Corporate Governance over the Business Cycle [*]

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June 2003

Abstract

I provide empirical evidence that badly governed firms respond more to aggregate shocks than do well governed firms. A simple model where shareholders' scrutiny increases when business conditions deteriorate can account for this empirical finding. The quantitative analysis suggests that the governance mechanism may explain 30% of aggregate volatility.

[*] I am grateful to Olivier Blanchard and Ricardo Caballero for their insightful supervision, and to Marios Angeletos and Ivan Werning for their help and encouragement. I also benefited from the comments of Daron Acemoglu, Mark Gertler and Bengt Holmström. I thank Manuel Amador, David Bowman, John Faust, Francesco Franco, Augustin Landier, Gordon Phillips, John Reuter, Roberto Rigobon, Bernard Salanie and Michael Woodford, as well as seminar participants at the Federal Reserve Board, the IMF, MIT, Delta and CREST for their comments.

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1 Introduction

I propose a simple model to study the implications of corporate governance for the business cycle, based on the idea that managers tend to expand their firms beyond the profit-maximizing size. What matters for aggregate volatility is whether these deviations from profit maximization are more likely to happen in booms or in recessions, which, in turn, depends on how the relative costs and benefits of monitoring firms' decisions change with the state of the economy. I take the view that the comparative advantage of managers is to come up with new ideas to seize profit opportunities, and that scrutinizing managerial decisions is a time consuming process. Since it is particularly costly to miss a profit opportunity when the demand for the firm's product is high, shareholders are more willing to leave discretionary authority in the hands of managers in good times than in bad times.

I study the implications of these governance conflicts in a standard dynamic macro model with imperfect competition in the goods markets. Imperfect competition is important for two reasons. First, it creates rents over which managers and shareholders can fight. Second, and more importantly, when goods markets are imperfectly competitive, firms are too small relative to the social optimum. In this case, managerial tendencies to increase investment, employment and output are at the same time costly for shareholders and beneficial for the economy[1]. This – together with the proposition that shareholders leave more discretion to managers in good times – implies that corporate governance issues amplify aggregate fluctuations. Quantitative simulations, tightly based on the new empirical evidence presented in section 2, suggest that aggregate volatility would be 30% lower if all firms were always perfectly governed.

This research is related to the microeconomic literature on governance conflicts between managers and shareholders. Jensen (1986) emphasizes the idea that managers tend to expand their firms beyond the profit-maximizing size. On the macroeconomic side, I build on Blanchard and Kiyotaki (1987) and on Rotemberg and Woodford (1992)[2] for the role of imperfect competition, and on Bernanke, Gertler, and Gilchrist (1999) for the implications

[1]On the other hand, other forms of managerial misbehavior, such as stealing and spending on non-productive activities, are socially wasteful.

[2]The empirical finding that markups of prices over marginal costs are counter-cyclical is relevant for my paper because a firm operating on its demand curve can expand its output only by lowering its markup. See Rotemberg and Woodford (1999) for a survey, and Bils and Kahn (2000) for recent evidence.

of …nancial frictions.

Section 2 provides new evidence on the business cycle properties of …rms with di¤erent governance qualities. Section 3 and 4 present the model. Section 5 explains the intuition for the ampli…cation mechanism. Section 6 discusses the calibration method and how it relates to the existing empirical literature about governance con‡icts. Section 7 presents the impulse responses and the simulations of the model. Section 8 concludes. Derivations and technical details are in the appendix.

2 Evidence

Figure 1 shows that …rms with bad governance have lower pro…t margins. The governance data come from the Investor Responsibility Research Center and are based on 24 distinct corporate-governance provisions. Gompers, Ishii, and Metrick (2003) construct an index by adding one for every provision that reduces shareholders rights, so that higher values mean worse governance. The original index ranges from 1 to 17, and I have created 3 groups with cuto¤s at the quantiles 20 and 80. The pro…t margin is the ratio of income to total assets, relative to the average of …rms in the same sector and age group. All details of the construction and sample selection are in the appendix. The di¤erence in pro…t margin between the extreme groups is signi…cant at the 5% level, and the di¤erences with the intermediate group are signi…cant at the 10% level. These results are in line with the ones reported in Gompers, Ishii, and Metrick (2003).

Figure 2 shows that the investment of …rms with bad governance is more cyclical that the investment of …rms with good governance. Aggregate sensitivity is de…ned as the regression coe¢cient (beta) of the growth rate of capital expenditure (for a particular …rm) on the aggregate growth rate of private non-residential investment. Again, the betas are adjusted for sector and age groups. The average beta of …rms in the top 20% of the governance index is 60% higher than the average beta of …rms in the bottom 20%. The di¤erence between the extreme groups is signi…cant at the 1% level, and the di¤erences with the intermediate group are signi…cant at the 10% level.

These results are summarized in Table 1, along with a number of robustness checks. The estimated coe¢cients are essentially the same for the sample of 538 …rms from 1980 to 2001 and for the sample of 1030 firms from 1990 to 2001. This is quite remarkable since the business cycles over the two periods were widely different.

3 Model

I introduce governance issues into a standard general equilibrium model. The consumers maximize

$$\max_{K_{t+1};L_t;C_t;u_t} E_0 \left[\sum_t \beta^t \left(\log(C_t) - \frac{1}{Z_t} \frac{\chi}{\chi+1} L_t^{\frac{\chi+1}{\chi}} \right) \right] \tag{1}$$

subject to the budget constraint

$$(1+g) K_{t+1} = (1 - \delta(u_t)) K_t + W_t L_t + u_t R_t K_t + \Pi_t - C_t - \frac{\gamma}{2} \frac{(K_{t+1} - K_t)^2}{K_t} \tag{2}$$

R_t is the rental price of capital services, u_t is the rate of utilization of the existing stock of capital K_t, Π_t are aggregate profits, g is the trend growth rate of labor productivity and γ captures adjustment costs for investment. Z_t is an exogenous aggregate labor supply shock[3]. The cost of higher utilization is captured by an increase in the depreciation rate $\delta(u_t)$ as in King and Rebelo (1999).

The economy produces a final good using differentiated inputs. The final good is produced competitively and it can be used for consumption and investment. The differentiated goods are produced by a continuum of mass N of firms indexed from 0 to 1. N will be determined in equilibrium by a free entry condition. The production function for the final good is

$$Y_t = N \cdot \left(\int_0^1 y_{it}^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}} \tag{3}$$

and the final good producers solve

$$\max_{y_{it}} P_t Y_t - N \cdot \int_0^1 p_{it} y_{it}$$

where y_{it} is the production of intermediate good i at time t.

