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# Board connections and crisis performance: Family, state, and political networks

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ABSTRACT

We introduce a novel concept of network interactions in which board connections provide access to external spheres of political influence, state ownership, and family control. We posit this form of indirect access via board association enables connected firms to benefit from information privy to external networks while avoiding their resource-based costs of membership. Board network data are assembled for 1290 East Asian firms and linked to hand-collected data on political connections and corporate ownership around the 2008–09 crisis. Companies with board connections to state-owned firms and family business groups had greater crisis-period accounting performance and stock returns. In countries with weak institutional development, board connections to politically connected firms were also beneficial.

Board networks have been demonstrated to boost firm performance during periods of economic stability and distress (Larcker et al., 2013; Dass, Kini, Nanda, Onal, and Wang 2014). Leading explanations for this effect emphasize the role of board networks as conduits of information flow. From this perspective, firms with many board connections are focal points of information within the economy (Freeman, 1978). But what kind of information is transmitted through board networks to enhance firm performance? And from which types of firms is this information likely to emanate?

Scholars have separately examined firm networks characterized by family control, state ownership, and political ties. A rich literature has examined the benefits and costs of inclusion in these networks.[1] But *indirect* association with them remains unexplored. We postulate that interlocking directorates may constitute an important form of indirect association with family business groups, SOEs, and politically connected firms. Board networks may facilitate access to the privileged information otherwise reserved for group members. But importantly, the costs of family control, state ownership, and political ties are typically resource-based (e.g. tunneling, pursuit of policy objectives, and campaign finance, respectively). So while board networks may transmit information-based benefits of association with such groups, this form of indirect access simultaneously shields a firm from the concomitant resource-based costs. This perspective may enhance our understanding of the established relation between board networks and performance.

Our unique data allow us to identify firms with board interlocks to companies characterized by family control, state ownership, and political ties. Throughout this paper, we refer to these novel types of network interactions as family networks, state networks, and political networks, respectively. Crucially, firms with these types of board networks need not themselves be characterized by family/

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[1] For family business groups, see Khanna and Palepu, 2002; Khanna and Yafeh, 2007. For state ownership, see Megginson and Netter, 2001; Aivazian et al., 2005; Chen et al., 2009. For political connections, see Faccio, 2006; Goldman et al., 2009; Bertrand et al., 2018.

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state ownership, nor by political ties. In fact, our identification relies on our ability to net out the direct benefits and costs of membership in such groups, thereby exposing the indirect benefits of board association.

Our empirical analysis demonstrates firms with strong board networks have significantly greater accounting and stock performance during the global financial crisis. By decomposing board networks into the above subtypes of network interactions, we demonstrate the performance benefits of board networks are concentrated primarily in those providing access to family business groups and SOEs. This finding adds nuance to a body of evidence on the effects of board interlocks implicitly regarded as homogeneous (see, for example, Larcker et al., 2013). Given well-cited research on the value of political connections (e.g. Fisman, 2001; Faccio, 2006), it is surprising our political networks do not generally boost crisis performance. However, in economies with weak institutions (as measured by GDP per capita, financial development, or investor protections), we do find political networks to improve outcomes.

Our research design resembles Lins et al. (2017) which examines the impact of social capital on firm performance during a crisis. Our identification strategy can therefore be expressed in nearly equivalent terms: We exploit the global financial crisis as a shock to the market equilibrium, while board networks remain fixed in the short-run. The crisis gives rise to environmental conditions in which the information accessed by board networks (and by family networks, state networks, and political networks) becomes potentially more valuable. We thus observe whether these various types of network interactions boost accounting and financial performance in this setting. Like Lins et al. (2017) we do not exploit a shock to the networks, and are consequently unable to identify their direct impact on performance outcomes during regular periods of economic activity.

Because the crisis was unexpected, selection concerns are mitigated. Board networks are unlikely to be ex-ante selected on ex-post crisis performance. Because networks *are* likely to be selected on contemporaneous performance, we invoke a dynamic model netting out that source of selection bias and isolating crisis-contingent effects. Still, it is possible networks are selected on correlates of performance-potential during the crisis. To alleviate such concerns we include a host of additional controls, and conduct a number of robustness checks.

To understand the mechanism underlying our main effects, we explore three potential channels. First, we check whether networks enable firms to maintain or boost sales, and find no evidence in support of this channel. Second, we test whether networks enable firms to secure trade credit, and find family and political networks do lead to higher crisis-period trade credit. Third, we examine a debt-related channel. We allow the performance effects of networks to vary between firms with below/above-median levels of maturing debt (relative to assets). Our evidence suggests firms with high levels of maturing debt benefit from all types of board networks during the crisis. Additional tests suggest, however, those benefits do not include direct reductions in the interest cost of debt.

To carry out this project we build a large multi-country dataset mapping each firm's board networks, ultimate ownership structure, and political ties. To identify the importance of each type of network interaction, we must focus on a region in which they are known to be highly salient. We therefore choose East Asia as the setting for our study (Hamilton, 1996). Our sample consists of 1290 of the largest publicly traded firms across nine East Asian economies: Hong Kong, Indonesia, Japan, South Korea, Malaysia, the Philippines, Singapore, Taiwan, and Thailand. To measure director networks, we use hand-collected data on approximately 29,000 directors. To determine whether firms are politically connected, we cross-reference our directors list with all politicians holding national-level executive or legislative positions in the region. Finally, we use manually collected ultimate ownership data to identify family and state-owned firms.

Our paper makes two broad contributions to the literature. First, we contribute significantly to existing research on board networks. Earlier research has highlighted the role of director/executive networks in transmitting information (e.g. Cohen et al., 2008; Bizjak et al., 2009; Larcker et al., 2013; Faleye et al., 2014; Jiang et al., 2017). We extend this literature by theorizing which types of board networks tap into valuable information repositories during a financial crisis. In related work, Dass et al. (2014) suggest directors from related industries may confer important information in times of distress. We further establish the importance of board network heterogeneity by highlighting the relevance of director interlocks with family, state, and politically connected firms. To substantiate our theoretical conjectures, we present robust empirical evidence for heterogeneous effects of board connections, depending on the external networks to which they grant access.

Our second contribution applies to the corporate finance literature more broadly. This paper constitutes one step towards connecting heretofore distinct branches of the literature examining different types of firm networks. To our knowledge, we assemble the first dataset permitting joint exploration of board connections, political ties, and ownership structures. These data enable us to adopt a holistic approach to the study of firm networks, with a special emphasis on their joint interaction. This innovation implies our findings speak simultaneously to the separate literatures on family business groups, state ownership, and political ties. Existing bodies of research have previously documented the benefits and costs related to each of the abovementioned phenomena (see Megginson and Netter, 2001; Khanna and Yafeh, 2007; Goldman et al., 2009). Our paper contributes to these lines of inquiry by introducing network interactions via board associations, and documenting the related benefits.

The remainder of this paper is structured as follows. Section 1 develops theory on the performance implications of family networks, state networks, and political networks. Section 2 describes data collection and variable construction. In Section 3 we examine the impact of networks on accounting performance and stock returns during the crisis. Section 4 extends our main analysis by exploring underlying mechanisms. Section 5 strengthens the causal interpretation of our findings by examining: director qualifications as a source of confound; crisis intensity as a moderating factor; and crisis-induced changes to networks. Section 6 concludes, and an online appendix offers further technical robustness checks.

## 1. Theory of network interactions

### 1.1. The importance of networks to Asian business

The importance of business networks as an institutional medium by which East Asian economies are organized is well documented (Redding, 1996; Dacin and Delios, 2005; Carney, 2005; Greif and Tabellini, 2010). Professional, family, state, and political networks are important to the organization of business throughout the region. However, countries are often characterized as privileging one type of network over others due to historical circumstances. For example, Chinese networks are commonly regarded as being dominated by kinship ties, with business relations based on networking, *guanxi* (i.e. social connections). Chinese networks are important not only to societies dominated by ethnically Chinese citizens (Taiwan, Singapore, and Hong Kong), but also to Southeast Asian economies where there is a large Chinese diaspora (Redding, 1993).

Southeast Asian networks are usually considered to be kinship-based and/or organized around patron-client political relationships. In Thailand, for example, family and kinship are the most important form of social bond in business networks (Suehiro and Wailerdsak, 2014), and they form the core around which the country's dominant business groups (*glum thurakit*) have been organized (Suehiro, 1989). In the Philippines, family forms the backbone of society with large and dense family networks common to family-owned conglomerates (Wolters, 1999; Kondo, 2014).

In Indonesia and Malaysia, patron-client relations are regarded as having had a significant impact on the organization of business networks. In a weak institutional environment like Indonesia, close personal relationships with powerful political patrons could reduce the uncertainties involved in carrying on a business, and also grant access to public sector contracts (Carney et al., 2008; Turner, 2007; Rademakers, 1998). In Malaysia, outside of ethnic Chinese businesses, inter-company networks are commonly state-led and state-mediated (Gomez and Jomo, 1999). Public investment comprises a large fraction of total investment, so the reliance of private actors on public investment proliferates patron-client business networks.

Inter-corporate ties that cement together a vast community of firms are widely viewed as dominating the structure of Japanese business networks. These groups, known as keiretsu, have dominated the structure of the post-war Japanese economy although their cohesiveness has varied across groups and time (Orru, 1996; Lincoln and Shimotani, 2010). An important characteristic of these groups is the sharing of information, leading some scholars to label them “information clubs” (Imai, 1988). South Korean business networks are regarded as being heavily influenced by elite business families that prospered through privileges granted by a strong state. Japan's pre-World War II zaibatsu business groups have often been compared to the Korean chaebol of today (Lee and Shim, 2012). Both chaebol and zaibatsu are terms represented by the same Chinese characters and denote large family owned and centrally controlled business networks. However, the chaebol are distinguished by their relations with the Korean state which has granted these large groups special privileges (Hamilton, 1996).

### 1.2. Board networks and information

Generally speaking, funds flow from firms with a capital surplus to those requiring finance for productive investments. An important barrier to the efficient allocation of capital is information frictions. When a financial crisis strikes, such frictions are exacerbated (Mishkin, 1996, 1997; Mishkin and Hahm, 2000). A major business failure increases uncertainty and impairs the ability of lenders to gauge the creditworthiness of borrowers.[2] The initiation or expansion of business opportunities can also be affected. In a crisis, it becomes harder to distinguish those with productive investment opportunities and healthy balance sheets from those without (Morellec and Schurhoff, 2011; Lambert et al., 2012). Taken together, this lack of credit and reluctance to initiate new ventures or modify existing contracts can magnify the negative performance implications of a crisis.

Existing research suggests director/executive networks might attenuate the above problems and thereby reduce the severity of a crisis for individual firms by facilitating information flows (Bizjak et al., 2009; Larcker et al., 2013; Faleye et al., 2014; Jiang et al., 2017). For example, Dass et al. (2014) demonstrate that board networks with directors from related industries can potentially bring valuable information and access to professional contacts. Valuable information may include industry conditions and trends, thereby facilitating better management of a firm's factors of production and protecting it against demand or supply shocks. Indeed, Dass et al. (2014) find the effect of such directors on firm value is stronger when the information gap is larger. Given that information gaps constitute a core problem of financial crises, we expect director networks to confer similar benefits in such a circumstance.

Through their capacity to reduce information asymmetries, board networks may grant firms better access to credit (Davis, 1991; Stuart and Yim, 2010). Stearns and Mizruchi (1993), for example, demonstrate the types of financial institutions represented on a firm's board affect its sources of financing. Highly connected boards may also have better information about business partners capable of modifying terms of contracts, such as allowing for orders and payments to be temporarily altered (Uzzi, 1999). Knowing which firms face a greater decline in the demand for their products/services, and which firms are less likely to make payments on time allows the well-connected firm to make calibrated adjustments to its own financial and business operations (Dass et al., 2014).

In light of the above, it is natural to expect that the value of director interlocks is determined by the types of firms with which the network enables exchange. Existing studies identify performance benefits due to director types satisfying specific environmental needs, such as deregulation, young firms, or firms pursuing diversification strategies (Hillman et al., 2000; Kroll et al., 2007; Jones

[2] Screening is more difficult under these conditions because prior methods for assessing borrower risk have proven problematic, and because of the heightened risk of contagion.

et al., 2008). We therefore consider various measures of board centrality, each differing in terms of which external network is reached via the director interlocks. In particular, we study director ties to politically connected firms, state-owned companies, and family business groups. We refer to these subcategories of board networks as political networks, state networks, and family networks, respectively.

