.0067	-0.0241	0.0163**	0.0554***	0.0890	0.0431***
	(0.008)	(0.091)	(0.008)	(0.016)	(0.124)	(0.016)
AFTER x Alliance x ChinaImportHigh	0.0028	-0.0782	-0.0568	-0.0103	-0.1976	-0.0598**
	(0.012)	(0.199)	(0.037)	(0.021)	(0.205)	(0.027)
Observations	141,356	125,491	156,622	165,129	85,599	107,030
Adjusted R-squared	0.429	0.011	0.597	0.628	0.231	0.235

Panel B. Private firms

Dependent variables:	(1) Cash Flow	(2) Cash Flow Growth	(3) Cash	(4) Leverage	(5) Log Sales Growth	(6) Capital Investments
Import dummy for above 25 percentile						
AFTER	-0.0042	0.0050	-0.0013	0.0011	-0.1170***	-0.0395***
	(0.004)	(0.072)	(0.003)	(0.007)	(0.042)	(0.009)
AFTER x Alliance	-0.0087	0.1632	0.0009	0.0435***	0.2391***	0.0148
	(0.010)	(0.151)	(0.007)	(0.016)	(0.089)	(0.021)
AFTER x Alliance x ChinaImportHigh	0.0206	-0.0264	-0.0056	0.0241	-0.2405**	0.0241
	(0.015)	(0.189)	(0.009)	(0.021)	(0.112)	(0.027)
Observations	68,925	60,956	76,725	83,517	40,301	56,569
Adjusted R-squared	0.393	0.012	0.654	0.648	0.186	0.210
Import dummy for above 75 percentile						
AFTER	-0.0014	-0.0137	0.0008	-0.0088*	-0.1339***	-0.0366***
	(0.003)	(0.056)	(0.002)	(0.005)	(0.034)	(0.007)
AFTER x Alliance	-0.0001	0.1912*	-0.0007	0.0652***	0.0903	0.0371**
	(0.008)	(0.108)	(0.006)	(0.013)	(0.065)	(0.018)
AFTER x Alliance x ChinaImportHigh	0.0168	-0.2183	-0.0098	-0.0382	0.0502	-0.0393
	(0.016)	(0.229)	(0.010)	(0.025)	(0.143)	(0.030)
Observations	68,925	60,956	76,725	83,517	40,301	56,569
Adjusted R-squared	0.393	0.012	0.654	0.648	0.186	0.210

Panel C. Public firms

Dependent variables:	(1) Cash Flow	(2) Cash Flow Growth	(3) Cash	(4) Leverage	(5) Log Sales Growth	(6) Capital Investments
Import dummy for above 25 percentile						
AFTER	0.0068	0.0001	-0.0268***	0.0220**	-0.0889	-0.0192
	(0.006)	(0.101)	(0.007)	(0.009)	(0.066)	(0.015)
AFTER x Alliance	-0.0143	-0.2212	0.0551***	0.0537	-0.0630	0.0532*
	(0.018)	(0.159)	(0.016)	(0.033)	(0.254)	(0.030)
AFTER x Alliance x ChinaImportHigh	-0.0072	0.0996	-0.0692**	-0.0424	0.1860	-0.0604*
	(0.018)	(0.216)	(0.030)	(0.035)	(0.270)	(0.037)
Observations	72,431	64,535	79,897	81,612	45,298	50,461
Adjusted R-squared	0.447	0.011	0.542	0.567	0.269	0.262
Import dummy for above 75 percentile						
AFTER	0.0065	0.0286	-0.0177***	0.0157**	-0.1298**	-0.0244**
	(0.005)	(0.071)	(0.006)	(0.007)	(0.057)	(0.010)
AFTER x Alliance	-0.0164	-0.1833	0.0362***	0.0318	0.1000	0.0403*
	(0.013)	(0.136)	(0.013)	(0.024)	(0.191)	(0.024)
AFTER x Alliance x ChinaImportHigh	-0.0058	0.0106	-0.0832*	0.0171	-0.3372	-0.0712*
	(0.018)	(0.292)	(0.047)	(0.029)	(0.287)	(0.042)
Observations	72,431	64,535	79,897	81,612	45,298	50,461
Adjusted R-squared	0.447	0.011	0.542	0.567	0.269	0.262