Equation (3) implies that each intermediate producer i faces an isoelastic demand curve:

$$y_{it} = \frac{Y_t}{N} \cdot \left(\frac{p_{it}}{P_t} \right)^{-\sigma} \tag{4}$$

[3] Labor supply shocks provide a convenient way to introduce aggregate shocks that do not directly affect the technological frontier of the economy. They can be interpreted, for instance, as nominal spending shocks that interact with nominal wage rigidities. See Chari, Kehoe, and McGrattan (2002)

The price level, P_t, is such that $\int_0^1 \left(\frac{p_{it}}{P_t}\right)^{1-\sigma} = 1$. This is also the zero profit condition for the final good producers. There is monopolistic competition in the differentiated goods sector. The production function for intermediate good i is characterized by constant returns to variable factors and some fixed costs. The variable factors are the flow of capital and labor services: k_{it} and l_{it}. The production function for good i at time t is:

$$y_{it} = \theta_t q_{it} k_{it}^{1-\alpha} l_{it}^{\alpha} \tag{5}$$

θ_t is an exogenous aggregate technology shock[4] and q_{it} is the endogenous firm-specific productivity (to be discussed shortly). The fixed costs for firm i are ϕ_{it} units of final good. The (real) profits of firm i are therefore:

$$\pi_{it} = \frac{p_{it}}{P_t} y_{it} - W_t l_{it} - R_t k_{it} - \phi_{it} \tag{6}$$

I now describe the governance environment. To make the problem non-trivial, I assume that managers have a comparative advantage in running the firms, but that their objectives differ from the ones of the shareholders. When managers runs the firms, the productivity is $q_{it} = 1$. Let $\{k^m; l^m; \phi\}$ be the profit maximizing solution: The fixed cost ϕ is exogenously given by technology, and $\{k^m; l^m\}$ maximize (6) subject to (4) and (5) with $q_{it} = 1$. However, governance conflicts are such that managers do not always implement the profit maximizing solution. Specifically, I assume that managers' favorite implementation is $\{(1+\eta^*) k^m; (1+\eta^*) l^m; (1+\tau^*) \phi\}$. In words, managers prefer firms that are larger by η^* for capital and labor and by τ^* for fixed costs. Finally, shareholders have a monitoring technology that allows them to enforce profit maximization, but with a lower productivity, $\underline{q}_i \leq 1$, which is distributed across firms according to the c.d.f. $F(q)$. I will use $\underline{q}_i$ as the measure of governance quality for firm i: When $\underline{q}_i = 1$, shareholders can enforce their rights without cost. When $\underline{q}_i < 1$, it is costly to control the manager. The decision to use

[4] I do not use Z and θ at the same time. I use either one or the other. I introduce θ for the sake of completeness. Since I have verified that the quantitative and qualitative results do not depend on whether the economy is driven by θ or by Z, I report only the simulations with Z. The one exception concerns the behavior of the real wage. For that variable, the value added of the model with governance is higher if one considers shocks that do not change the aggregate technology, such as demand shocks (remember that demand shocks together with nominal wage inertia are equivalent to shocks to Z). Demand shocks without governance conflicts imply a counter-cyclical real wage, as discussed in section 7. The governance model overturns this counter-factual prediction – as would any model of counter-cyclical markups.

the "managerial" technology $\{1; \eta^*; \tau^*\}$ or the alternative technology $\left\{\underline{q}_i; 0; 0\right\}$ is made to maximize the value of the firm[5].

A rational expectations equilibrium for this economy is a set of stochastic processes for the exogenous shocks (either θ_t or Z_t) and for the endogenous prices and quantities. $\{l_{it}; k_{it}; p_{it}\}_i$ solve the intermediate firms' program described above, $\{Y_t; y_{it}\}$ are determined by (3), and consumers maximize (1) over $\{K_{t+1}; C_t; L_t; u_t;\}$. All the agents take $\{P_t; W_t; R_t\}$ as given, and the following market clearing conditions hold:

$$
\begin{aligned}
Y_t &= C_t + I_t + N \times \int_0^1 \Phi_{it} di \\
u_t K_t &= N \times \int_0^1 k_{it} di \\
L_t &= N \times \int_0^1 l_{it} di
\end{aligned}
$$

This definition of equilibrium is conditional on the number of firms, N, which is constant at business cycle frequencies. To pin down N, I impose that a free entry condition holds in the non-stochastic steady state of the economy (see Rotemberg and Woodford (1999) and the appendix).

4 Governance Choice

One can think of the governance technology in the following way. Agents inside the firm (CEO, managers, employees) come up with plans to take advantage of profit opportunities as they appear. A plan specifies a technology and the amounts of capital and labor that must be hired to implement it. Supervisors (the board for the CEO, the CEO for the division managers) can either rubber-stamp the plan proposed by the agent, or they can scrutinize it. Scrutinizing is time consuming and entails the possibility that the profit opportunity will be missed, so that the expected productivity under close monitoring drops to $\underline{q}_i$. On the other hand, scrutinizing allows the supervisors to cut wasteful expenses (τ^*: inefficiencies, private jets, outright stealing..), and to make sure that the project is implemented on the right scale (η^*: buying expensive machines, hiring too many employees, refusing to close down a plant..).

[5] The appendix contains a discussion of the role of financial incentives.

Proposition 1 describes the optimal choice to rubber-stamp or to monitor closely for firm i at time t.