### 1.3. Crisis performance and network interactions

A key benefit of board networks in comparison to networks linked via ownership regards the relative absence of an obligation to transfer resources to other firms. For example, a family- or state-owned firm that controls another firm may possess the capacity to divert resources from it (Hillman et al., 2009). During a crisis, these ownership costs are likely to rise as a parent firm with ownership and control rights will exercise its power to divert resources from a subject firm in order to shore up its own financial position.[3] However, firms linked exclusively via board networks enjoy autonomy to act on information received without concomitant obligations. In this context, firms can exploit their information channels to lessen uncertainty related to their economic environment (Hillman et al., 2000). As uncertainty in the economic environment rises, the value of information also rises, thereby amplifying the benefits provided via board networks.

#### 1.3.1. Family networks

A family business group is a collection of legally independent firms under the ownership of a single family. A distinctive feature of such groups is the existence of internal markets allowing for the allocation of capital among member firms. Studies of Korean *chaebol* for example have documented negative outcomes associated with tunneling (Bae et al., 2002; Joh, 2003; and Baek et al., 2006), which may be exacerbated during a crisis (Bertrand et al., 2002).[4]

Other scholars have reported that family groups may actually be helpful by exploiting their financing and reputation advantages to fund young high-growth firms with limited cash flows at the bottom of pyramidal ownership structures.[5] Khanna and Yafeh (2007) also argue that links between group firms may provide for mutual insurance which can help to dampen shocks; and Jia et al. (2013) provide evidence for this phenomenon in the Chinese context.

A firm with director ties to a family group is well positioned to secure some benefits of association without incurring costs. Such firms may selectively act upon valuable information while obviating the need to transfer resources. Without being subject to ownership by a controlling family shareholder, a firm will not face costs associated with tunneling and other forms of predatory behavior. The extension of benefits may also be reduced, such as inter-firm resource transfers (e.g., to young, high-growth firms with limited cash flows) (Gopalan et al., 2007; Morck et al., 2005; Almeida et al., 2011). But during a crisis, the likelihood for tunneling is greater than the prospect of receiving financial assistance.

At the same time, firms with family networks may be especially well positioned to receive information regarding the capacity of group firms to calibrate their financial and business operations (Khanna and Yafeh, 2007). The board connection may serve as a conduit of information on the feasibility of modifying existing contracts with group firms; being extended trade credit in relation to orders and payments; or temporarily reducing the size of interest payments on debt (Uzzi, 1999; Stuart and Yim, 2010).

#### 1.3.2. State networks

Firms that are state-owned confront similar types of resource diversion costs as family-owned firms described above. Additionally, state-owned firms also face costs due to the pursuit of government policy objectives unaligned with the firm's optimal financial strategy (Dinc, 2005; Tian and Estrin, 2007). During a crisis, the costs of state ownership may become substantial as the state prioritizes policy objectives, such as elevated employment levels or extending loans to troubled firms (Megginson and Netter, 2001). These costs may be offset by access to state resources that dampen the need to implement cost-cutting measures (Chen et al., 2009).

Firms with state networks may receive valuable information enabling access to resources typically reserved for state-owned firms. At the same time, these firms are not subject to an obligation to implement government policy directives, nor do they face resource diversion. State networks can provide similar benefits to family networks when they access numerous firms within a state-owned group. State networks may transmit information on the willingness of various firms to make advance payments; to delay payments for receivables; to move forward purchases (thereby forestalling a decline in sales); or to grant an extension of trade credit (Uzzi, 1999; Stuart and Yim, 2010). If a financial institution is a member of the state-owned group, then state networks may also convey information regarding capacity to delay debt repayment, or to reduce the cost of debt (Stearns and Mizruchi, 1993). Further information may regard government capacity to extend preferential treatment or to offer various forms of financing assistance during the crisis period.

#### 1.3.3. Political networks

Firms with politically connected directors face somewhat similar tradeoffs as firms that are state-owned. These firms may exchange bribes or campaign finance for favorable treatment by the state (Shleifer and Vishny, 1994; Lester et al., 2008). Benefits may

[3] Granted some firms (such as those critical to a parent firm's operations) may receive financial assistance.

[4] Tunneling in the context of business groups refers to the transfer of assets/profits across firms within the group. Related work on tunneling focuses on transfers across shareholders *within* (rather than across) firms (Lemmon and Lins, 2003; Johnson et al., 2000; Baek et al., 2004).

[5] See Morck et al. (2005) and Khanna and Yafeh (2007) for surveys of this literature.

include greater access to government financing (Khwaja and Mian, 2005; Duchin and Sosyura, 2012; Li et al., 2008) or bailout funds (Faccio et al., 2006); increased procurement of government contracts (Goldman et al., 2013); protection from market competition (Bunkanwanicha and Wiwattanakantang, 2009); and favorable regulatory treatment (Berkman et al., 2010). Firms have been shown to benefit from their political connections in both emerging and high-income economies (Fisman, 2001; Johnson and Mitton, 2003; Ferguson and Voth, 2008; Goldman et al., 2009; Cingano and Pinotti, 2013; Acemoglu et al., 2016).

Despite the advantages above, political connections may also impose pressures to pursue policy objectives at odds with firm performance, like elevated employment levels (Naughton, 2009). An additional drawback of political connections is the incentive for managers to expropriate for personal gain. Faccio et al. (2006) find politically connected firms more likely to be bailed out, and they also exhibit worse performance. Chekir and Diwan (2013) find in Egypt that politically connected firms display worse accounting performance. Moreover, politically connected firms face costs arising from their affiliation with patronage networks allied to incumbent political leaders (i.e., patron-client relationships) (Johnson and Mitton, 2003). During a crisis, costs are likely to rise in order to fulfill political leaders' objectives of preserving the stability of their political rule.

Firms with political networks (but no direct political connection) are one step removed from political influence, and do not face pressures to implement costly measures for political expediency. Instead, they can benefit from information privy to political insiders, thereby gaining privileged access to credit and other government-provided benefits. Despite these benefits, firms with political networks will lack access to information concerning multiple lines of business (as with family or state networks). This limits the availability of information regarding adjustments to accounts payable or the extension of trade credit, for example.

## 2. Data

We assemble a unique dataset capturing various types of network interactions among East Asian firms. In particular, we document board connections to firms characterized by family business group affiliation, state ownership, and political ties. Due to the substantial resources devoted to hand-collecting this data, our sample faces constraints to cross-sectional breadth and temporal depth. Still, we present detailed board network data for 1290 firms, which are among the 200 largest companies by 2008 market capitalization in each of nine East Asian economies.[6]

Our regional coverage includes Hong Kong (accounting for 133 sample firms), Indonesia (169), Japan (126), South Korea (133), Malaysia (281), the Philippines (98), Singapore (116), Taiwan (107), and Thailand (127). Within East Asia, we choose these nine economies because they have a sufficiently large number of listed firms with data available. But data availability on board members still precludes us from including *all* target firms in our sample. Our results are therefore subject to a sample selection bias towards firms with greater disclosure practices. It is unclear how this selection may bias later findings, but we have no theoretical justification to suspect strong directional bias. Given the nature of our selection (missing data), we unfortunately cannot conduct a sensitivity analysis to determine whether effect sizes are conditional on likelihood of inclusion in our sample.

We use cross-sectional network data for our sample in 2008. These are then supplemented with other cross-sectional and panel data throughout the analysis. In the remainder of this section we first discuss mapping board networks, then describe our data on family business groups, state ownership, and political connections. Then we formally introduce our measures of network interactions, and conclude the section by describing data on additional firm characteristics. Descriptive statistics for all firm data are presented in Table 1.

### 2.1. Board connections

To measure board networks we count the number of board interlocks - instances in which a firm's board member or executive is shared with another firm in the economy. This method of measuring board networks follows Bizjak et al. (2009) and Larcker et al. (2013). To construct this measure, we require board members and executives data for each sample firm. We focus on the largest 200 publicly-traded firms within each country, annual report availability permitting. Annual reports are taken from Worldscope, OSIRIS, and company websites. In gathering data from these sources, we amass a pool of approximately 29,000 names affiliated with our sample firms. We algorithmically match directors/executives across firms to depict each firm's board network. Subsequently, we conduct manual verification to correct for inconsistencies across annual reports arising from transliteration.

Gathering time-varying board network data is not feasible in our case since we require hand-collected data linking board connections, ownership structures, and political connections. Existing studies focusing exclusively on board networks have benefitted from the BoardEx database which provides extensive details on individual directors of listed firms. For our region and time period of interest, however, directors data are not widely available from that source. Crisis-period (2008–09) data for the countries in our study is limited to only 250 firms in BoardEx. Due to minimal coverage, Indonesia, South Korea, the Philippines, and Thailand would need to be dropped from a study based on BoardEx data. The resulting sample would therefore lack the size and institutional variation necessary for identifying our network interactions of interest. Consequently, to conduct our analysis we rely on manually collected data on board networks, ownership structures, and political connections.

[6] For Malaysia, our sample is drawn from the largest *300* listed firms.

**Table 1**
Descriptive statistics.

| | N | mean | SD | min | max |
|---|---|---|---|---|---|
| ROA | 9426 | 1.91 | 4.11 | −14.35 | 16.36 |
| avg return | 29,966 | −0.09 | 0.74 | −11.28 | 16.98 |
| board network | 1290 | 4.4 | 5.6 | 0 | 38 |
| family network | 1290 | 1.38 | 3.15 | 0 | 26 |
| state network | 1290 | 0.87 | 2.01 | 0 | 18 |
| political network | 1290 | 0.28 | 1.01 | 0 | 14 |
| family | 1097 | 0.24 | 0.43 | 0 | 1 |
| state | 1290 | 0.17 | 0.37 | 0 | 1 |
| political | 1290 | 0.04 | 0.21 | 0 | 1 |
| boardsize | 1290 | 11.3 | 4.9 | 0 | 34 |
| listing | 1273 | 1992 | 8.8 | 1973 | 2007 |
| concentration | 1145 | 34.2 | 26 | 0 | 100 |
| institutional | 1145 | 1.2 | 7.5 | 0 | 100 |
| blockholder | 1150 | 0.59 | 0.49 | 0 | 1 |
| tangible | 8166 | 0.33 | 0.24 | 0.00 | 0.90 |
| cash | 7369 | 0.07 | 0.08 | 0.00 | 0.47 |
| liabilities | 9692 | 5.43 | 18.24 | 0.00 | 145.01 |
| volatility | 9893 | 0.03 | 0.03 | 0.00 | 0.16 |
| leverage | 8154 | 0.52 | 0.27 | 0.03 | 1.46 |
| ROE | 8173 | 2.69 | 6.77 | −32.81 | 28.97 |
| sales | 7987 | 11.42 | 2.28 | 0.00 | 18.05 |
| size | 8272 | 13.55 | 2.08 | 8.98 | 18.77 |
| mature debt | 7980 | 0.10 | 0.29 | 0.00 | 1.19 |
| account payable | 1246 | 0.09 | 0.08 | 0.00 | 0.50 |
| skill | 3541 | 65.58 | 24.56 | 0 | 100 |
| cv | 3549 | 10.38 | 3.73 | 2 | 25 |
| experience | 3513 | 7.48 | 4.48 | 0.25 | 28.84 |
| affiliations | 3540 | 0.92 | 0.83 | 0 | 5.36 |

Data are for 1290 firms spread across nine East Asian countries. Network and corporate governance data (panels 2–4) are assembled by the authors, and are cross-sectional for 2008. Other financial/accounting data span from 2007 Q2 until 2009 Q1. *ROA*: return on assets (quarterly, percentage points). *average return*: daily average return (monthly average, percentage points). *board network*: number of interlocking directorates. *Family network*: director ties to family-owned firms. *State network*: director ties to state-owned firms. *Political network*: director ties to politically connected firms. *State*: indicates if firm has government blockholder. *Political*: indicates if firm has politically connected director. *Family*: indicates if firm belongs to business group. *Boardsize*: number of board members. *Listing*: year of IPO. *concentration*: control rights of largest blockholder (%). *institutional*: control rights of largest financial institution blockholder. *Blockholder*: indicates if any entity controls more than 10% of shares. *Tangible*: tangible assets - ratio of investment in plants, property, and equipment to total assets. *Cash*: relative to total assets. *Liabilities*: total liabilities - short and long term obligations. *Volatility*: realized return volatility (quarterly, standard deviation of daily realized return). *leverage*: ratio of total liabilities to total assets. *ROE*: return on equity (quarterly, percentage points). *sales*: total sales (log). *size*: total assets (log). *mature debt*: debt maturing within one year (scaled by assets). *account payable*: calculated over assets. *Skill*: % of board members who have either an industry-specific or financial background. *cv*: total number of board members with publicly disclosed background. *Experience*: average number of years each board member has been on the board. *Affiliations*: average number of other corporate affiliations for the board member.