Table 8. Panel regression by deal type

This table shows the panel OLS regression estimations for changes in firm performance around alliance announcement. The sample includes firm-year observations ten years around the alliance announcement. *AFTER* is equal to one for the years after the alliance and zero otherwise. All regressions include a set of control variables presented in Table 5. Standard errors are corrected for clustering at the firm level and robust standard errors are in parentheses. Variable descriptions are provided in Appendix A1. ***, **, and * represent the statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Cross-border alliances

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variables:	Cash flow	Cash flow growth	Cash	Leverage	Log(Sales growth)	Capital Investments
AFTER x Alliance x Cross-border	0.0097	0.0356	-0.0027	-0.0005	-0.0141	0.0260*
	(0.008)	(0.123)	(0.010)	(0.012)	(0.070)	(0.015)
AFTER x Alliance	-0.0132*	-0.0492	0.0019	0.0444***	0.0403	0.0028
	(0.008)	(0.114)	(0.006)	(0.012)	(0.071)	(0.015)
AFTER	0.0039	-0.0147	-0.0059**	-0.0095**	-0.0875***	-0.0165**
	(0.003)	(0.049)	(0.003)	(0.005)	(0.032)	(0.008)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Observations	209,639	184,903	244,718	261,386	133,195	161,914
Adjusted R-squared	0.426	0.017	0.593	0.645	0.245	0.219

Panel B. High-tech alliances

Dependent Variables:	(1) Cash flow	(2) Cash flow growth	(3) Cash	(4) Leverage	(5) Log Sales growth	(6) Capital Investments
AFTER x Alliance x Hi-Tech	0.0011	-0.1524	-0.0088	0.0321**	-0.1613	0.0196
	(0.010)	(0.117)	(0.015)	(0.013)	(0.128)	(0.021)
AFTER x Alliance	-0.0055	0.0377	0.0031	0.0321***	0.0884	0.0167
	(0.004)	(0.076)	(0.005)	(0.008)	(0.055)	(0.011)
AFTER	-0.0056***	-0.0667*	0.0008	0.0004	-0.0422	-0.0269***
	(0.002)	(0.037)	(0.002)	(0.003)	(0.027)	(0.005)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Observations	209,639	184,903	244,718	261,386	133,195	161,914
Adjusted R-squared	0.426	0.017	0.593	0.646	0.245	0.219

Panel C. Joint ventures

Dependent Variables:	(1) Cash flow	(2) Cash flow growth	(3) Cash	(4) Leverage	(5) Log Sales growth	(6) Capital Investments
AFTER x Alliance x Joint Venture	-0.0089	-0.0254	0.0164	-0.0300*	0.1537	-0.0176
	(0.008)	(0.103)	(0.012)	(0.016)	(0.105)	(0.018)
AFTER x Alliance	-0.0018	-0.0101	-0.0068	0.0565***	-0.0316	0.0310**
	(0.008)	(0.085)	(0.013)	(0.015)	(0.105)	(0.015)
AFTER	0.0063***	-0.0107	-0.0059**	-0.0152***	-0.1014***	-0.0263***
	(0.002)	(0.039)	(0.002)	(0.003)	(0.026)	(0.005)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Observations	209,639	184,903	244,718	261,386	133,195	161,914
Adjusted R-squared	0.426	0.017	0.593	0.646	0.245	0.219

Appendix A1. Variable Definition

Variable	Definition
AFTER	An indicator variable equals to one for firm-years after alliance formation
Total Assets	Total assets in U.S. million dollars
Cash Flow	Cash flows/Total assets
Cash Flow Growth	(Cash flow - Lagged cash flow)/Lagged cash flow
Sales Growth	(Sales - Lagged sales)/Lagged sales
Leverage	(Long-term debt + Current liabilities)/Total assets
Capital Investment	(Fixed assets - Lagged fixed assets + Depreciation)/Total assets
Log GDP	Log of GDP of a country in U.S. million dollars
GDP Growth	(GDP - Lagged GDP)/Lagged GDP
Lending growth	Weighted average growth of gross loans within a country and year. *(Source: Bankscope)*
China Import	China import is a one-year change in Chinese import in a country in the year prior to alliance announcement. Chinese import in a country is calculated using a mean percentage of Chinese imports across four-digit NACE codes in a country. *(Source: Comext database in Eurostat)*
IPO Activity	Log number of IPOs within a country and year. *(Source: SDC)*

Appendix A2: Pre-alliance analysis: Probit regressions

This table reports marginal effects from the probit regressions. The probability of alliance is estimated. The sample is limited to alliances formed in industries that are not subject to China import penetration. Each alliance firm is matched to control firms from the same country in the same three-digit SIC industry code. Matched firms are required to have total assets greater than 1 million U.S. dollars and the difference in total assets is no greater than 30% one year prior to the alliance formation. The control group includes a maximum of five matched firms with the smallest difference in total assets. Variable descriptions are provided in Appendix A1. ***, **, and * represent the statistical significance at the 1%, 5%, and 10% levels, respectively.