Proposition 1 *The shareholders of firm i rubber-stamp managerial propositions if and only if*

$$q_i < Q_t$$

where

$$Q_t = \left(\kappa(\eta^*) - \frac{\tau^* \Phi}{A_t} \right)^{\frac{1}{\sigma - 1}} \tag{7}$$

and

$$A_t \equiv \left(\frac{1}{\theta_t} \left(\frac{R_t}{1-\alpha} \right)^{1-\alpha} \left(\frac{W_t}{\alpha} \right)^{\alpha} \right)^{1-\sigma} \frac{Y_t}{\sigma N}$$

$$\kappa(\eta^*) \equiv (1 + \eta^*) \times \frac{\mu (1 + \eta^*)^{-\frac{1}{\sigma}} - 1}{\mu - 1}; \; \mu = \frac{\sigma}{\sigma - 1}$$

Proof. The decision rule is simple: the shareholders will rubber-stamp if and only if

$$\pi_t^m \left(\underline{q} \right) < \pi^* (1)$$

Using some simple algebra, one can see that the maximum profits are

$$\pi_t^m (q) = A_t q^{\sigma - 1} - \Phi$$

And the profits from the manager's favorite choice are

$$\pi_t^* (1) = A_t \kappa^* - (1 + \tau^*) \Phi$$

So the optimal choice is to rubber-stamp if and only if:

$$A_t q^{\sigma - 1} < A_t \kappa^* - \tau^* \Phi$$

QED. ■

Proposition 1 says that governance decisions are characterized by a simple cutoff rule: strict profit maximization is enforced in all firms with governance quality above Q_t, while managerial decisions are rubber-stamped in all firms below the cutoff. The factor A_t captures the influence of the state of the economy on the profits of the firms: higher output Y_t

means higher pro…ts, and higher marginal cost $\frac{1}{µ_t} ³ \frac{R_t}{1 ¡ ®} ´^{1 ¡ ®} ¡ \frac{W_t}{®} ¢^{®}$ means lower pro…ts. The in‡uence of the parameter $¿^¤$ is straightforward. The in‡uence of $´^¤$ is slightly more subtle: The pro…t losses are summarized by the function $· (´^¤)$, which is concave and reaches a maximum for $´^¤ = 0$. Starting from the optimal size $(k^m; l^m)$, a small deviation by $´^¤$ implies only a second order loss in pro…ts.

The measure of …rms that rubber-stamp managerial propositions is $F (Q_t)$. The crucial point is that it is an increasing function of A_t. This result follows from the assumption that monitoring costs come from lower productivity: These costs are large when A_t is large. On the other hand, the cost of rubber-stamping is less than proportional to A because of the …xed component $¿^¤$. As a consequence, shareholders are more inclined to rubber-stamp managerial propositions in good times.

The pro…t margins of …rms with bad governance are persistently lower than the ones of better governed …rms. This …ts …gure 1. The model also implies that …rms with di¤erent governance qualities have di¤erent cyclical properties: Firms with excellent governance always maximize pro…ts, while …rms with bad governance follow the objective function of their manager when A_t is large and the objective function of the shareholders when A_t is small. As a consequence, their capital spending increases and decreases more than proportionally with the business cycle. This …ts …gure 2.

The next step is to investigate the quantitative implications of governance con‡icts.

5 Ampli…cation

Before turning to the simulations of the model, it is useful to present the intuition for the result that corporate governance ampli…es aggregate ‡uctuations. From the de…nition of the aggregate price level and from the pricing decisions of the intermediate goods producers, one can obtain the following equation

$$¹ £ Â_t = h (1 + ´^¤)^{\frac{1}{¹}} £ F (Q_t) + G(Q_t) i^{\frac{1}{¾ ¡ 1}} \quad (8)$$

where

$$Â_t ´ \frac{1}{µ_t} µ \frac{R_t}{1 ¡ ®} ¶^{1 ¡ ®} µ \frac{W_t}{®} ¶^{®}$$

is the marginal cost associated with the Cobb-Douglas production function. $F (Q_t) = R_0^{Q_t} f (q) dq$ and $G (Q_t) = R_{Q_t}^{1} q^{¾ ¡ 1} f (q) dq$. Equation (8) is shared by all general equilibrium models of imperfect competition where the pricing behavior of firms is described by $\frac{p_{it}}{P_t}$ = ¹$_{it}$ £ $\hat{A}_{it}$. Most models focus on the symmetric equilibrium where all firms have the same marginal cost and the same markup. In a symmetric equilibrium, one would get the simple condition: ¹ £ $\hat{A}_t$ = 1. In my model however, firms differ in both their marginal costs and their markups. Firms that choose to delegate control have, on average, higher productivity and lower markups than other firms. Equation (8) can be seen either as defining the aggregate markup as a weighted average of the firms' markups or as defining the aggregate marginal cost as a weighted average of the firms' marginal costs. Because the markup choices are correlated with firms' idiosyncratic productivity, one cannot in general disentangle the aggregate markup from the aggregate marginal cost.

Consider equation (7), that defines the cutoff Q_t. In this equation, the RHS increases with W_t and R_t and decreases with Y_t. We can now understand the amplification mechanism. Consider the case of a positive technology shock. Following the shock, output will increase but so will the real wage. If factor supplies are elastic, output will increase more than the real wage and this will push the cutoff Q_t to the left and lead some shareholders to leave more leeway to the managers. These firms will then hire more capital and labor and increase their output. Again, if factor supplies are elastic, this will increase output more than it will increase the wage and Q_t will move further to the left[6]. We therefore expect the amplification mechanism to be stronger when factor supplies are elastic. This is why the presence of capacity utilization is important in this model. It is well understood that capacity utilization makes the standard RBC model more responsive to shocks. Here, this will also apply to the amplification factor over and above what the RBC would predict.

6 Calibration

The calibration exercise is conceptually straightforward. I take the standard technological parameters from the textbook, and I choose the parameters that describe the governance environment in order to match the results in Table 1 (columns 3 and 6, sample 1980-2001).

The steady state is computed to match the standard ratios $\left(\frac{C}{GDP}; \frac{WL}{GDP}; \frac{K}{GDP}\right)$. The labor

[6] This suggests that the model could have multiple equilibria. This is indeed a possibility. For the parameter values that I estimate however, firm level heterogeneity $\underline{g}_i$ is large enough to remove this possibility.

supply elasticity is Á = 4 as in the benchmark RBC model. The elasticity of substitution between goods is ¾ = 4, which implies a value-added markup of 33% as in Rotemberg and Woodford (1999). Recall that free entry drives the pro…ts to 0 on the balanced growth path: This pins down N and ©. The adjustment cost parameter is ° = 4 (at quarterly frequency), following Hall (2002). The elasticity of depreciation with respect to utilization is 0:1 as in King and Rebelo (1999), and the steady state utilization is normalized to u = 1.

¹	¾	Á	°	$\frac{±''(1)}{±'(1)}$
1.33	4	4	4	0.1

The governance environment is characterized by ´¤; ¿¤ and the distribution F (q). To simplify, I assume that q is distributed uniformly over £q̲; 1¤. I choose the 3 parameters ©´¤; ¿¤; q̲ª to match the results in Table 1. This involves simulating a large number of …rms and plotting the implied distribution of pro…t margins and investment betas for the quantiles of the governance distribution. The results are shown on …gure 3a; b. The parameters are:

¿¤	´¤	q̲
22%	20%	.91

In steady state, the cuto¤ is such that F (Q) = 16:5%. This means that 83.5% of the …rms do not leave much leeway to their managers.