### 2.2. Family business groups, state ownership, and political connections

We consider a firm to form part of a family group if it falls under the direct or indirect ownership of that group. Each group includes at minimum two of our large listed sample firms, and also includes other non-sample firms. This definition is consistent with Khanna and Palepu (2002) and Masulis et al. (2011). If two sample firms share a common family shareholder, they are deemed affiliated to a family group.[7] To build our family group indicator we draw on previously collected ownership data from Carney and Child (2013). Following common practice (see Claessens et al., 2000; Morck et al., 2005), we use a 10% threshold of outstanding share ownership to depict control. The shares need not be held directly, and are often held via other publicly traded firms in which the group enjoys majority control.[8] When a pyramid arises, we calculate ultimate ownership as the smallest stake in the chain of control (following Classens et al. 2000).

We identify state-owned firms as those in which the state holds a controlling share (Megginson and Netter, 2001). Again we use a 10% threshold to define control, and ownership by the state may be direct or indirect (via a number of other entities, including sovereign wealth funds). Precise ultimate ownership calculations are carried out as described above. An exhaustive explanation of the construction of ownership figures is available in Carney and Child (2013). The sources for ownership data include the ThomsonONE Worldscope, Bureau Van Dijk OSIRIS, and LexisNexis databases; company websites; stock exchange filings; and media reports.

We consider a firm to be politically connected if a director or executive has political ties (i.e. he/she simultaneously occupies a

[7] Our proportion of *group-affiliated* listed firms per country closely resembles the analogous figures reported in Masulis et al. (2011).
[8] Either the family group or the intermediate listed firm may be situated abroad, although this is rarely the case empirically.

position as minister or MP). To identify such connections, we combine hand-collected data on politicians with aforementioned data on board members and executives. The data on politicians were assembled from various government websites, hardcopy publications, and email correspondence with public officials (Carney and Child, 2013). A complete list of sources used for this data is available in Table A1. For each country, every member of the legislative and executive branches of government has been recorded. We supplement an algorithm with manual verification to cross-reference the list of politicians with board members to detect firms with political ties.[9] Our method of identifying political connections follows Faccio (2006), except our coverage includes *all* directors (in addition to top executives), but does not identify the political status of directors' friends and family. By restricting the measure to encompass only directors/executives who *concurrently* hold political office, we can be confident about their access to political information of potential relevance to a firm.[10]

### 2.3. Network interactions

Our analysis is centered on the network of interlocking directorates. The nodes of this network are firms, and the links represent cross-directorships between corresponding firms. We calculate degree centrality - the sum of board interlocks with other firms (each interlock weighted according to the number of board members involved). With respect to the flow of information, an actor with a relatively high measure of degree centrality is a focal point of communication and information (Freeman, 1978). An actor with a low measure of degree centrality would be at the periphery of the network's information flow, isolated from direct communication with others in the network. Hence, degree centrality is important as a baseline index of potential communication activity and information exposure.

We decompose degree centrality into subcomponents reflecting director ties to various types of firm groups. These subcomponents constitute network interactions. Specifically, we examine the overlap between board networks and networks of: political influence ($p$); state ownership ($s$); and family business group affiliation ($f$). We also trace board connections to firms unrelated to all the above networks ($o$). In what follows, we formally define our general measure of board networks and each network interaction. To begin, our degree centrality measure is calculated as:

$$\mathbf{D} = \mathbf{G}\mathbf{u}$$

where $\mathbf{G}$ is the matrix of interlocking directorates, and $\mathbf{u}$ is the unit vector. The symmetric matrix $\mathbf{G}$ is of dimension $N \times N$, where $N$ is the number of sample firms within the subject country, and also the length of $\mathbf{u}$. Each element $\mathbf{G}_{ij}$ indicates the number of common board members between firm $i$ and firm $j$.

Our decomposition of degree centrality is very straightforward. Let $p_i$, $s_i$, $f_i$, and $o_i$ be firm-level indicators of political influence; state ownership; family affiliation; and the absence thereof, respectively. For each of these dimensions, we encode a column vector of length $N$ whose elements are the corresponding binary indicators. Let us denote these column vectors as $\mathbf{p}$, $\mathbf{s}$, $\mathbf{f}$, and $\mathbf{o}$. The resulting decomposition then simply takes the following form.[11]

$$\mathbf{D}^d = \mathbf{G}\mathbf{d} \quad \mathbf{d} \in \{\mathbf{p}, \mathbf{s}, \mathbf{f}, \mathbf{n}\}$$

The element $\mathbf{D}_i^d$ therefore reflects how many board connections firm $i$ shares with other firms possessing network connections in domain $d$. Alternatively put, $\mathbf{D}^d$ provides an index of communication potential and information exposure with respect to firms characterized by $d$.

Descriptive statistics for each board network type are offered in Table 2, broken down by country. For each network interaction, there is considerable variation both across and within countries. At the same time, these networks often occur in tandem at the firm level. Table 3 reports Pearson's correlation coefficients between the various types of board networks, which are all positive and significant at the 1% level.

### 2.4. Firm characteristics

Financial data for our analysis are obtained from Datastream. Our key performance measures are: (i) return on assets (ROA), measured quarterly and calculated as the ratio of net income to total assets (expressed in percentage points); and (ii) daily stock returns, averaged monthly and expressed in percentage points. Our control variables include: public listing date (year)[12]; tangible assets (ratio of investment in plants, property, and equipment to total assets, quarterly); firm size (log of total assets, quarterly); total liabilities (quarterly); cash (relative to total assets, quarterly); ROE (quarterly); sales (log of total sales, quarterly); debt maturing within 1 year (relative to total assets, FY2007); cost of goods sold (relative to total assets, quarterly); leverage (ratio of total liabilities to total assets, quarterly); stock return volatility (standard deviation of daily stock returns, quarterly); and industry classification (13 sectors, based on two-digit SIC codes in accordance with Campbell, 1996). In addition to the above, we use previously hand-collected data from Carney and Child (2013) to report on board size (number of board members); blockholders (indicating whether a single entity holds more than 10% of outstanding shares); ownership concentration (control rights of the largest owner); and institutional

[9] In our sample, it is never the case that foreign politicians (from within East Asia) fill domestic board positions.

[10] We identify political ties for 4% of sample firms, while Faccio (2006) identifies political ties for 5% of firms across the same set of countries.

[11] In a strict sense, the set $\{\mathbf{D}^p, \mathbf{D}^s, \mathbf{D}^f, \mathbf{D}^o\}$ is not a pure decomposition of $\mathbf{D}$ because $p_i$, $s_i$, and $f_i$ are not mutually exclusive indicators.

[12] Year of establishment is unavailable for some countries in our sample, so we opt instead for the listing date as a proxy for firm age.

**Table 2**
Networks across East Asia.

| Country | N | Board network | | | Family network | | | State network | | | Political network | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | mean | SD | max | mean | SD | max | mean | SD | max | mean | SD | max |
| Hong Kong | 133 | 5.12 | 6.1 | 33 | 2.62 | 4.51 | 26 | 1.00 | 1.41 | 6 | 0.67 | 1.37 | 6 |
| Indonesia | 169 | 1.64 | 3.31 | 23 | 0.95 | 2.64 | 17 | 0.14 | 0.38 | 2 | 0.22 | 1.09 | 9 |
| Japan | 126 | 1.84 | 2.33 | 15 | 0.07 | 0.42 | 3 | 0.09 | 0.31 | 2 | 0.00 | 0.00 | 0 |
| South Korea | 133 | 2.5 | 2.8 | 21 | 1.09 | 1.37 | 6 | 0.15 | 0.40 | 2 | 0.02 | 0.15 | 1 |
| Malaysia | 281 | 7.35 | 6.61 | 37 | 1.07 | 1.94 | 8 | 2.15 | 3.09 | 18 | 0.36 | 0.74 | 5 |
| Philippines | 98 | 8.52 | 8.91 | 38 | 5.33 | 6.16 | 21 | 0.71 | 1.59 | 10 | 0.20 | 0.81 | 6 |
| Singapore | 116 | 3.52 | 3.24 | 15 | 0.59 | 1.66 | 12 | 1.28 | 2.40 | 11 | 0.57 | 1.90 | 14 |
| Taiwan | 107 | 1.6 | 2.22 | 12 | 0.21 | 1.11 | 7 | 0.14 | 0.46 | 3 | 0.00 | 0.00 | 0 |
| Thailand | 127 | 5.11 | 5.04 | 23 | 1.58 | 3.15 | 19 | 0.73 | 1.99 | 11 | 0.29 | 1.16 | 8 |

Data are for 1290 firms across nine East Asian economies. All network data are assembled by the authors, and are cross-sectional for 2008. Table reports country-level statistics on board networks, family networks, state networks, and political networks. Minimum values are everywhere 0. *board network* counts the amount of board/executive interlocks. *Political network* counts the amount of board/executive interlocks with politically-connected firms. *Family network* counts the amount of board/executive interlocks with family-controlled firms. *State network* counts the amount of board/executive interlocks with state-owned firms.

**Table 3**
Network correlations.

| | board network | political network | family network |
|---|---|---|---|
| Political network | 0.3300* | | |
| Family network | 0.7417* | 0.3021* | |
| State network | 0.2665* | 0.2620* | 0.0872* |

Reported numbers are Pearson correlations (* means significant at the 1% level). Data are for the 1290 firms for which network data are available across all networks. *Board network* counts the amount of board/executive interlocks. *Political network* counts the amount of board/executive interlocks with politically-connected firms. *Family network* counts the amount of board/executive interlocks with family-controlled firms. *State network* counts the amount of board/executive interlocks with state-owned firms.

ownership (percentage of shares held by financial institutions). All monetary values are expressed in terms of USD. Accounting measures and volatility are winsorized at the 1% and 99% levels.

## 3. Performance implications of board networks

### 3.1. Networks and accounting performance

Throughout this section we operationalize firm performance as quarterly ROA. Our composite board network measure is degree centrality, ultimately decomposed into family networks, state networks, political networks, and other networks. Following Lins et al. (2017), the crisis period we examine includes Q4 2008 and Q1 2009. This period directly follows the collapse of Lehman Brothers on September 15th 2008. Since the crisis arrived as a shock, our identification suffers less from selection bias. For example, it is not intuitive that firms ex-ante select their board networks on the basis of crisis-performance. However, board networks may well be selected on traits correlated with crisis performance (e.g. regular performance). Throughout this section we hope to allay such concerns; additional threats to identification are addressed in section five and an online appendix.

#### 3.1.1. Cross-sectional model

To understand the correlation between firm performance and board networks during the global financial crisis, we first report simple bivariate regressions for Q4 2008 (the hardest-hit quarter).[13] For ease of interpretation, we include country-industry fixed effects. We thus examine whether networked firms enjoyed higher performance during the global financial crisis than non-networked country-industry counterparts. The statistical model we estimate in Table 4 is:

$$y_{ijk} = \beta N_{ijk} + \gamma_{jk} + \varepsilon_{ijk}$$

In this specification, ROA ($y$) of firm $i$ in industry $j$ of country $k$ is determined only by the network measure ($N$) and the country-industry effect ($\gamma$). The network measure $N$ alternates across columns 1–5 between degree centrality and its various subcomponents ($N \in \{\mathbf{D}, \mathbf{D}^f, \mathbf{D}^s, \mathbf{D}^p, \mathbf{D}^o\}$).

The first column of Table 4 shows firm performance during the 2008 crisis strongly positively correlates with board network

[13] Results are similar for Q1 2009.