	All firms	Private firms	Public firms
	(1)	(2)	(3)
Log Total Assets	0.0783***	0.0110	0.0933**
	(0.021)	(0.015)	(0.040)
Cash Flow	0.1867	0.0262	0.3156
	(0.274)	(0.151)	(0.460)
Cash	0.4334**	0.2151*	0.3869
	(0.188)	(0.113)	(0.298)
Leverage	0.4460***	0.1245*	0.2543
	(0.107)	(0.069)	(0.227)
Log Sales Growth	0.0020	0.0212	-0.0498
	(0.022)	(0.014)	(0.033)
Capital Investments	0.0628	0.0164	0.0503
	(0.061)	(0.032)	(0.094)
Country dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Observations	275	104	136
Log pseudolikelihood	-94.57	-36.01	-46.51

Appendix A3: Changes in firm performance before and after alliances: Panel regression

This table shows the panel OLS regression estimations for changes in firm performance around alliance announcement. The sample is limited to alliances formed in industries that are not subject to China import penetration. *AFTER* is equal one for the years after the alliance and zero otherwise. Standard errors are corrected for clustering at the firm level and robust standard errors are in parentheses. Variable descriptions are provided in Appendix A1. ***, **, and * represent the statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. All firms

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variables:	Cash Flow	Cash Flow Growth	Cash	Leverage	Log Sales Growth	Capital Investments
AFTER	0.0112	-0.0103	-0.0227***	0.0036	0.0964	-0.0129
	(0.008)	(0.178)	(0.007)	(0.014)	(0.124)	(0.023)
AFTER x Alliance	-0.0262*	-0.1312	0.0142	0.0322	-0.3971*	0.0302
	(0.013)	(0.298)	(0.020)	(0.026)	(0.228)	(0.044)
Log Total Assets	0.0539***	-0.0697	-0.0170	0.0037	0.0559	0.0529
	(0.013)	(0.396)	(0.012)	(0.013)	(0.074)	(0.046)
Firm dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,253	5,498	7,038	7,644	3,689	5,278
Adjusted R-squared	0.470	0.067	0.474	0.636	0.271	0.213

Panel B. Private firms

Dependent variables:	(1) Cash Flow	(2) Cash Flow Growth	(3) Cash	(4) Leverage	(5) Log Sales Growth	(6) Capital Investments
AFTER	-0.0095	0.0799	-0.0072	0.0160	-0.0536	0.0448
	(0.010)	(0.234)	(0.009)	(0.022)	(0.139)	(0.029)
AFTER x Alliance	0.0067	-0.6579	-0.0074	0.0715	-0.1364	-0.0620
	(0.016)	(0.422)	(0.014)	(0.046)	(0.200)	(0.048)
Log Total Assets	0.0225	0.0863	-0.0413***	0.0012	-0.0437	0.0553*
	(0.014)	(0.202)	(0.011)	(0.020)	(0.101)	(0.031)
Firm dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,592	2,293	3,038	3,558	1,721	2,325
Adjusted R-squared	0.466	0.030	0.525	0.602	0.197	0.177

Panel C. Public firms

Dependent variables:	(1) Cash Flow	(2) Cash Flow Growth	(3) Cash	(4) Leverage	(5) Log Sales Growth	(6) Capital Investments
AFTER	0.0238**	-0.0725	-0.0370***	0.0051	0.1990	-0.0724**
	(0.010)	(0.238)	(0.011)	(0.014)	(0.159)	(0.034)
AFTER x Alliance	-0.0495**	0.2222	0.0209	-0.0219	-0.5733**	0.1264*
	(0.020)	(0.397)	(0.033)	(0.029)	(0.272)	(0.068)
Log Total Assets	0.0628***	-0.1380	-0.0004	-0.0072	0.1574	0.0716
	(0.017)	(0.543)	(0.016)	(0.014)	(0.104)	(0.059)
Firm dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,661	3,205	4,000	4,086	1,968	2,953
Adjusted R-squared	0.450	0.104	0.443	0.646	0.329	0.240