Are these parameters consistent with what we know about corporate governance? Denis and Kruse (2000) show that corporate restructuring is triggered by declines in performance and that it involves major cost cutting e¤orts, plant closing, asset sales and layo¤s. These restructuring e¤orts increase shareholder value (see also Gilson (1998)). Denis and Denis (1995) show that …rms experience an average employment decline of 16 to 19% following a normal retirement of the CEO at age 65, suggesting that …rms are on average too fat. The …gure rises to more than 40% after a forced resignation of the CEO[7]. Similarly, Kaplan (1989) …nds that MBOs are followed by declines in employment, sales and investment, and by increases in pro…ts. All this is consistent with my assumption about ´¤ and ¿¤. More speci…cally for ¿¤, Berger and Ofek (1999) show that the amount of unallocated expenses is a strong determinant of corporate refocusing programs. They also show that disciplinary events (shareholder pressure, …nancial distress, management turnover) usually occur before refocusing takes place and are followed by average cumulative abnormal returns of 7%.

[7] But this is of course an endogenous event, so this number cannot be taken at face value.

One can also obtain evidence from the literature that studies the effects of leverage on firms' behavior. Leverage has long been proposed as an efficient way to limit managerial discretion (Jensen (1986)). Empirically, one sees that more highly leveraged firms charge higher prices and respond more quickly and more strongly to shocks: Phillips (1995), Sharpe (1994), Chevalier and Scharfstein (1996). Kovenock and Phillips (1997) confirm the results in Kaplan (1989) that LBO firms decrease their investment and show that this effect is stronger in highly concentrated industries. The idea that leverage can be used to put pressure on insiders is also directly supported by the fact that boards increase the leverage of their companies in response to increases in unions' power (Gorton and Schmid (2000) for Germany, Bronars and Deere (1991) for the US).

7 Impulse Responses and Simulations

I log-linearize the model around its balanced growth path and I conduct two independent simulations, one for the labor shock $z_t = \log(Z_t)$ and one for the technology shock μ_t. Except for real wages, the properties of the model do not depend on which shock is used, and I report only the results for the driving process z_t. All time series are detrended using the HP filter.

Figure 4 shows the response of the economy to a positive, persistent shock to $\log(Z)$. The shock is the dotted line. GDP is the solid line. The third line represents the fraction of firms whose CEOs enjoy some discretion. All the responses are in deviation from steady state. Following a shock of 1% to $\log(Z)$, GDP increases by 2.5% and the fraction of loosely controlled firms increases from 16.5% (steady state) to 17.8%.

Figure 5 shows the amplification coming from the governance mechanism. In response to the same shock as in figure 4, the economy without governance conflict experiences a smaller increase in GDP. This shows the quantitative importance of the amplification mechanism described above.

In the simulations, the driving process z_t is specified as an AR(1):

$$z_t = \rho z_{t-1} + \varepsilon_t$$

Note however that z_t is not observable in the data and that ρ is not known. The calibration procedure follows the strategy used by King and Rebelo (1999). I make an initial guess for

ρ. Given this guess, I solve the model using rational expectations. The solution takes the form

$$\hat{y}_t = \beta_{yk} \times \hat{k}_t + \beta_{yz} \times \hat{z}_t$$

The coefficient β_{yk} and β_{yz} are complex functions of all the parameters of the model and of ρ. This equation for output can be inverted into $\hat{z}_t = \frac{1}{\beta_{yz}} \times \hat{y}_t - \frac{\beta_{yk}}{\beta_{yz}} \times \hat{k}_t$. Using actual values for $\hat{y}_t$ and $\hat{k}_t$, one can create a series for $\hat{z}_t$. One can then compute the AR(1) coefficient for this series. It is, in general, different from the original ρ. This value is then used as a new starting point. The procedure is repeated until convergence. The estimated value of ρ is $.886$ (I estimated essentially the same values of ρ for z and for θ).

Figure 6 shows the simulated economy. The match in the top panel is mechanical: the shocks are chosen to fit the GDP series. The other 3 panels suggest that the model generates reasonable time series for the main macroeconomic variables. Figure 7 shows the time series of the fraction of firms that are loosely controlled. This fraction is higher in booms and lower in recession, thereby increasing aggregate volatility: For the same realizations of the exogenous shocks (z or θ), the economy would have been 30% less volatile without governance conflicts. Figure 8 shows the simulated Solow residual (defined in the standard way) for the economy driven by the labor shock z. In this economy, short run fluctuations in the residual come from capacity utilization and fixed costs, not from aggregate technology shocks[8]. The simulated time series for the residual is close to its empirical counterpart, even though the model was not calibrated for that purpose. Among other things, this means that I could have chosen the shocks to fit the residuals, as in the RBC tradition (instead of the GDP series), and the model would have implied reasonable time series for GDP, consumption, hours and investment.

For the behavior of the real wage, the governance model generates a first order improvement over the alternative, in the case of business cycles driven by non-technological shocks. The model without endogenous governance and driven by z_t predicts a counter-cyclical real wage: its correlation with the actual (HP-filtered) wage series is -57%. The governance model, on the other hand, delivers a correlation of +52%, because positive shocks induce firms to leave more discretion to insiders who are more willing to hire for a given real wage,

[8] The true technology is not exactly constant because Q_t moves with the business cycle. The impact on the residual is small, however.

and who are also more e¢cient at doing so. The aggregate labor demand therefore shifts out in good times, and this shift compensates the impact of decreasing returns to labor.

8 Conclusion

Consistent with the prediction of a simple model of …rm governance, I have shown that badly governed …rms have lower pro…t margins and are more cyclical than well governed …rms. I have studied the mechanism through which governance con‡icts amplify aggregate shocks. When times are good, insiders enjoy more control over the decisions of their …rms, which leads to more hiring and more investment spending. These hiring and investment decisions feed-back into the aggregate and amplify the boom. The quantitative analysis suggests that corporate governance may be responsible for 30% of aggregate volatility.