**Table 4**
Firm performance and board networks.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| Board network | 0.0800*** | | | | | | | |
| | (0.0274) | | | | | | | |
| Family network | | 0.0927* | | | | 0.0890* | 0.108* | 0.163** |
| | | (0.0473) | | | | (0.0504) | (0.0606) | (0.0820) |
| State network | | | 0.744** | | | 0.668** | 1.616** | 2.797*** |
| | | | (0.290) | | | (0.295) | (0.644) | (0.746) |
| Political network | | | | −0.0160 | | −0.103 | −0.0488 | −0.119 |
| | | | | (0.136) | | (0.148) | (0.167) | (0.236) |
| Other network | | | | | 0.0888** | 0.0708* | 0.0701 | 0.0330 |
| | | | | | (0.0388) | (0.0399) | (0.0506) | (0.0559) |
| Network controls | | | | | | | √ | √ |
| Firm controls | | | | | | | | √ |
| Observations | 1178 | 1178 | 1178 | 1178 | 1178 | 1178 | 1033 | 753 |
| R-squared | 0.192 | 0.189 | 0.191 | 0.186 | 0.190 | 0.196 | 0.202 | 0.336 |

Data are for 1178 firms spread across nine East Asian countries. Financial indicators come from Worldscope and Datastream. Network data are assembled by the authors. Dependent variable is quarterly return on assets (ROA), expressed in percentage points. Explanatory variables are various measures of networks (defined in Sections 2.1–2.3). In column 7, we additionally control for network controls: state ownership, family ownership, and political connections. In column 8, we additionally control for other firm characteristics (listed in Section 3.1.1). Data are cross-sectional for the fourth quarter of 2008 - the crisis period following the collapse of Lehman Brothers. All specifications include country-industry fixed effects. The standard errors reported in parentheses are clustered by country-industry (***$p < 0.01$, **$p < 0.05$, *$p < 0.1$).

centrality. Columns 2–5 decompose board networks into the various subcomponents (i.e. network interactions). Performance is positively correlated with board connections to family, state, and ordinary firms. Because these network dimensions are interrelated (see Table 3), we include them together in column 6 (formally, $N$ becomes the vector $[D^f, D^s, D^p, D^o]$). Again we find a similar relationship. But the estimates in column 6 are likely subject to omitted variable bias. Obvious sources of confound include family control, state ownership, and political ties. A state-owned company is likely to have interlocking directorates with other SOEs (correlation 0.61), and the same logic extends to family business groups (correlation 0.56) and politically connected firms (correlation 0.37). Accordingly, in column 7 we include a vector of controls, $X_{ijk}$, capturing state ownership, family control, and political ties (hereafter referred to as network controls). The estimated model takes the form:

$$y_{ijk} = \beta N_{ijk} + \psi X_{ijk} + \gamma_{jk} + \varepsilon_{ijk}$$

When including network controls, family and state networks remain positively correlated with crisis performance, but ordinary board networks are no longer significant. Other firm characteristics may also drive crisis-performance and be correlated with board networks. Following related work by Anderson and Reeb (2003), Gorton and Rosen (1995), Dass et al. (2014), Erkens et al. (2012), Adams et al. (2004), Masulis and Mobbs (2011), Jensen (1986), and De Jong (2002), we control for: firm age; firm size; board size; institutional ownership; blockholders; ownership concentration; return volatility; leverage; tangible assets; liabilities; and cash.[14]

Adding the aforementioned controls to the vector $X_{ijk}$, we estimate a more flexible model in column 8. Family networks and state networks are highly correlated with crisis performance, and coefficient magnitudes are larger under this controlled specification. But because our sample size has also declined in column 8 (due to missing control data) we cannot determine whether changes in effect sizes/significance are due to improved precision or sample selection. Overall, however, these results suggest observable firm characteristics are unlikely to explain the performance differential between firms with strong networks and those without.

### *3.1.2. Dynamic model*

In the preceding section we show crisis performance is strongly correlated with board networks, and board connections to family and state-owned firms in particular. We also provide evidence that board networks are not proxying for omitted firm characteristics. An important remaining question is whether these correlations are restricted to the crisis period. To the extent that board networks and performance are correlated over time, our argument against selection deteriorates. We claim crisis-performance alone is unlikely to determine a firm's network established prior to the crisis. But regular firm performance is harder to rule out as a potential selection criterion. If regular performance is correlated with crisis-performance, and we focus exclusively on the crisis period, we would misinterpret our results as causal when they could be rooted in selection.

To address this concern we invoke a dynamic model with a 2-year sample starting from Q2 2007. Following Lins et al. (2017), Q4 2008 and Q1 2009 form our crisis period. All preceding quarters comprise the benchmark. We are interested in crisis-contingent effects - the interaction term between networks and the crisis. A general network effect introduces a performance wedge between networked and non-networked firms during non-crisis periods. That wedge may be attributable to selection effects. The crisis-contingent network effect captures the magnitude of increase in that wedge during the crisis. That increase is net of selection on time-invariant characteristics. We control for country-industry, and allow for country-industry shocks during the crisis period. This rules

[14] Refer to Section 2.4 for precise definitions of our control variables.

out the explanation that networked firms happen to be concentrated in country-industries relatively unscathed by the crisis. Moreover, we explicitly control for firm performance over the preceding eight quarters to capture any time-varying performance-related selection into treatment. We include time period dummies to net out common time shocks. To account for interdependencies, standard errors are clustered at the country-industry level.[15] The panel model we estimate is:

$$y_{ijkt} = \beta N_{ijk} C_t + \omega N_{ijk} + \alpha_{jk} C_t + \gamma_{jk} + \rho y_{ijk,t-} + \delta_t + \varepsilon_{ijkt} \quad (1)$$

where $C$ is a crisis dummy indicating whether period $t$ is either Q4 2008 or Q1 2009. Hence, we allow both the network effects and the country-industry effects to vary during the crisis. It is the effects captured in β which are of primary interest.

The first column of Table 5 suggests the performance of firms with strong board networks was buoyed following the collapse of Lehman Brothers. Even in comparison to country-industry counterparts with similar performance trajectories, firms with strong board networks fared better. During regular periods of economic activity, however, there is no performance differential between firms with strong and weak board networks (conditional on a strict set of controls). To understand which types of board connections yield benefits during the crisis, we next unpack our composite board network measure into its constituent parts. In columns 2–5 the board network measure alternates between various types of network interactions. Similar to our cross-sectional results, we find the beneficial impacts to be concentrated in family and state networks. In column 6 we include all networks simultaneously. Again we find state and family networks to be the strongest determinants of crisis performance. Because of the aforementioned correspondence between family control and family networks; between state ownership and state networks; and between political ties and political networks; in column 7 we extend our model to account for the network controls.

$$y_{ijkt} = \beta N_{ijk} C_t + \omega N_{ijk} + \psi X_{ijk} C_t + \zeta X_{ijk} + \alpha_{jk} C_t + \gamma_{jk} + \rho y_{ijk,t-} + \delta_t + \varepsilon_{ijkt} \quad (2)$$

The network controls in $X_{ijk}$ are also interacted with the crisis dummy, to allow for crisis-specific shocks. The effects we detect are thus marginal effects beyond any direct performance implications of such characteristics (in or out of crises).[16] Our results are robust to this flexible panel model. Our final column 8 adds to $X_{ijk}$ the firm controls described in the preceding section. Again, our results remain robust to this flexible specification.[17] During the crisis period, a one-standard-deviation increase to family network size implied a 0.57 percentage point boost to quarterly ROA (relative to a crisis mean and standard deviation of 0.50% and 4.7%, respectively). By comparison, a one-standard-deviation increase to the size of state networks yielded a 3.2 percentage point increase in quarterly ROA.

### 3.2. Networks and stock returns

In the preceding section we demonstrate accounting performance was buoyed by family and state networks during the global financial crisis. To determine whether financial markets value board access to family and state-owned firms, we next examine the impact of network interactions on stock performance (i.e. raw returns, following Lins et al., 2017). To this end we estimate the following model:

$$y_{ijkt} = \beta N_{ijk} C_t + \omega N_{ijk} + \alpha_{jk} C_t + \gamma_{jk} + \delta_t + \varepsilon_{ijkt} \quad (3)$$

where the outcome $y$ is average daily stock returns, measured each month ($t$) and expressed in percentage points. We again allow for level-shifts in country-industry effects (γ) during the crisis and, as before, β is our coefficient of interest. Standard errors are clustered at the country-industry level.

In column 1 of Table 6 we first estimate the general impact of board networks on stock performance. We find the effect to be positive and significant during the crisis. Next, in columns 2–5 we unpack that effect into the various network subtypes. As with accounting performance, we find the positive impact on financial performance to be driven by family and state networks. Including all network interactions at once in column 6 yields a similar result. In column 7 we condition the estimates on crisis-contingent network controls and find our results robust. Finally, in column 8 we include a vector of firm controls deemed important in earlier research: firm size (Dass et al., 2014); return volatility (Goyal and Santa-Clara, 2003); leverage and return on equity (Jensen, 1986; De Jong, 2002; Acemoglu et al., 2016). In this final specification we again find family and state networks to be robust determinants of stock performance during the crisis.

On average our sample firms incurred a one-third percentage point decline in daily stock returns during the crisis (relative to pre-crisis means). Our estimates from column 8 therefore suggest a one-standard-deviation increase to the size of state networks

[15] Because firm clusters are nested within country-industry clusters, it is not surprising our results are robust to firm-level clusters. With only nine countries, it is inadvisable to cluster over so few (unbalanced) clusters (Cameron and Miller, 2015).

[16] As a point of theoretical interest, the net impacts of family group affiliation, state ownership, and political connections during the crisis are typically indistinguishable from zero in our setting. This may be due to costs of association outweighing benefits during the crisis, or adverse selection during periods of regular economic activity.

[17] Notably, we find no evidence that board networks influence performance outside of the crisis. At first glance this may appear inconsistent with the findings of Larcker et al. (2013), but the latter results are identified using within-firm variation in boardroom centrality. Our network effects remain poorly identified during periods of regular economic activity, as we rely on the crisis shock to introduce environmental conditions in which the beneficial features of board networks become salient. Accordingly, our documented effects of board networks on firm performance are truly conditional on this period of high uncertainty and financial dislocation.

**Table 5**
Impact of board networks on crisis performance.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| Board network × crisis | 0.0313** | | | | | | | |
| | (0.0127) | | | | | | | |
| Family network × crisis | | 0.0614*** | | | | 0.0589*** | 0.0517** | 0.182* |
| | | (0.0209) | | | | (0.0209) | (0.0255) | (0.0941) |
| State network × crisis | | | 0.379** | | | 0.363** | 0.558*** | 1.591** |
| | | | (0.155) | | | (0.150) | (0.191) | (0.628) |
| Political network × crisis | | | | 0.0585 | | −0.0433 | −0.0202 | −0.0675 |
| | | | | (0.0688) | | (0.0651) | (0.0664) | (0.115) |
| Other network × crisis | | | | | 0.00551 | −0.000200 | −0.00360 | 0.0225 |
| | | | | | (0.0196) | (0.0206) | (0.0285) | (0.0258) |
| Board network | 0.00258 | | | | | | | |
| | (0.00600) | | | | | | | |
| Family network | | 0.00693 | | | | 0.00373 | 0.0146 | 0.0816** |
| | | (0.00950) | | | | (0.0108) | (0.0150) | (0.0395) |
| State network | | | −0.000602 | | | −0.0106 | −0.130 | 0.0786 |
| | | | (0.158) | | | (0.158) | (0.231) | (0.371) |
| Political network | | | | 0.0283 | | 0.0297 | 0.0449 | −0.0493 |
| | | | | (0.0245) | | (0.0301) | (0.0295) | (0.0620) |
| Other network | | | | | −0.00153 | −0.000565 | −0.00248 | −0.0286 |
| | | | | | (0.00602) | (0.00669) | (0.0101) | (0.0233) |
| Network controls | | | | | | | √ | √ |
| Firm controls | | | | | | | | √ |
| Observations | 6990 | 6990 | 6990 | 6990 | 6990 | 6990 | 5914 | 4452 |
| R-squared | 0.554 | 0.554 | 0.553 | 0.554 | 0.553 | 0.555 | 0.573 | 0.235 |

Data are for 1178 firms spread across nine East Asian countries. Financial indicators come from Worldscope and Datastream. Network data are assembled by the authors. Dependent variable is quarterly return on assets (ROA) expressed in percentage points. Explanatory variables of interest are various measures of networks (defined in Sections 2.1–2.3), interacted with the crisis period to capture the crisis-contingent network effect. Network data are cross-sectional for 2008. In column 7, we additionally control for network controls: state ownership, family ownership, and political connections and their interaction terms with the crisis period. In column 8, we additionally control for other firm characteristics (listed in Section 3.1) and their interaction terms with the financial crisis period. Observations run from second quarter 2007 until first quarter 2009, leaving a panel of eight quarters. All specifications include country-industry fixed effects, as well as crisis-period country-industry shocks. Each specification contains eight quarterly lags of the dependent variable. The standard errors reported in parentheses are clustered by country-industry (***$p < 0.01$, **$p < 0.05$, *$p < 0.1$).

cushioned that decline by more than one-half.[18] A standard-deviation increase to family networks offset the negative crisis shock by approximately 7%. Earlier work establishes that director networks generate equity value (Larcker et al., 2013), also during times of distress (Dass et al., 2014). Our results add to this knowledge by demonstrating higher crisis-period stock returns for firms with state and family networks. Meanwhile, some scholars have associated the onset of state ownership and family control with greater shareholder value (Bunkanwanicha et al., 2013; Karolyi and Liao, 2017). Our results suggest part of that value may be captured even through *indirect* board association with state- and family-owned groups.

