Resource Allocation within Firms and Financial Market Dislocation: Evidence from Diversified Conglomerates

Gregor Matvos and Amit Seru (RFS, 2014)

Corporate Finance - PhD Course 2017

Stefan Greppmair, Yannik Schneider
Empirical Observation

- Conglomerate discount is apparent
- EV varies over time and increases with credit risk in the market
- Conglomerates appear to offset dislocations in external capital markets via their internal markets
- Spread between high and low dispersion conglomerates decreases with the credit risk
- Explanation for this could lie within the investment-productivity sensitivity

\[ EV = \log \left( \frac{\text{Firm Value}_{\text{Conglomerate}}}{\text{Firm Value}_{\text{benchmark portf.}}} \right) \]

Let’s quantify this through identifying the forces driving internal capital reallocation!
Driving forces of internal capital allocation

Disentangle the forces that drive the reallocation

**Bright Side** (Stein, 1997)
- Centralized control over internal capital allocation
- Internal capital markets limit exposure to frictions in external capital markets
  - Free allocation of capital inbetween divisions
  - Relatively cheaper borrowing cost

**Dark Side** (Rajan et al., 2000; Scharfstein and Stein 2000)
- Resources are inefficiently allocated from stronger to weaker divisions – “Corporate Socialism”
- Managers value a dollar produced by divisions with above (below) average productivity at less (more) than one dollar
The Theoretical Model

Modeling the managerial utility function

Utility\_t =

\[ \lambda \sum_j (z_{t,j} - z^*) k_{t,j} \]

- Utility is a function of the j divisions in the company
- Several tradeoffs are included in the model:
  - Allocating resources to weak division improves Corporate Socialism but relatively decreases Production
  - Financing via internal or external funds
Recover policy functions from the data, estimating investment and financing choices with a Tobit model (interest lies in the $\beta$ coefficients):

$$I_{ti} = \max(0, Q_2(k_t, z_t, \xi_t, p_t; \beta_i) + \epsilon_{ti}) \quad f_t = Q_2(k_t, z_t, \xi_t, p_t; \beta_f) + \epsilon_{tf}$$

Recover state transition functions from the data to map state variables and choices of period $t$ into state variables of period $t+1$ (which in turn determine policies in period $t+1$ and so forth)

$$k_{t+1,i} = (1 - \delta)k_{t,i} + I_{ti} + \epsilon_{k_{ti}}$$

Estimated coefficients for policy and state transition functions are used in the forward simulation of the second stage of the structural estimation.
1. The Idea

Manager chooses action C because he associates the highest expected utility with it

\[ V(k_t, z_t, p_t, \xi_t; \sigma_C; \theta) > V(k_t, z_t, p_t, \xi_t; \sigma_{\{A,B\}}; \theta) \]

“For every alternative policy A/B/C, I calculate the expected profits. The parameters I have in my head translate expected profit into expected utility for me…since I am smart and rational, I choose the action associated with the highest expected utility”
2. The Real World

- Parameters and alternative policies are unobservable and need to be estimated.
- But based on the previous slide, the observed action is the utility maximizing one in state $s$.

\[ V(k_t, z_t, p_t \xi_t; C; \theta) > V(k_t, z_t, p_t, \xi_t; \sigma_{\{A,B\}}; \theta) \]

- Forward simulate the observed action $C$ and a set of alternative policies (perturbations of $C$) for 1000 different realizations of state $s$ (TED spread, productivity) for 100 years.
- Calculate the expected profits. For a given set of parameters, calculate the expected utility of the true policy and all alternative policies.
- The structural parameters are the ones which minimize profitable deviations from the true policy (= minimize violations of the optimality condition).
3. Implementation

- Parameters $\theta$ can be used to translate the expected profits $W_{tv}$ into expected utility $V_{tv}$ for which the optimality condition holds.

- Structural parameters then minimize the squared deviations from the optimality condition as follows:

$$\hat{\theta} = \min_{\theta} \frac{1}{npns} \sum_{i=1}^{N} (V_t(s; \sigma_n) - V_t(s; \sigma^*))^2 = \min_{\theta} \frac{1}{npns} \sum_{i=1}^{N} (W_t(s; \sigma_n) - W_t(s; \sigma^*))^2 \theta^2$$
Driving forces of internal capital allocation

Disentangle the forces that drive the reallocation

**Bright Side** (parameter for cost of external financing)
- At the median TED spread, average cost of financing amount to 8.6%
- TED shocks affect the cost of external financing in a convex manner
- At the sample maximum of 2%, external financing becomes unprofitable and increases the shadow value of internal funds

**Dark Side** (parameter for corporate socialism)
- Estimate for corporate socialism is 0.69
- Corporate socialism is worse in conglomerates with high productivity dispersion
- Corporate socialism helps to understand the conglomerate discount (at least in the absence of external capital market constraints)
Out of Sample Test - The Financial Crisis

Test the model for the period of the financial crisis

- Forward simulate the model (estimated until 2006)
  - Draw productivity shocks starting in 2008
  - Expose the firms to realized TED values from 2008-2010 to get out-of-sample predictions in this counterfactual exercise
  - Estimate the EV via the present value of cash flows

- Conglomerate Discount decreases as TED spikes and increases when TED drops
  - Conglomerates are able to cushion financial shocks through internal reallocation

- The relative value increase stems from the ability of conglomerates to reallocate resources more efficiently exactly when times are tough
  - Capital expenditures in diversified firms become more sensitive to productivity
  - Socialism relatively less important in times of distress
They respond to the question how resource allocation decision and its driving forces varies among conglomerates
- with differences in productivity diversion
- and how this is related to external capital markets

Their model explicitly allows for corporate socialism as an agency friction which is found to be economically large

They find evidence for a dynamic interaction of bright and dark side of capital markets driven by external credit market conditions

Studying this type of distortions to resource allocation, they provide a link between external credit markets conditions and the productivity & output of an economy