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A Evidence

I start by matching the quarterly COMPUSTAT files with the data provided by Andrew Metrick on his web page. The governance index can potentially vary over time, but in practice the variations are very small and I treat it as a fixed firm characteristic. I keep only those firms that report non missing values for sales and for capital expenditures between 1979:1 and 2001:4. This leaves me with 538 firms. I take the non-residential private fixed investment and its deflator from the NIPA. I define sectors based on SIC codes in such a way that there are at least 10 firms by sector: I use the 1-digit codes for all firms and some 2-digits codes within manufacturing. I construct the annual growth rate of (deflated) capital expenditures of firm i at time t: $g_{it} = \log(capex_{i,t}) - \log(capex_{i,t-4})$. I winsorize this growth rate at 5-95% within each sector and each period to make sure that results are not driven by outliers. For each firm, I run

$$g_{it} = \alpha_i + \beta_i \times \bar{g}_t + \gamma_i \times t + \varepsilon_{it}$$

I define the profit margin of firm i in sector j at time t as: $\mu_{ijt} = income_{ijt}/assets_{ijt}$. I compute the median profit margin by sector and period: $\hat{\mu}_{jt} = median_i\left(\mu_{ijt}\right)$ and the relative margin of firm i over the sample period as $\mu_i = median_t\left(\mu_{ijt}/\hat{\mu}_{jt}\right)$. This procedure is robust to any sector specific trend over the period, and there are many. It is also robust to outliers. It will assign $\mu_i > 1$ if and only if a firm's margin is persistently higher than the median of its sector.

I compute the (sector-specific) quantiles 40 and 70 of the age distribution of firms within each sector. For both β_i and μ_i, I remove the mean of the sector $\times$ age group (since there are 17 sectors and 3 age groups, there are 51 different means). Finally, I compute the mean of β_i and μ_i for each governance category: the results are displayed on figures 1 and 2.

I also made many robustness checks: some, but not all, are reported in Table 1. First, I computed the betas for sales. They show a similar pattern as the betas for investment but the results are less statistically significant (this is not surprising since sales are not under the direct control of the manager, while capital expenditures are). Second , I repeated the same exercise for the sample period 1990-2001. This allows me to have 1030 firms instead of 538. The results were similar. I also tried controlling for firm size as opposed to firm age.

B Governance Model

I now outline a simple moral hazard model and discuss the role of financial incentives. The main idea is the same as in the text: managers come up with new ideas that deliver productivity $q_{it} = 1$ but they do not share the objectives of the stockholders. The focus on CEO and shareholders is purely for convenience, as it should be obvious that the same model would apply to moral hazard problems between CEO and division managers. There are 2 ways to implement the new technology and the manager chooses a probability distribution $(\bar{e}, 1 - \bar{e})$ over the two implementations, and $\bar{e}$ can take two values: $\bar{e} = e$ or 1. Each implementation delivers profits and private benefits. Private benefits are not transferable and $\bar{e}$ is not observable. I interpret the model as follows: managers can expand effort to cut all unnecessary expenses, fire all unnecessary employees, invest only the optimal amount of resources into new projects, etc.. These efforts are both costly for the manager and difficult to observe for the shareholders.

- Probability $\bar{e}$: $\pi_t = A_t$ and $B_t = 0$.
- Probability $1 - \bar{e}$: $\pi_t = A_t \kappa^{*} - \tau^{*}\Phi$ and $B_t = \tau^{*}\Phi + bA_t$.

Assumption A1: $(1-e)(1-\eta^{*}) < b < 1-\eta^{*}$

Under (the second inequality of) Assumption 1, the first best is to implement $\tilde{e}^{FB}=1$: if $\tilde{e}$ were contractible, all firms would choose $\tilde{e}^{FB}=1$ in every period. However, when $\tilde{e}$ is not contractible, the first inequality of A1 implies that the second best (with general financial incentives and limited liability) is to implement $\tilde{e}^{SB}=e$.

In such a world, the possibility to intervene directly is obviously valuable: this is what the monitoring technology $\underline{q}_i$ does. A firm will choose the direct monitoring if and only if

$$\underline{q}_i^{\sigma-1}A_t > eA_t + (1-e)\left(A_t\eta^{*} - \tau^{*}\Phi\right)$$

Note that I can always choose b and e such that A1 holds and e is close to 0. In this case, the model boils down to the one used in the text. The cutoff is given by:

$$Q_t = \left(\eta^{*} - \frac{\tau^{*}\Phi}{A_t}\right)^{\frac{1}{\sigma-1}}$$

C Technical Details

The setup takes into account both capacity utilization (u) and adjustment costs (γ). I use $\overrightarrow{C}$ to denote the fact that C has a trend (to be removed as soon as all the FOCs are derived). Consumers maximize:

$$\max_{L_t;C_t}\sum_t \beta^t\left(\log\left(\overrightarrow{C}_t\right) - \frac{1}{Z_t}\frac{\chi}{\chi+1}L_t^{\frac{\chi+1}{\chi}}\right)$$

Subject to the budget constraint

$$\overrightarrow{K}_{t+1} = (1-\delta(u_t))\overrightarrow{K}_t + \overrightarrow{W}_t L_t + u_t R_t\overrightarrow{K}_t + \overrightarrow{\Pi}_t - \overrightarrow{C}_t - \frac{\gamma}{2}\frac{\left(\frac{\overrightarrow{K}_{t+1}}{(1+g)} - \overrightarrow{K}_t\right)^2}{\overrightarrow{K}_t}$$

There is monopolistic competition in the intermediate goods markets. The production function is:

$$\overrightarrow{y}_{it} = q_{it}\theta_t\overrightarrow{k}_{it}^{1-\alpha}\left[(1+g)^t l_{it}\right]^{\alpha}$$

Note that k denotes the flow of capital services (including the u term) and l is labor. θ_t is an aggregate productivity shock, q_{it} is firm's idiosyncratic productivity. $(1+g)$ is the Harrod-neutral trend growth. The profits are

$$\begin{aligned}\overrightarrow{\pi}_{it} &= \frac{p_{it}}{p_t}\overrightarrow{y}_{it} - \overrightarrow{W}_t l_{it} - R_t\overrightarrow{k}_{it} - \overrightarrow{\Phi}_{it}\\ \overrightarrow{\Phi}_{it} &= \overrightarrow{\Phi}\times(1+\tau_{it})\end{aligned}$$