### 3.3. Political networks and institutions

Earlier work has found political connections to be valuable in emerging economies (e.g., Fisman, 2001; Faccio, 2006). Conducting business in that context can be challenging because of the prevalence of institutional voids (Khanna and Palepu, 1997). Such voids inhibit the spread of information; intermediaries responsible for verifying, disseminating, and analyzing financial information (e.g., accounting firms, credit rating agencies, and banks) are either absent or ineffective. Moreover, in environments with insecure property rights, disclosing information about financial performance can make a firm vulnerable to predatory behavior by other actors (Durnev et al., 2009), with negative implications likely magnified in times of uncertainty. To alleviate the above risks in emerging markets, political connections can protect firms from exploitation and grant privileged access to information and resources. Thus, political networks may also prove more valuable in weak institutional environments. To assess whether institutional development moderates the benefits of political networks, we allow their impact to vary across three institutional factors: GDP per capita, investor protections, and financial development.[19] For each measure of institutional development we define a binary variable, $I_k$, indicating whether the value for country $k$ is greater than or equal to the median level of our sample in 2008. In Table 7 we estimate the following model.

[18] Precisely, we multiply the standard deviation of state networks (2.01) and the effect size (0.0936%) to obtain +0.188%, which offsets more than half the average crisis decline.

[19] GDP per capita data are from the IMF World Economic Outlook Database. The investor protection measure is from La Porta et al. (2006), and reflects a combination of liability, disclosure, and antidirector rights. Financial development is based on Rajan and Zingales (1998), and is measured by the ratio of stock market capitalization and domestic credit to GDP.

**Table 6**
Impact of board networks on stock returns.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| Board network × crisis | 0.00414** | | | | | | | |
| | (0.00179) | | | | | | | |
| Family network × crisis | | 0.00734** | | | | 0.00634** | 0.00563* | 0.00724** |
| | | (0.00306) | | | | (0.00301) | (0.00313) | (0.00330) |
| State network × crisis | | | 0.0716*** | | | 0.0683*** | 0.0644** | 0.0936*** |
| | | | (0.0184) | | | (0.0182) | (0.0247) | (0.0289) |
| Political network × crisis | | | | 0.0139 | | 0.000805 | 0.00344 | −0.00880 |
| | | | | (0.0110) | | (0.00914) | (0.0109) | (0.0109) |
| Other network × crisis | | | | | 0.000903 | 0.000190 | −0.00257 | −0.00608* |
| | | | | | (0.00254) | (0.00258) | (0.00348) | (0.00356) |
| Board network | −0.00112 | | | | | | | |
| | (0.00104) | | | | | | | |
| Family network | | −0.00158 | | | | −0.000725 | 0.000986 | 0.00161 |
| | | (0.00131) | | | | (0.00147) | (0.00221) | (0.00242) |
| State network | | | −0.0165 | | | −0.0147 | −0.0164 | −0.0263* |
| | | | (0.0103) | | | (0.00974) | (0.0125) | (0.0141) |
| Political network | | | | −0.00706 | | −0.00499 | −0.00522 | 0.000560 |
| | | | | (0.00453) | | (0.00493) | (0.00462) | (0.00553) |
| Other network | | | | | −0.000271 | −0.000372 | −0.00153 | 0.00131 |
| | | | | | (0.00131) | (0.00142) | (0.00194) | (0.00203) |
| Crisis | −0.137*** | −0.129*** | −0.134*** | −0.123*** | −0.122*** | −0.143*** | −0.123*** | 0.0269 |
| | (0.0234) | (0.0206) | (0.0199) | (0.0209) | (0.0233) | (0.0238) | (0.0254) | (0.115) |
| Network controls | | | | | | | √ | √ |
| Firm controls | | | | | | | | √ |
| Observations | 22,845 | 22,845 | 22,845 | 22,845 | 22,845 | 22,845 | 19,634 | 17,880 |
| R-squared | 0.013 | 0.013 | 0.012 | 0.013 | 0.012 | 0.013 | 0.013 | 0.045 |

Data are for 1178 firms spread across nine East Asian countries. Stock price data come from Datastream. Network data are assembled by the authors. Dependent variable is raw return expressed in proportions. Explanatory variables of interest are various measures of networks (defined in Sections 2.1–2.3), interacted with the crisis period to capture the crisis-contingent network effect. In column 7, we additionally control for network controls: state ownership, family ownership, and political connections, interacted with the crisis period. In column 8, we additionally control for other firm characteristics including ROE, leverage, stock price volatility, firm size and their interaction terms with the financial crisis period. Network data are cross-sectional for 2008. Observations run from February 2007 to March 2009 (inclusive), leaving a panel of twenty-six months. All specifications include country-industry fixed effects, as well as a crisis-period dummy. The standard errors reported in parentheses are clustered by country-industry (***$p < 0.01$, **$p < 0.05$, *$p < 0.1$).

**Table 7**
Political networks and institutional strength.

| | (1) | (2) | (3) |
|---|---|---|---|
| | GDP per capita | Investor Protection | Financial Development |
| Institutions × political network × crisis | −0.177** | −0.221** | −0.234*** |
| | (0.0761) | (0.0897) | (0.0799) |
| Political network × crisis | 0.137** | 0.191** | 0.191*** |
| | (0.0536) | (0.0787) | (0.0691) |
| Institutions × political network | 0.0512 | 0.0707 | 0.0762* |
| | (0.0535) | (0.0434) | (0.0451) |
| Political network | 0.00668 | −0.0150 | −0.0166 |
| | (0.0217) | (0.0197) | (0.0192) |
| Observations | 6990 | 6990 | 6990 |
| R-squared | 0.549 | 0.549 | 0.549 |

Data are for 1178 firms spread across nine East Asian countries. Financial indicators come from Worldscope and Datastream. Network data are assembled by the authors. Dependent variable is quarterly return on assets (ROA) expressed in percentage points. Explanatory variables of interest are links with political firms (defined in Sections 2.1–2.3), interacted with the crisis period to capture the crisis-contingent network effect. We set independent variables (GDP per capita, Investor Protection, Financial Development) to one if it is at or higher than the median value of these nine countries and zero otherwise. Network data are cross-sectional for 2008. Observations run from second quarter 2007 until first quarter 2009, leaving a panel of eight quarters. All specifications include country-industry fixed effects, as well as crisis-period country-industry shocks. Each specification contains eight quarterly lags of the dependent variable. The standard errors reported in parentheses are clustered by country-industry (***$p < 0.01$, **$p < 0.05$, *$p < 0.1$).

$$y_{ijkt} = \beta_0 N_{ijk} C_t + \beta_1 N_{ijk} C_t I_k + \omega_0 N_{ijk} + \omega_1 N_{ijk} I_k + \alpha_{jk} C_t + \gamma_{jk} + \rho y_{ijk,t-} + \delta_t + \varepsilon_{ijkt}$$

Each column of Table 7 invokes a separate measure of institutional development, yet all yield similar results. Political networks significantly boost crisis performance in countries with weak institutions, but that effect dissipates in strong institutional environments.[20] Under weak institutions, a standard-deviation increase to the size of political networks boosted quarterly ROA by 0.14–0.19% during the crisis. Earlier research has documented the value of direct political connections in emerging economies (Fisman, 2001; Faccio, 2006), including during times of crisis (Johnson and Mitton, 2003). Our results add to that literature by documenting the value of *indirect* association to politicians via director interlocks.[21]

## 4. Mechanisms

In this section we test three potential channels through which our different types of network interactions may generate value. The first mechanism concerns the ability of firms to adjust trade credit in relation to accounts payable (Garcia-Teruel and Martinez-Solano, 2010). Trade credit received represents a source of short-term financing which may be used to finance a significant portion of the firm's current assets. Several studies have explained that trade credit provides a higher degree of financial flexibility than bank loans and that it can overcome a variety of financial constraints, such as when credit from financial institutions is not available (Danielson and Scott, 2004; Huyghebaert et al., 2007; Garcia-Teruel and Martinez-Solano, 2010). Firms belonging to a large ownership group (i.e. family- or state-owned firms) will have information regarding a comparatively large volume of sales across many different businesses, expanding the opportunities for the extension of trade credit. Table 8 examines the relation between each type of board network and trade credit during the crisis period.[22] Columns 2 and 4 demonstrate that family and political networks exhibit a significant positive relationship to trade credit. While those effects are not robust to the most flexible model in column 6, we contend this is one possible channel through which benefits are conferred through these networks.

We next explore a debt financing channel (see Lins et al., 2017; Cohn and Wardlaw, 2016; Almeida et al., 2012). Firms with political connections or state ownership may have preferential access to government resources, such as bank credit, and may convey information about government-linked financial institutions that will modify financing arrangements. Financial institutions owned by family groups may also extend financing assistance, but they would be more constrained than a government-linked entity with greater resources and stronger political motivation to stem the impact of a crisis. Stearns and Mizruchi (1993), for example, demonstrate the types of financial institutions represented on a board affect the financing obtained by firms. We explore whether similar effects extend to board networks by examining whether firms with strong networks enjoy a lower cost of debt, and whether firms with high debt maturity draw greater benefits from the network.

In Table 9 we examine whether the benefits of board networks are greater for firms with high levels of debt maturity. We build a firm-level indicator of debt maturity equal to 1 if FY2007 debt maturing within 1 year (i.e. during the crisis) is greater than the sample median. We then test whether this measure moderates the impact of board networks on performance during the crisis.[23] Table 9 shows that high-debt firms with family, state, and political networks exhibit better ROA performance during the crisis. Next, in Table A2 we test whether board networks may reduce the cost of interest on debt during the crisis. We find little evidence in support of this mechanism, suggesting the benefits derived from board networks by high-debt firms do not include directly lower interest rates.

As a final potential channel, director networks may inform firms which businesses are capable of preserving their orders (or even increasing purchases), which would be reflected in a smaller decline in sales growth. Dass et al. (2014) find that firms with directors from related industries better anticipate and navigate sales shocks because they can more effectively manage their inventories. In the

[20] Notably, we find no significant correlation between political networks and firm performance during non-crisis quarters. It is therefore worth repeating our identification strategy does not permit valid inference based on the estimates $\omega_0$ or $\omega_1$ - both net effects subject to selection-based endogeneity.

[21] Taken together, Tables 5 and 7 imply political networks are effective at buffering performance in weak institutional environments, while state networks buoy firm performance in general. This corresponds to a common reliance on patronage networks under weak institutions. For example, private business owners linked to Malaysia's political incumbent Mahathir incurred far lower costs during the 1997 crisis than those allied to the exiled political challenger, Anwar Ibrahim (Johnson and Mitton, 2003). By contrast, state-owned networks are likely to confer benefits regardless of institutional strength (e.g., Singapore and Malaysia SOEs both received state support during the 97 crisis). While the Malaysia episode is a dramatic illustration of the benefits of *direct* political ties under weak institutions, our results are consistent with this narrative.

[22] Throughout Table 8 we control for firm characteristics that have been found to affect trade credit and are potentially correlated with networks. The effects of these potential confounds are also allowed to vary during the crisis. Control variables include cash holdings, investments, purchases, sales (log), and debt maturing within one year (all scaled by total assets). The existence of matching asset liquidity to the maturity of liabilities in a firm is an important factor that positively impacts firm performance in general (Morris, 1976; Myers, 1977). We control for investment in current assets because firms with more investment may require more supplier financing. Following Deloof and Jegers (1999) we control for cash holding. Motivated by Garcia-Teruel and Martinez-Solano (2010), to control for the quantity of credit offered to customers we include cost of goods sold as a proxy for purchases. The broader literature establishes that growth opportunities can reshape financing demands (Deloof and Jegers, 1999; Niskanen and Niskanen, 2006). We therefore control for sales, expecting firms with higher sales to have higher demands for trade credit. Li et al. (2008) document that well-connected firms have better access to external financing, so we control for debt maturity as firms find it difficult to roll over maturing debt, and networks may be more important for these firms and thus increase the usage of trade credit.

