Incentive Contracting with Multiple Directorships

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Motivation

- An intriguing feature of the independent outside director market is the multiple directorships.
  - From Riskmetrics, 55.7% directors hold multiple directorships.
- However, little is known about optimal contracting for multiple directorships.

Research Questions

- What is the relation between the number of directorships and incentives (Pay-Performance Sensitivity, PPS) ?
- What is the optimal number of directorships a director chooses to hold?
Summary

- Theoretically, the relation between incentives and the number of directorships is
  - negative when efforts are strongly substitutive;
  - positive when efforts are complementary or slightly substitutive.

- The optimal number of directorships is decreasing in
  - directors’ degree of risk aversion
  - companies’ riskiness
  - the cost of efforts
Common Agency (CA) model

- Only one director (common agent)
- Multiple companies (principals)

Timeline

- At $t=0$, the director determines the number of directorships ($N$)
- At $t=1$, $N$ companies simultaneously offer incentive contracts, i.e. $\{k_i, b_i\}_{i=1}^{N}$
- At $t=2$, the director decides unobservable efforts ($\{m_i\}_{i=1}^{N}$)
- At $t=3$, outputs are realized, and payments occur ($\{b_iy_i + k_i\}_{i=1}^{N}$)
- Linear-Exponential-Normal (LEN) framework
  - Company $i$’s output $y_i = m_i + \epsilon_i$, $\epsilon_i \sim N(0, \sigma^2)$
  - The director has an exponential utility;
    $$CE = E[\sum_{i=1}^{N} (b_i y_i + k_i)] - \frac{1}{2} \gamma \text{Var}[\sum_{i=1}^{N} (b_i y_i + k_i)] - c [m_1^2 + m_2^2 + ... m_N^2 + p (\sum_{i<j} m_i m_j)]$$
  - $p$ captures whether and to what degree efforts are substitutive or complementary
    - **Substitution** ($p > 0$): director has limited time and energy, if he exerts more efforts in company $i$, his marginal cost for efforts on company $j$, is higher
    - **Complementary** ($p < 0$): it is more efficient if the director also works for other companies in the same industry
Theorem

Given the number of directorships, N, the optimal contract offered by each company is

\[ b_i^* = \frac{1}{1 + \frac{(2-p)(2-p+pN)}{(2-2p+pN)} c \gamma \sigma^2 + \frac{p^2(1-N)}{(2-p+pN)(2-2p+pN)}} \]

\[ \forall i = 1, 2...N. \]
Table: Relation between the Number of Directorships and Incentives

<table>
<thead>
<tr>
<th>Case</th>
<th>Competition Effect</th>
<th>Multi-task Effect</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) $p &lt; 0$</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>(2) $p &gt; 0$, small</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>(3) $p &gt; 0$, large</td>
<td>+</td>
<td>-</td>
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</tbody>
</table>

- **Multi-task effect** is the effect when companies cooperate/collude;
- **Competition effect**: because companies compete with each other.
- **Competition effect is always positive**: with more companies, competition is more fierce, leading to higher incentives.
- **Multitask effect**
- If efforts are **complementary** ($p < 0$), with more companies, it’s less costly to induce the agent to work hard, incentives are higher, so the overall effect is **positive**.
- If efforts are **substitutive** ($p > 0$), multi-task effect is **negative**.
  - When $p < p^*$ ($p > p^* > 0$), competition (multi-task) effect dominates, leading to overall positive (negative) relation.
Moreover, the effect of the number of directorships $N$, on incentives $b_i^*$, is decreasing in the degree of substitution $p$, i.e. $\frac{\partial b_i^*}{\partial N} < 0$.

Comparison to other models

- **Special case when $p = 0$**
  - Intuition: efforts are neither substitutive nor complementary, it restores to one-princial one-agent framework ($b_i^* = \frac{1}{1+2c\gamma\sigma^2}$).

- **Multi-task model**
  - No competition effect, so $b_i^*(MT) < b_i^*(CA)$.
  - $\frac{\partial b_i^*(MT)}{\partial N} < 0$ if $p > 0$ and $\frac{\partial b_i^*(MT)}{\partial N} > 0$ if $p < 0$. The cutoff is 0 while that in the common agency model is $p^* > 0$. 
How is the number of directorships determined?

- With more directorships, directors’ payoffs are higher while companies’ profits are lower. Optimal (Maximum) number of directorships is determined by the constraint that a company’s profit is non-negative.

- Optimal number of directorships is decreasing in directors’ degree of risk aversion $\gamma$, companies’ riskiness $\sigma^2$ and cost of efforts $c$.

Then, I treat $N$ as endogenous (function of parameters) and investigate the effect of parameters (directors’ degree of risk aversion $\gamma$, companies’ riskiness $\sigma^2$ and the cost of efforts $c$) on PPS $(\frac{\partial b_i^*}{\partial \gamma} < 0, \frac{\partial b_i^*}{\partial c} < 0, \frac{\partial b_i^*}{\partial \sigma^2} < 0)$. 
Conclusions

- Theoretically, I build a common agency model, and show that the relation between incentives and number of directorships is
  - negative when efforts are strongly substitutive;
  - positive when efforts are complementary or slightly substitutive.

- The optimal number of directorships is decreasing in
  - directors’ degree of risk aversion
  - companies’ riskiness
  - and the cost of efforts

- I also empirically verify some predictions from the model.
Thank you!
The “Hewitt Analysis of outside director compensation” report shows that the compensation for outside directors consists of three parts: (1) annual retainer (2) stocks and stock options (3) payment on attendance of board meetings (becoming less common and negligible).

The average annual retainer is $67,624 while the average value of equities is $68,767. Therefore, performance pay makes up a large part of the total compensation. In the model, I assume directors receive both fixed and performance-based pay.
Outside director vs. independent director

- Theoretically, I do not differentiate between outside directors and independent directors. I focus on directors who can hold multiple directorships.

- Empirically, in RiskMetric’s Directors dataset, directors can have one of the following board affiliations: Insiders/Employees (E), Affiliated Outsiders/Linked (L), or Independent Outsiders (I). I only include the sample of Independent Outsiders (I).

  Independent outside Director (I): No material connection to the company other than a board seat.

Comparative static analysis when N is treated as endogenous

- $\frac{\partial b_i^*}{\partial c} < 0$;
- $\frac{\partial b_i^*}{\partial \gamma} < 0$;
- $\frac{\partial b_i^*}{\partial \sigma^2} < 0$;
Theorem

(Lemma 1) Given $N$ and contracts $\{k_i, b_i\}_{i=1}^N$, optimal efforts are $m_i^* = \frac{1}{c(2-p)(2-p+pN)}[(2 - p + pN) b_i - p \sum_{j \neq i} b_j]$ for all $i = 1, 2...N$.

- If $b_i$ is larger, the director exerts more efforts in firm $i$
- When efforts are substitutive ($p > 0$), larger $b_j$ leads to lower efforts in firm $i$
- When efforts are complementary ($p > 0$), larger $b_j$ leads to higher efforts in firm $i$
- If efforts are less costly (smaller $c$), optimal efforts are higher for every company