There is a fixed cost in terms of goods $\left(\overrightarrow{\Phi}\right)$ indexed on aggregate productivity to keep the number of firms constant on the balanced growth path. I now remove the trend $(1+g)^t$. Define for the wage (and similarly for all other trending variables):

$$W_t = \frac{\overrightarrow{W}_t}{(1+g)^t}$$

So the marginal cost of firm i is

$$c_{it} = \frac{\chi_t}{q_{it}}$$

$$\chi_t \equiv \frac{1}{\theta_t}\left(\frac{R_t}{1-\alpha}\right)^{1-\alpha}\left(\frac{W_t}{\alpha}\right)^{\alpha}$$

Let's compute first the monopoly solution

$$\max \left(\frac{p_{it}}{p_t} - c_{it}\right) y_{it}$$

This monopolist chooses a markup $\mu = \frac{\sigma}{\sigma-1}$ and prices at $\frac{p^m_{it}}{p_t} = \frac{\mu\chi_t}{q_{it}}$. The quantities produced and hired are:

$$y^m_{it} = \frac{Y_t}{N}\left(\frac{1}{\mu c_{it}}\right)^{\sigma} = \frac{Y_t}{N\,(\mu\chi_t)^{\sigma}}\, q^{\sigma}_{it}$$

$$l^m_{it} = \frac{\alpha}{1-\alpha}\frac{R_t}{W_t} k^m_{it}$$

$$k^m_{it} = \frac{y^m_{it}}{\theta_t q_{it}}\left(\frac{1-\alpha}{\alpha}\frac{W_t}{R_t}\right)^{\alpha}$$

The profits of the firm are:

$$\pi^m_{it} = A_t q^{\sigma-1}_{it} - \Phi$$

$$A_t \equiv (\mu\chi_t)^{1-\sigma}\frac{Y_t}{\sigma N}$$

But the manager proposes a bigger firm

$$\frac{l_{it}}{l^m_{it}} = \frac{k_{it}}{k^m_{it}} = 1 + \eta_{it}$$

$$\frac{p_{it}}{p^m_{it}} = (1 + \eta_{it})^{-\frac{1}{\sigma}}$$

The profits become:

$$\pi_{it} = A_t q^{\sigma-1}_{it} \cdot \kappa(\eta_{it}) - \Phi - \tau_{it}\Phi$$

$$\kappa(\eta_{it}) \equiv (1 + \eta_{it}) \times \frac{\mu(1 + \eta_{it})^{-\frac{1}{\sigma}} - 1}{\mu - 1}$$

The aggregate price level condition is:

$$\int_0^1 (q_{it})^{\sigma-1}(1 + \eta_{it})^{\frac{\sigma-1}{\sigma}} = (\mu\chi_t)^{\sigma-1}$$

And the aggregate demands for capital and labor are:

$$\frac{L^d_t}{K^d_t} = \frac{\alpha}{1-\alpha}\frac{R_t}{W_t}$$

$$K^d_t = \left(\frac{1-\alpha}{\alpha}\frac{W_t}{R_t}\right)^{\alpha}\frac{\Psi_t}{(\mu\chi_t)^{\sigma}}\frac{Y_t}{\theta_t}$$

$$\Psi_t \equiv \int_0^1 (1 + \eta_{it})\, q^{\sigma-1}_{it}$$

The equilibrium in the capital market gives:

$$K_t^d = u_t K_t$$

C.1 Complete Model

Firms with good governance ($q_i > Q_t$) choose to enforce shareholders rights. Other firms Governance decisions lead to:

$$\begin{aligned}
\Psi_t &\equiv \int_0^1 (1+\eta_{it})\, q_{it}^{\sigma-1} = \int_0^{Q_t} (1+\eta^*)\, f(q)\, dq + \int_{Q_t}^1 q^{\sigma-1} f(q)\, dq \\
\Psi_t &= (1+\eta^*) \times F(Q_t) + G(Q_t) \\
F(Q_t) &= \int_0^{Q_t} f(q)\, dq \\
G(Q_t) &= \int_{Q_t}^1 q^{\sigma-1} f(q)\, dq
\end{aligned}$$

And for the marginal cost I get:

$$\begin{aligned}
\chi_t &= \frac{1}{\mu} \left[\int_0^1 (1+\eta_{it})^{\frac{\sigma-1}{\sigma}}\, q_{it}^{\sigma-1} \right]^{\frac{1}{\sigma-1}} \\
\chi_t &= \frac{1}{\mu} \left[(1+\eta^*)^{\frac{1}{\mu}} \times F(Q_t) + G(Q_t) \right]^{\frac{1}{\sigma-1}}
\end{aligned}$$

So the complete model is described by the following equations:

- Labor supply and labor demand:

$$\begin{aligned}
L_t &= \left(\frac{Z_t W_t}{C_t} \right)^{\phi} \\
\frac{L_t}{u_t K_t} &= \frac{\alpha}{1-\alpha} \frac{R_t}{W_t}
\end{aligned}$$

- Euler equation

$$\frac{1}{C_t}\left(1 + \gamma \frac{K_{t+1} - K_t}{K_t}\right) = \frac{\beta}{1+g} E_t \left[\frac{1}{C_{t+1}} \left(1 + u_{t+1} R_{t+1} - \delta_{t+1} + \gamma \frac{K_{t+2} - K_{t+1}}{K_{t+1}} \right) \right]$$

- Utilization

$$\delta'(u_t) = R_t$$

- Capital accumulation

$$(1+g) K_{t+1} = Y_t + (1 - \delta(u_t)) K_t - C_t - N\Phi - N\Phi\tau^* F(Q_t) - \frac{\gamma}{2} \frac{(K_{t+1} - K_t)^2}{K_t}$$

- Capital demand

$$u_t K_t = \left(\frac{1-\alpha}{\alpha} \frac{W_t}{R_t} \right)^{\alpha} \frac{\Psi_t}{(\mu \chi_t)^{\sigma}} \frac{Y_t}{\theta_t}$$

- Marginal cost

$$\chi_t \equiv \frac{1}{\theta_t}\left(\frac{R_t}{1-\alpha}\right)^{1-\alpha}\left(\frac{W_t}{\alpha}\right)^{\alpha}$$