[23] Denoting our measure of debt maturity as $M_{ijk}$, the estimated model is: $y_{ijkt} = \beta_0 N_{ijk} C_t + \beta_1 N_{ijk} C_t M_{ijk} + \omega_0 N_{ijk} + \omega_1 N_{ijk} M_{ijk} + \alpha_{jk} C_t + \gamma_{jk} + \psi_0 M_{ijk} C_t + \psi_1 M_{ijk} + \rho y_{ijk,\,t-} + \delta_t + \varepsilon_{ijkt}$

**Table 8**
Networks and trade credit.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Board network × crisis | 0.00182 | | | | | |
| | (0.00190) | | | | | |
| Family network × crisis | | 0.00468** | | | | 0.00132 |
| | | (0.00217) | | | | (0.00984) |
| State network × crisis | | | −0.00759 | | | −0.00603 |
| | | | (0.00841) | | | (0.00917) |
| Political network × crisis | | | | 0.00779** | | 0.00486 |
| | | | | (0.00359) | | (0.0128) |
| Other network × crisis | | | | | 0.00176 | 0.00184 |
| | | | | | (0.00214) | (0.00208) |
| Board network | −0.00278 | | | | | |
| | (0.00195) | | | | | |
| Family network | | −0.00951 | | | | −0.00399 |
| | | (0.00723) | | | | (0.0182) |
| State network | | | 0.0132 | | | 0.0114 |
| | | | (0.0162) | | | (0.0168) |
| Political network | | | | −0.0149 | | −0.0107 |
| | | | | (0.0160) | | (0.0267) |
| Other network | | | | | −0.00231 | −0.00241 |
| | | | | | (0.00225) | (0.00229) |
| Observations | 1374 | 1374 | 1374 | 1374 | 1374 | 1374 |
| R-squared | 0.494 | 0.493 | 0.491 | 0.494 | 0.492 | 0.499 |

Data are for 1178 firms spread across nine East Asian countries. Financial indicators come from Worldscope and Datastream. Network data are assembled by the authors. Trade credit is calculated as accounts payable over assets. Control variables are cash holdings over assets, investment in current assets divided by assets, the purchases over assets, logarithm of sales and debt maturing within one year divided by total assets. Explanatory variables of interest are various measures of networks (defined in Sections 2.1–2.3), interacted with the crisis period to capture the crisis-contingent network effect. Network data are cross-sectional for 2008. Observations run from second quarter 2007 until first quarter 2009, leaving a panel of eight quarters. All specifications include country-industry fixed effects, as well as crisis-period country-industry shocks. Each specification contains eight quarterly lags of the dependent variable. The standard errors reported in parentheses are clustered by country-industry (***$p < 0.01$, **$p < 0.05$, *$p < 0.1$).

context of a crisis, governments may deploy fiscal stimulus measures, and both political and state networks could convey useful information about policy developments. Accordingly, Table A3 tests whether firms with network interactions undergo smaller declines in sales growth during the crisis. We find no evidence in support of this channel.

## 5. Robustness

Thus far we have addressed endogeneity by introducing a dynamic model, employing a strict set of controls, and setting our analysis in the unexpected crisis period. Still, additional challenges to identification persist. An online appendix rules out time-invariant firm-level confounders, and demonstrates insensitivity to country and industry outliers. The present section is reserved for robustness checks of greater theoretical interest: (1) director qualifications as a source of confound; (2) crisis intensity as a moderating factor; and (3) crisis-induced changes to networks.

### 5.1. Director qualifications

Highly-qualified directors likely hold multiple directorships, including those at family and state-owned firms. Meanwhile, qualified directors should be adept at buoying firm performance and navigating financial crises, due to superior monitoring and advising capabilities. Therefore, director qualifications may underlie our main results as an important confounding factor.[24] To acknowledge this type of concern, we collect quarterly data on director qualifications and conduct a number of supplemental tests.

We assemble data on director qualifications based on three firm-level measures from Datastream. The first variable, *skill*, captures the percentage of board members with an industry-specific or financial background. A second measure, *CV*, indicates the total number of board members with publicly disclosed professional backgrounds. A third proxy, *experience*, measures the average tenure of current board members. Unfortunately, the above measures of director qualification are available for only a subsample of 206

[24] For example, consider a qualified director holding board positions at family-owned and widely-held firms. As discussed in Section 1.3.1, the family-owned firm may face tunneling costs during the crisis, muting any monitoring or advising benefits associated with our director. The widely-held firm, by contrast, would only benefit from enhanced monitoring and advising, and would be characterized by family networks due to the connections of the qualified director. In this scenario our analysis would erroneously attribute strong performance of the widely-held firm to family networks, but it would in fact be rooted in director qualifications.

**Table 9**
Debt maturity and network effects.

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Debt maturity × board network × crisis | 0.000157* | | | | |
| | (8.54e-05) | | | | |
| Debt maturity × family network × crisis | | 0.000152** | | | |
| | | (7.05e-05) | | | |
| Debt maturity × state network × crisis | | | 0.00108* | | |
| | | | (0.000601) | | |
| Debt maturity × political network × crisis | | | | 0.000788*** | |
| | | | | (6.16e-05) | |
| Debt maturity × other network × crisis | | | | | −0.000294 |
| | | | | | (0.000304) |
| Board network × crisis | 0.0283 | | | | |
| | (0.0212) | | | | |
| Family network × crisis | | −0.00957 | | | |
| | | (0.0326) | | | |
| State network × crisis | | | 0.251 | | |
| | | | (0.209) | | |
| Political network × crisis | | | | 0.0574 | |
| | | | | (0.0678) | |
| Other network × crisis | | | | | 0.0347** |
| | | | | | (0.0151) |
| Board network | 0.00346 | | | | |
| | (0.0121) | | | | |
| Family network | | 0.0231 | | | |
| | | (0.0174) | | | |
| State network | | | 0.00578 | | |
| | | | (0.225) | | |
| Political network | | | | 0.0512 | |
| | | | | (0.0524) | |
| Other network | | | | | −0.0102* |
| | | | | | (0.00567) |
| Debt maturity × crisis | −0.000828*** | −0.000802*** | −0.000799*** | −0.000824*** | −0.000729*** |
| | (0.000136) | (0.000166) | (0.000163) | (0.000139) | (0.000232) |
| Observations | 5717 | 5717 | 5717 | 5717 | 5717 |
| R-squared | 0.547 | 0.547 | 0.547 | 0.547 | 0.546 |

Data are for 1178 firms spread across nine East Asian countries. Financial indicators come from Worldscope and Datastream. Network data are assembled by the authors. Dependent variable is quarterly return on assets (ROA) expressed in percentage points. Explanatory variables of interest are various measures of networks (defined in Sections 2.1–2.3), interacted with the crisis period to capture the crisis-contingent network effect. For each firm, we set debt maturity to one if debt maturing within one year of fiscal year-end 2007 divided by total assets is at or above the 50th percentile for the sample and zero otherwise. Network data are cross-sectional for 2008. Observations run from second quarter 2007 until first quarter 2009, leaving a panel of eight quarters. All specifications include country-industry fixed effects, as well as crisis-period country-industry shocks. Each specification contains eight quarterly lags of the dependent variable. The standard errors reported in parentheses are clustered by country-industry (***$p < 0.01$, **$p < 0.05$, *$p < 0.1$).

firms. Relative to our full sample, this subsample is reasonably balanced along financial and industry characteristics, but Table A4 shows Japanese firms comprise 57% of the subsample. Before checking director qualification as a potential confound, we therefore must re-establish benchmark results for the restricted sample.

Columns 1 of Tables A5-A6 reproduces tests from columns 8 of Tables 5-6, but for the restricted sample of 206 firms. Roughly consistent with results from our full sample, we find state networks to boost ROA, and find both state and family networks to improve stock returns. Political networks actually appear to negatively affect crisis performance in this subsample, however, according to both ROA and stock returns.[25] Relative to the column 1 benchmark, we next explore the confounding role of director qualifications. In columns 2–4 of Tables A5-A6 we add to the benchmark our measures of director qualifications and their interaction with the crisis period. In columns 5 we include all qualification measures simultaneously. Our results suggest director qualifications do not systematically influence ROA or stock returns during the crisis period. Moreover, effect sizes and standard errors of network interactions remain reasonably stable when including director qualifications as a potential confound. Thus, it appears director qualifications do not significantly confound the role of state and family networks, at least within this restricted sample.

For additional reassurance, we conduct further tests on a broader sample of East Asian companies. For 817 out-of-sample firms in

[25] Among these 206 firms, most political connections are identified in Hong Kong and Singapore (comprising 1/4 of the subsample). It is possible that managers in the region overestimated government assistance (based on their 1997 experience), contributing to suboptimal decisions and performance declines. In countries with weak institutions, firms may draw upon political networks for assistance under such conditions. But in countries with strong institutions (e.g., HK and Singapore), such assistance may not be forthcoming.

the region, Datastream offers firm-quarter averages of director qualifications and directors' external corporate affiliations. We regard this *affiliations* measure as a proxy for board networks, and demonstrate its importance for crisis performance. In columns 1 of Tables A7-A8 affiliations are found to significantly improve performance during the crisis period (consistent with the effect of board networks in columns 1 of Tables 5-6). In columns 2–5 we allow for the confounding role of director qualifications, yet the estimated impact of affiliations remains positive and significant across all specifications. Our coefficient of interest remains stable in Table A7, but effect sizes are dampened in Table A8 (where qualifications are also found to boost stock performance).[26] Director qualifications could therefore account for some of the network effects we earlier identify in Table 6. But taken together, the evidence of this section suggests director qualifications are *not* sufficiently important to constitute an alternative interpretation of our main results.

### 5.2. Crisis intensity

During a crisis, family and state owned firms may be compelled to divert resources towards parent companies, while politically connected firms may incur costs helping politicians preserve their rule. We posit that firms with board associations to family, state, or politically connected companies do not have an obligation to transfer resources to external actors. At the same time, such firms will glean information from board associations to help calibrate their crisis response. The value of such information rises as uncertainty in the economic environment escalates - in tandem with the severity of a crisis. So according to our theory, the beneficial effects of network interactions should be stronger for firms located in countries hit harder by the crisis.

To verify whether data support our theory in the above respect, we build five measures of crisis intensity following Lane and Milesi-Ferretti (2011). With data from the IMF World Economic Outlook, we calculate for each economy the crisis-period (2008–09) growth rates of GDP, private consumption, investment, imports, and exports. We then construct binary indicators of *crisis intensity* equal to one if the corresponding growth rate is less than or equal to the sample median, and zero otherwise. In Table A9 we allow for heterogeneous effects of network interactions according to crisis severity. Columns are differentiated by the growth rate upon which crisis intensity is defined. In Sections 3.1 and 3.2, state and family networks were found to be most beneficial to crisis performance in our setting. It is therefore reassuring we find both of these network interactions more impactful in settings characterized by severe crises.

### 5.3. Crisis impact on networks

Our network data is accurate for the end of 2008, but we treat networks as static throughout the sample period (Q2 2007 - Q1 2009). Measurement error therefore constitutes a potential threat to identification. While board composition and ownership structures are persistent, they do in fact change. In the context of our study, such changes could be triggered by the crisis itself, which would imply early observations are mismeasured. If inaccuracies were randomly distributed across firms, this would cause attenuation bias in the regular network effects, and consequent overestimation of (marginally additive) network effects during the crisis. If measurement error were nonrandom, our estimates would be subject to directional bias. In this subsection we therefore endeavor to test whether the crisis meaningfully impacted firm networks.

The absence of time-varying network data is at the core of this issue, so we cannot directly observe whether the crisis altered networks within our sample. For the out-of-sample firms from Section 5.1, however, we can examine the crisis impact on *affiliations* - our time-varying board network proxy. This measure reflects the average number of external affiliations at the board level, so it is subject to change in the event of significant director turnover. In Table A10 we estimate:

$$N_{ijkt} = \beta C_t + \gamma_{jk} + \varepsilon_{ijkt} \tag{4}$$

where $C$ is the crisis indicator, $N$ captures affiliations, $t$ indexes the quarter (between Q2 2007 and Q1 2009), and the fixed effects $\gamma$ vary across columns. In Panel A the network outcome is expressed in level terms; in Panel B it is expressed in first differences (between $t$ and $t-1$); and in Panel C the outcome constitutes a binary indicator for whether any change (positive or negative) occurred. Across all model specifications we find no evidence to suggest the crisis significantly influenced external affiliations of directors. It is therefore unlikely the crisis meaningfully impacted board networks during the crisis (at least for this particular sample).

Beyond board networks, our primary interest regards state networks, family networks, and political networks. To determine whether the crisis altered these networks, we must also examine its impact on ownership structures and political appointments. Practically no elections or transfers of political power occurred during the crisis, so political networks remained as constant as board networks.[27] Ownership structures, on the other hand, are generally subject to greater fluidity. To test whether the crisis affected family and state ownership, we leverage data from Carney et al. (2020) tracing ownership for 238 sample firms between 2000 and

[26] Interestingly, director skill appears to *negatively* influence accounting performance (Table A7) but positively affect stock performance (Table A8). Because a large proportion of companies are family or state-owned, experienced directors are likely to be loyal to the dominant owner rather than outside shareholders. Insofar as a crisis magnifies trade-offs between insiders and outsiders, such loyalty can contribute to the suboptimal allocation of resources, leading in turn to a decline in ROA. At the same time, positive stock performance may be due to mock compliance with the "letter of the law" regarding director qualifications, but not the "spirit of the law" in terms of the abovementioned incentives (Walter, 2008).

[27] Thailand is an exception, with a national election on 15 December 2008. Importantly, Table A13 of the Online Appendix shows that excluding Thailand from our main analysis does not meaningfully affect results.

2009. We estimate a variant of eq. 4 with annual ownership outcomes (defining 2008/09 as the crisis). Similar to Table A10, we estimate the crisis impact on (i) an indicator for family or state blockholders; (ii) the first-difference of that indicator; and (iii) an indicator for whether any change to the presence of family or state blockholders occurred. Just as in Table A10, for each outcome we alternate country, industry, and country-industry fixed effects. In untabulated results we find the crisis to be an insignificant determinant of family and state ownership, across all the above specifications.[28] Taken together, the results of this section suggest family, state, and political networks in East Asia were not meaningfully affected by the crisis.

## 6. Conclusion

This paper introduces a novel concept of board network interactions. By gathering unique data across 1290 East Asian firms, we identify companies with board interlocks to networks characterized by family business groups, state ownership, and political connections. We find stronger crisis performance among companies with board interlocks to family and state-owned firms. Based on several indicators of institutional strength, we find board interlocks to politically connected firms most beneficial when institutions are weak.

Our results are based on data from East Asia, but the prevalence of business networks in other regional contexts makes our findings of general interest. For example, interlocking directorates are commonplace in Latin America (Cardenas, 2014), Europe (Van Veen and Kratzer, 2011) and the United States (Larcker et al., 2013). Faccio (2006) finds widespread evidence of political connections among shareholders and top corporate officers in a study of 47 countries. And Khanna and Yafeh (2007) document the prevalence of family business groups around the world. In effect, wherever these business networks coexist, our findings are of relevance.

From our study we draw some managerial and policy implications. Our findings suggest firm networks can result in higher trade credit, and the benefits of networks are greater under high levels of debt maturity. This implies managers would gain from identifying, cultivating, and maintaining director ties to organizations capable of modifying finance or trade credit arrangements. Policymakers may target firms lacking networks as they are more vulnerable to underperform during a crisis. This is particularly concerning if those firms offer products or services of national strategic importance (e.g., drug manufacturing, financial services). If the government seeks a level playing field, it should ensure equitable access to information on support from regulatory agencies or state-owned organizations. Maximal transparency about which policies or programs are likely to benefit or harm companies/industries in the near future would reduce the disproportionate benefits conferred to firms with access to privileged information via director networks.

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## Appendix A. Appendix

Table A1
Sources for politicians data.

| Country | Sources |
|---|---|
| *Panel A: Parliament Members* | |
| Hong Kong Legislative Council | www.elections.gov.hk/elections/legco2004 |
| Hong Kong Election Committee Members | webb-site.com/dbpub |
| Indonesia | www.mpr.go.id/profil/anggota |
| Japan | www.weblio.jp/wkpja/content |
| South Korea | Source file emailed to us by the National Assembly |
| Malaysia National Assembly | psephos.adam-carr.net |
| Malaysia Senate | www.parlimen.gov.my |
| Philippines House | www.congress.gov.ph/download/archives/mem_14th.pdf |
| Philippines Senate | en.wikipedia.org/wiki/14th_Congress_of_the_Philippines |
| Singapore | www.parliament.gov.sg/history/11th-parliament |

(*continued on next page*)

[28] Interested readers may contact the authors for tabulated results.

Table A1 (*continued*)

| Country | Sources |
|---|---|
| Taiwan | www.ly.gov.tw/en/03_leg/legList.action |
| Thailand | www.senate.go.th/inforcenter/documents/infosection23_1.pdf |
| *Panel B: Ministers* | |
| All countries except Hong Kong | United States Central Intelligence Agency. Various years. Chiefs of State and Cabinet Members of Foreign Governments. Washington, DC. |
| Hong Kong Executive (Secretaries) | webb-site.com/dbpub |

Table A2
Networks and cost of debt.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Board network × crisis | −0.00931* | | | | | |
| | (0.00513) | | | | | |
| Family network × crisis | | −0.00622* | | | | 0.0162 |
| | | (0.00347) | | | | (0.0214) |
| State network × crisis | | | 0.00270 | | | 0.0417 |
| | | | (0.0371) | | | (0.0653) |
| Political network × crisis | | | | −0.225 | | −0.245 |
| | | | | (0.215) | | (0.235) |
| Other network × crisis | | | | | −0.00498 | −0.00693 |
| | | | | | (0.00447) | (0.00475) |
| Board network | 0.000695 | | | | | |
| | (0.00454) | | | | | |
| Family network | | −0.00193 | | | | −0.0206 |
| | | (0.00432) | | | | (0.0209) |
| State network | | | −0.0159 | | | −0.0473 |
| | | | (0.0325) | | | (0.0652) |
| Political network | | | | 0.193 | | 0.214 |
| | | | | (0.213) | | (0.231) |
| Other network | | | | | −0.00401* | −0.00216 |
| | | | | | (0.00239) | (0.00285) |
| Observations | 4461 | 4461 | 4461 | 4461 | 4461 | 4461 |
| R-squared | 0.039 | 0.039 | 0.039 | 0.055 | 0.039 | 0.057 |

Data are for 1178 firms spread across nine East Asian countries. Financial indicators come from Worldscope and Datastream. Network data are assembled by the authors. Dependent variable is interest rate measured by interest expense divided by total debt. Control variables are leverage, firm size, firm age and debt maturing within one year divided by total assets (following Adams et al., 2004; Masulis and Mobbs, 2011; Duchin, Ozbas and Sensoy, 2010; and Harford et al., 2014). Explanatory variables of interest are various measures of networks (defined in Sections 2.1–2.3), interacted with the crisis period to capture the crisis-contingent network effect. Network data are cross-sectional for 2008. Observations run from second quarter 2007 until first quarter 2009, leaving a panel of eight quarters. All specifications include country-industry fixed effects, as well as crisis-period country-industry shocks. Each specification contains eight quarterly lags of the dependent variable. The standard errors reported in parentheses are clustered by country-industry (***$p < 0.01$, **$p < 0.05$, *$p < 0.1$).

Table A3
Networks and sales growth.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Board network × crisis | 0.0501 | | | | | |
| | (0.0756) | | | | | |
| Family network × crisis | | 0.551 | | | | 0.768 |
| | | (0.599) | | | | (0.684) |
| State network × crisis | | | 0.0898 | | | 0.544 |
| | | | (0.415) | | | (0.702) |
| Political network × crisis | | | | −1.703 | | −2.565 |
| | | | | (1.627) | | (1.832) |
| Other network × crisis | | | | | −0.00699 | −0.0363 |
| | | | | | (0.0184) | (0.0377) |
| Board network | −0.0617 | | | | | |
| | (0.0753) | | | | | |

(*continued on next page*)

Table A3 (*continued*)

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Family network | | −0.631 | | | | −0.842 |
| | | (0.633) | | | | (0.711) |
| State network | | | −0.727 | | | −1.441 |
| | | | (0.566) | | | (1.034) |
| Political network | | | | 1.469 | | 2.339 |
| | | | | (1.604) | | (1.723) |
| Other network | | | | | 0.00715 | 0.0118 |
| | | | | | (0.0299) | (0.0301) |
| Observations | 5527 | 4523 | 4523 | 4523 | 4523 | 4523 |
| R-squared | 0.072 | 0.112 | 0.112 | 0.112 | 0.112 | 0.112 |

Data are for 1178 firms spread across nine East Asian countries. Financial indicators come from Worldscope and Datastream. Network data are assembled by the authors. Dependent variable is sales growth. Explanatory variables of interest are various measures of networks (defined in Sections 2.1–2.3), interacted with the crisis period to capture the crisis-contingent network effect. Network data are cross-sectional for 2008. Observations run from second quarter 2007 until first quarter 2009, leaving a panel of eight quarters. All specifications include country-industry fixed effects, as well as crisis-period country-industry shocks. Each specification contains eight quarterly lags of the dependent variable. The standard errors reported in parentheses are clustered by country-industry (***$p < 0.01$, **$p < 0.05$, *$p < 0.1$).

Table A4
Country distributions for full sample and datastream subsample.

| Country | Full Sample | | Datastream Subsample | |
|---|---|---|---|---|
| | Frequency | Percent | Frequency | Percent |
| Hong Kong | 133 | 10.31 | 26 | 12.62 |
| Indonesia | 169 | 13.1 | 5 | 2.43 |
| Japan | 126 | 9.77 | 117 | 56.8 |
| Korea | 133 | 10.31 | 19 | 9.22 |
| Malaysia | 281 | 21.78 | 8 | 3.88 |
| Philippines | 98 | 7.6 | 1 | 0.49 |
| Singapore | 116 | 8.99 | 24 | 11.65 |
| Taiwan | 107 | 8.29 | 3 | 1.46 |
| Thailand | 127 | 9.84 | 3 | 1.46 |
| Total | 1290 | 100 | 206 | 100 |

This table reports distributions for our main sample of firms ($N = 1290$) and the Datastream subsample ($N = 206$). Datastream subsample consists of all sample firms for which director qualifications data are available.

Table A5
Director qualifications, networks, and ROA.

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Family network × crisis | 0.0274 | 0.0295 | 0.0250 | 0.0302 | 0.0346 |
| | (0.0407) | (0.0405) | (0.0431) | (0.0406) | (0.0435) |
| State network × crisis | 0.821* | 0.778* | 0.694* | 0.825* | 0.674* |
| | (0.454) | (0.449) | (0.385) | (0.458) | (0.396) |
| Political network × crisis | −0.190* | −0.188* | −0.120 | −0.188* | −0.103 |
| | (0.107) | (0.106) | (0.0758) | (0.107) | (0.0746) |
| Other network × crisis | −0.0368 | −0.0423 | −0.0149 | −0.0349 | −0.0142 |
| | (0.0313) | (0.0345) | (0.0331) | (0.0327) | (0.0365) |
| Skill × crisis | | 3.324 | | | 10.41 |
| | | (6.609) | | | (10.27) |
| Skill | | 5.282* | | | 5.940* |
| | | (2.810) | | | (3.495) |
| Experience × crisis | | | 24.48 | | 12.75 |
| | | | (28.75) | | (27.10) |
| Experience | | | −3.679 | | −11.98 |
| | | | (20.98) | | (25.24) |
| cv × crisis | | | | −43.50* | −84.71 |
| | | | | (24.23) | (55.73) |
| cv | | | | −5.567 | −0.757 |
| | | | | (8.129) | (19.23) |

(*continued on next page*)

Table A5 (*continued*)

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Network controls | √ | √ | √ | √ | √ |
| Firm controls | √ | √ | √ | √ | √ |
| Observations | 1352 | 1153 | 990 | 1347 | 907 |
| R-squared | 0.758 | 0.760 | 0.748 | 0.759 | 0.752 |

Data are for 206 firms across nine East Asian economies. Financial indicators and director qualifications data are from Worldscope and Datastream. Network data are assembled by the authors. Dependent variable is quarterly return on assets (ROA) expressed in percentage points. Explanatory variables of interest are various measures of networks (defined in Sections 2.1–2.3) and director qualifications (including *skill*, *CV*, and *experience*), interacted with the crisis period. *Skill*: percentage of board members who have either an industry-specific or a strong financial background. *cv*: total number of board members with publicly disclosed professional backgrounds. *Experience*: average number of years each board member has been on the board. Observations run from second quarter 2007 until first quarter 2009, leaving a panel of eight quarters. We suppress network and firm controls to save space. All specifications include country-industry fixed effects, as well as crisis-period country-industry shocks. Each specification contains eight quarterly lags of the dependent variable. The standard errors in parentheses are clustered by country-industry (***$p < 0.01$, **$p < 0.05$, *$p < 0.1$).