- The cutoff is such that

$$\underline{q}_t^{\sigma-1}A_t = A_t\kappa^* - \tau^*\Phi$$

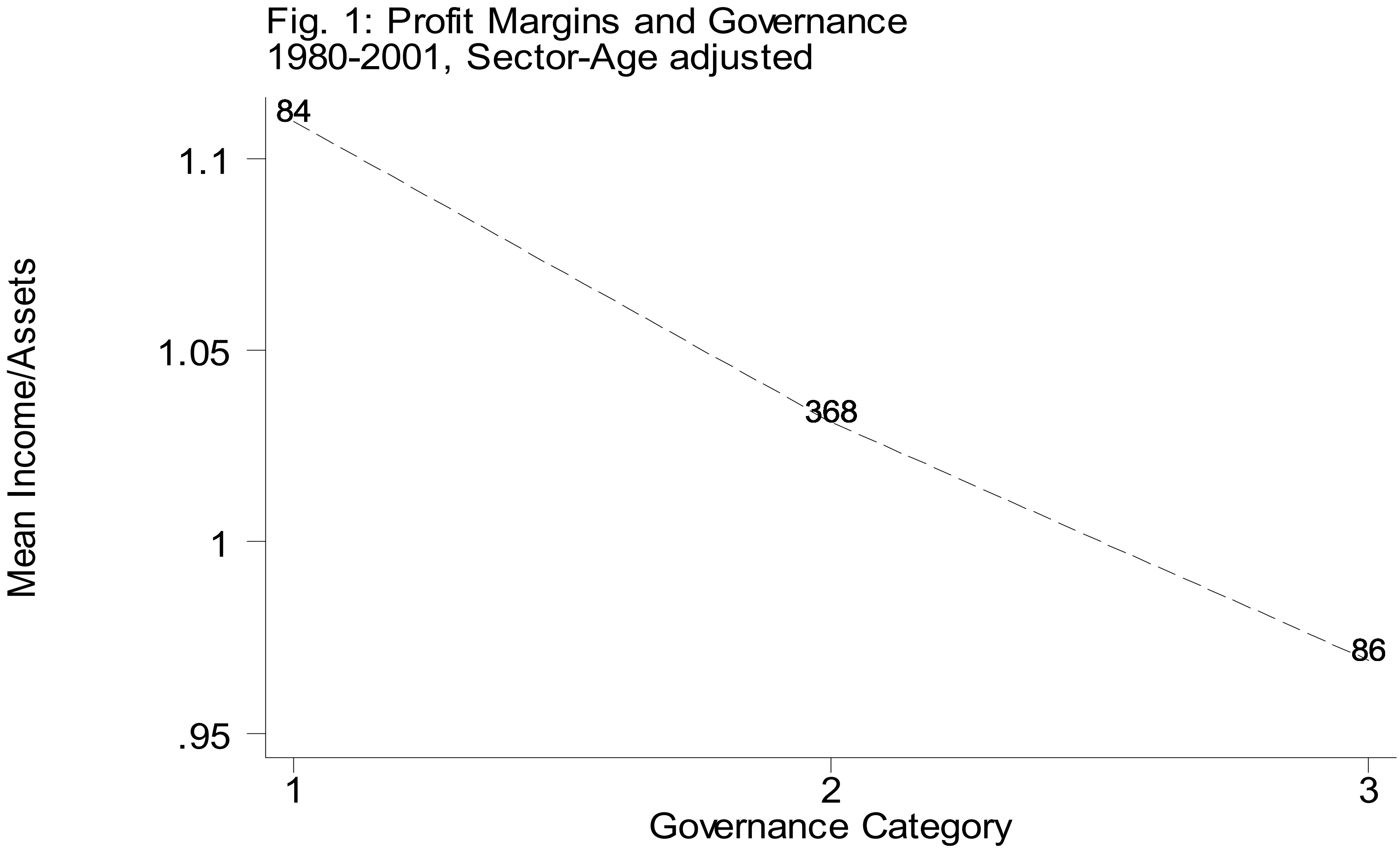
$$A_t \equiv (\mu\chi_t)^{1-\sigma}\frac{Y_t}{\sigma N}$$

- Finally the free entry condition says that (unconditional) expected profits have to be 0. This assumes for simplicity that governance is randomly drawn after entry.