Table A6
Director qualifications, networks, and stock returns.

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Family network × crisis | 0.0182*** | 0.0172*** | 0.0198*** | 0.0187*** | 0.0201*** |
| | (0.00587) | (0.00586) | (0.00651) | (0.00587) | (0.00606) |
| State network × crisis | 0.0817** | 0.0778** | 0.0732* | 0.0846** | 0.0739* |
| | (0.0382) | (0.0382) | (0.0388) | (0.0385) | (0.0400) |
| Political network × crisis | −0.0286** | −0.0298** | −0.0309** | −0.0277** | −0.0324** |
| | (0.0118) | (0.0120) | (0.0138) | (0.0117) | (0.0132) |
| Other network × crisis | −0.00634 | −0.00917 | −0.00734 | −0.00585 | −0.0111 |
| | (0.00566) | (0.00639) | (0.00765) | (0.00561) | (0.00832) |
| Skill × crisis | | 0.308 | | | 0.106 |
| | | (0.652) | | | (1.015) |
| Skill | | 0.0340 | | | 0.232 |
| | | (0.209) | | | (0.244) |
| Experience × crisis | | | 5.079 | | 5.762 |
| | | | (3.844) | | (3.633) |
| Experience | | | −1.975 | | −2.721 |
| | | | (1.784) | | (1.880) |
| cv × crisis | | | | −2.413 | −3.851 |
| | | | | (1.695) | (3.449) |
| cv | | | | −1.033 | 0.486 |
| | | | | (0.792) | (2.579) |
| Network controls | √ | √ | √ | √ | √ |
| Firm controls | √ | √ | √ | √ | √ |
| Observations | 4081 | 3411 | 2972 | 4057 | 2641 |
| R-squared | 0.075 | 0.071 | 0.074 | 0.076 | 0.073 |

Data are for 206 firms across nine East Asian economies. Stock price and director qualifications data are from Datastream. Network data are assembled by the authors. Dependent variable is average daily stock returns. Explanatory variables of interest are various measures of networks (defined in Sections 2.1–2.3) and director qualifications (including *skill*, *CV*, and *experience*), interacted with the crisis period. *Skill*: percentage of board members who have either an industry-specific or a strong financial background. *cv*: total number of board members with publicly disclosed professional backgrounds. *Experience*: average number of years each board member has been on the board. Control variables are firm characteristics including ROE, leverage, stock price volatility and firm size. Network data are cross-sectional for 2008. Observations run from February 2007 to March 2009 (inclusive), leaving a panel of twenty-six months. We suppress network and firm controls to save space. All specifications include country-industry fixed effects, as well as a crisis-period dummy. The standard errors in parentheses are clustered by country-industry (***$p < 0.01$, **$p < 0.05$, *$p < 0.1$).

Table A7
Director qualifications, corporate affiliations, and ROA.

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Affiliations × crisis | 0.531** | 0.503* | 0.510* | 0.532** | 0.522* |
| | (0.259) | (0.278) | (0.258) | (0.258) | (0.281) |
| Affiliations | 0.00259 | 0.00200 | 0.00316 | 0.00255 | 0.00269 |
| | (0.00214) | (0.00203) | (0.00220) | (0.00214) | (0.00204) |
| Skill × crisis | | −17.43* | | | −10.92 |
| | | (9.263) | | | (9.823) |
| Skill | | 0.691 | | | 3.170 |
| | | (9.494) | | | (9.845) |
| Experience × crisis | | | −194.8*** | | −182.4*** |
| | | | (43.75) | | (43.58) |
| Experience | | | −50.39 | | −68.11* |
| | | | (42.48) | | (40.74) |
| cv × crisis | | | | −0.839 | −13.92 |
| | | | | (50.58) | (52.00) |
| cv | | | | 42.23 | 45.66 |
| | | | | (41.82) | (43.36) |
| Observations | 3509 | 3330 | 3470 | 3505 | 3290 |
| R-squared | 0.421 | 0.420 | 0.426 | 0.421 | 0.426 |

Data are for 734 firms across nine East Asian economies. Data come from Worldscope and Datastream. Dependent variable is quarterly return on assets (ROA) expressed in percentage points. Explanatory variables of interest are corporate *affiliations* and director qualifications (including *skill*, *CV*, and *experience*), interacted with the crisis period. *Skill*: percentage of board members who have either an industry-specific or a strong financial background. *cv*: total number of board members with publicly disclosed professional backgrounds. *Experience*: average number of years each board member has been on the board. Observations run from second quarter 2007 until first quarter 2009, leaving a panel of eight quarters. All specifications include country-industry fixed effects, as well as crisis-period country-industry shocks. Each specification contains eight quarterly lags of the dependent variable. The standard errors in parentheses are clustered by country-industry (***$p < 0.01$, **$p < 0.05$, *$p < 0.1$).

Table A8
Director qualifications, corporate affiliations, and stock returns.

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Affiliations × crisis | 0.0341*** | 0.0165*** | 0.0153*** | 0.0124*** | 0.00980*** |
| | (0.00610) | (0.00441) | (0.00433) | (0.00456) | (0.00366) |
| Affiliations | −0.00310** | −0.00130 | −0.000687 | −0.000581 | −0.000290 |
| | (0.00123) | (0.00111) | (0.00129) | (0.00105) | (0.00117) |
| Skill × crisis | | 0.433*** | | | 0.129 |
| | | (0.0534) | | | (0.108) |
| Skill | | 0.154*** | | | 0.195*** |
| | | (0.0437) | | | (0.0465) |
| Experience × crisis | | | 3.665*** | | 1.432** |
| | | | (0.507) | | (0.703) |
| Experience | | | −0.691*** | | −0.442* |
| | | | (0.244) | | (0.253) |
| cv × crisis | | | | 3.231*** | 1.726** |
| | | | | (0.385) | (0.721) |
| cv | | | | −0.102 | −0.137 |
| | | | | (0.268) | (0.284) |
| Observations | 17,070 | 17,018 | 16,914 | 17,044 | 16,836 |
| R-squared | 0.018 | 0.022 | 0.021 | 0.022 | 0.023 |

Data are for 720 firms across nine East Asian economies. Data come from Datastream. Dependent variable is average daily stock returns. Explanatory variables of interest are corporate *affiliations* and director qualifications (including *skill*, *CV*, and *experience*), interacted with the crisis period. *Skill*: percentage of board members who have either an industry-specific or a strong financial background. *cv*: total number of board members with publicly disclosed professional backgrounds. *Experience*: average number of years each board member has been on the board. Control variables are firm characteristics including ROE, leverage, stock price volatility and firm size. Network data are cross-sectional for 2008. Observations run from February 2007 to March 2009 (inclusive), leaving a panel of twenty six months. All specifications include country-industry fixed effects, as well as a crisis-period dummy. The standard errors reported in parentheses are clustered by country-industry (***$p < 0.01$, **$p < 0.05$, *$p < 0.1$).

Table A9
Crisis intensity moderating the impact of networks on firm performance.

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | GDP | consumption | investment | import | export |
| Family network × crisis × crisis intensity | 0.0461** | 0.0846** | 0.0406 | 0.0786* | 0.00171 |
| | (0.0179) | (0.0424) | (0.0422) | (0.0428) | (0.0408) |
| State network × crisis × crisis intensity | 0.0323** | 0.0667*** | 0.0404** | 0.0446*** | 0.0476*** |
| | (0.0151) | (0.0177) | (0.0174) | (0.0129) | (0.0121) |
| Political network × crisis × crisis intensity | 0.0675 | 0.206* | 0.0694 | 0.0500 | 0.115 |
| | (0.145) | (0.113) | (0.188) | (0.152) | (0.127) |
| Other network × crisis × crisis intensity | −0.0449 | −0.0698* | −0.0340 | −0.0802 | −0.00743 |
| | (0.0327) | (0.0362) | (0.0520) | (0.0489) | (0.0420) |
| Family network × crisis | 0.0438 | 0.0444 | 0.0462 | 0.124* | 0.0348 |
| | (0.0310) | (0.0298) | (0.0424) | (0.0677) | (0.0403) |
| State network × crisis | 0.281 | 0.271* | 0.341 | 0.178 | 0.0510 |
| | (0.172) | (0.158) | (0.209) | (0.208) | (0.203) |
| Political network × crisis | −0.0439 | −0.0460 | −0.0461 | −0.0433 | −0.0565 |
| | (0.105) | (0.0537) | (0.168) | (0.0963) | (0.0459) |
| Other network × crisis | −0.0369 | −0.137 | −0.214 | 0.106 | 0.268 |
| | (0.236) | (0.249) | (0.259) | (0.267) | (0.275) |
| Network controls | √ | √ | √ | √ | √ |
| Firm controls | √ | √ | √ | √ | √ |
| Observations | 6990 | 6990 | 6990 | 6990 | 6990 |
| R-squared | 0.550 | 0.550 | 0.550 | 0.550 | 0.550 |

Data are for 1178 firms across nine East Asian economies. Financial indicators come from Worldscope and Datastream. Network data are assembled by the authors. Dependent variable is quarterly return on assets (ROA) expressed in percentage points. We set *crisis intensity* equal to one if the corresponding growth rate (in GDP, private consumption, investment, imports, or exports) is less than or equal to the median growth rate for 2008–09, and zero otherwise. Growth rates are from the IMF World Economic Outlook Database. Observations run from Q2 2007 until Q1 2009, leaving a panel of eight quarters. All specifications include country-industry fixed effects, as well as crisis-period country-industry shocks. Each specification contains eight quarterly lags of the dependent variable. The standard errors reported in parentheses are clustered by country-industry (***$p < 0.01$, **$p < 0.05$, *$p < 0.1$).

Table A10
Crisis impact on corporate affiliations.

| | (1) | (2) | (3) |
|---|---|---|---|
| *Panel A: Levels* | | | |
| Crisis | 0.0210 | 0.00520 | 0.0145 |
| | (0.0136) | (0.0148) | (0.0105) |
| Fixed effect | industry | country | industry × country |
| Observations | 5978 | 5978 | 5978 |
| R-squared | 0.265 | 0.281 | 0.642 |
| *Panel B: Change* | | | |
| Crisis | 0.0258 | 0.0274 | 0.0273 |
| | (0.0194) | (0.0202) | (0.0198) |
| Fixed effect | industry | country | industry × country |
| Observations | 5738 | 5738 | 5738 |
| R-squared | 0.036 | 0.004 | 0.071 |
| *Panel C: Change Indicator* | | | |
| Crisis | 0.178 | 0.177 | 0.182 |
| | (0.170) | (0.168) | (0.173) |
| Fixed effect | industry | country | industry × country |
| Observations | 5738 | 5738 | 5738 |
| R-squared | 0.047 | 0.030 | 0.062 |

Data are for 817 firms across nine East Asian economies. Corporate affiliations data come from Datastream. Dependent variable is a board network proxy - the average number of external corporate affiliations among board members. *Crisis* is a dummy indicator for Q4 2008 and Q1 2009. The estimated model is $N_{ijkt} = \beta\ crisis_t + \text{fixed effect} + \varepsilon_{ijkt}$. Panel A (B) outcome is expressed in terms of levels (first-differences). Panel C outcome is an indicator for whether a change to corporate affiliations took place between *t-1* and *t*. Observations run from second quarter 2007 until first quarter 2009, leaving a panel of eight quarters. Columns are differentiated by the level of fixed effects aggregation. The standard errors reported in parentheses are clustered by country-industry (***$p < 0.01$, **$p < 0.05$, *$p < 0.1$).

## Appendix B. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jcorpfin.2020.101630.

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