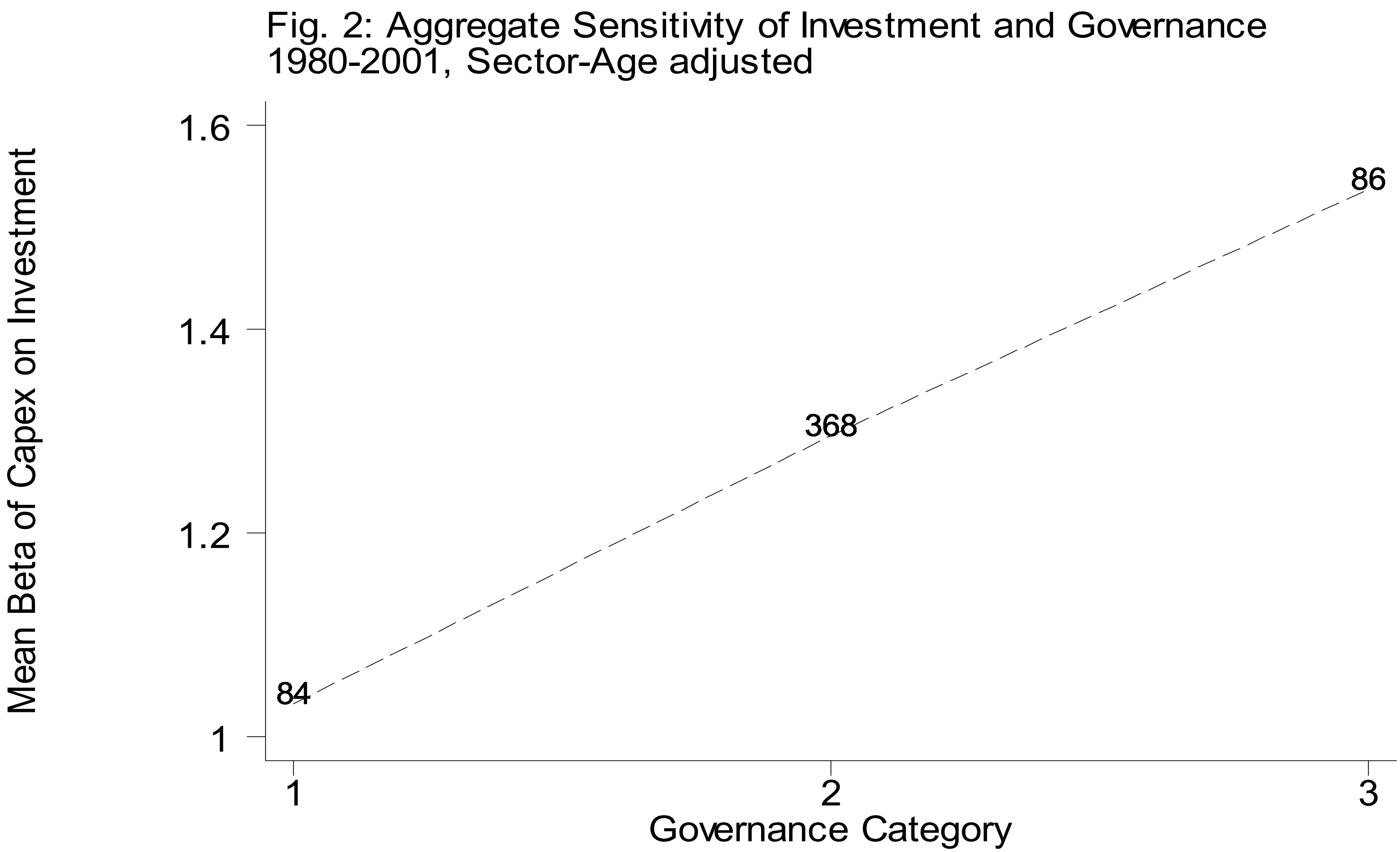
$$E[\pi_{it}] = 0$$

Table 1. Regressions of profit margins and capex betas on governance variables. Profit margin is the median (over the sample period) income over assets relative to the median in the same sector. Sensitivity of capital expenditures is the coefficient from the regression of the growth rate of capital expenditures on the aggregate growth rate of investment. See appendix for details. The omitted category for Governance is 1<G<=6 (Good Governance). There are 17 sector dummies: sectors are based on 2 digits SIC codes, grouped in such a way that there are at least 10 firms per sector. The 3 age dummies correspond to the percentiles 40 and 70 of the distribution of years where firms were first listed in COMPUSTAT. The 3 size dummies correspond to the percentiles 40 and 70 of the distribution of log(assets). Regression coefficients are in bold, t-statistics in italics.

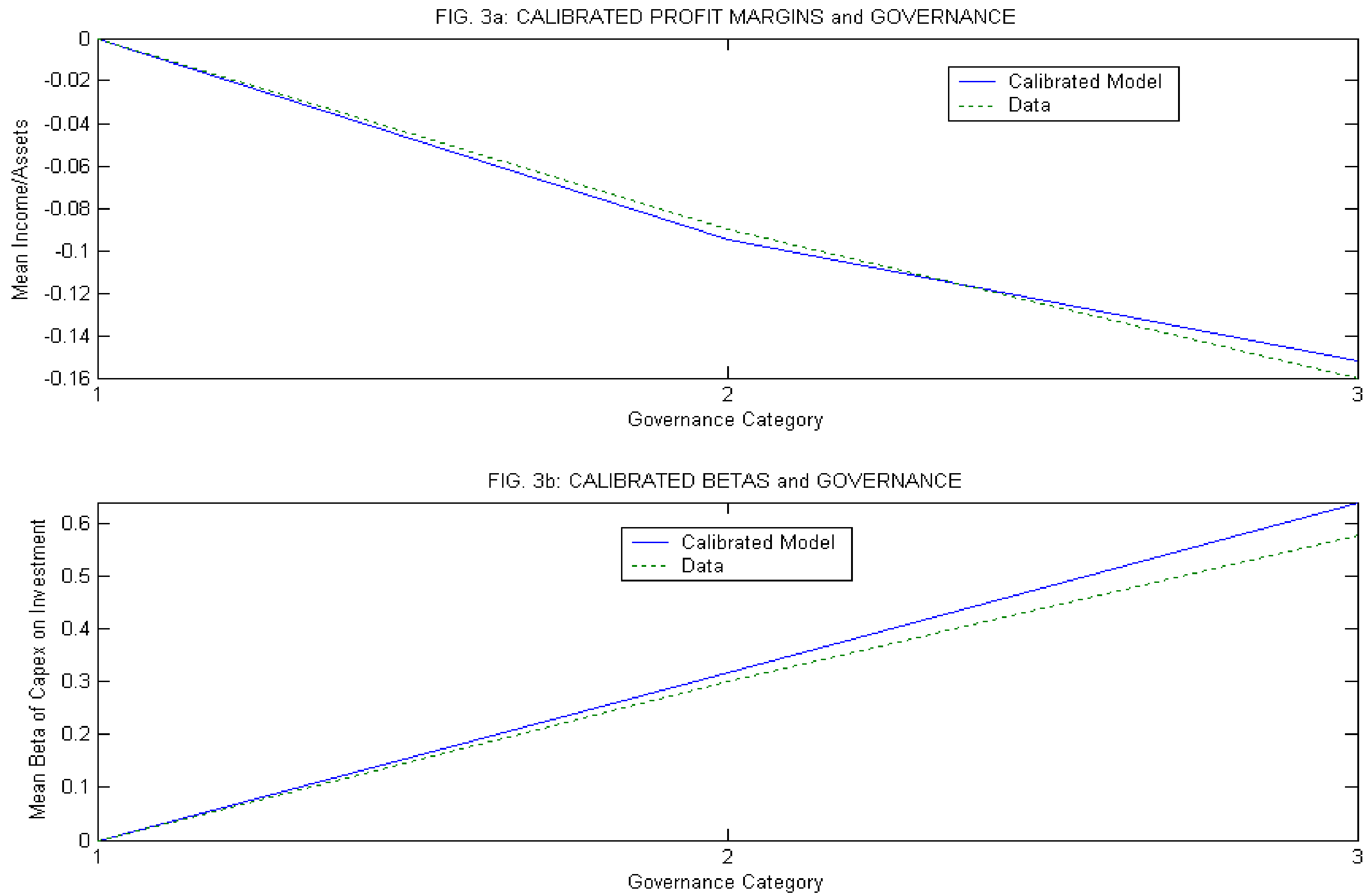
Dependent Variable	1	2	3	4	5	6
		Profit Margin			**Capex Beta**	
Sample Period for Estimation of Dependent Variables: 1980-2001						
7 <= G <= 12	**-0.09**	**-0.07**	**-0.09**	**0.47**	**0.38**	**0.30**
	-1.61	*-1.29*	*-1.64*	*2.19*	*2.21*	*1.71*
13 <= G (Bad Governance)	**-0.14**	**-0.13**	**-0.16**	**0.56**	**0.73**	**0.58**
	-2.07	*-1.94*	*-2.32*	*2.06*	*3.39*	*2.58*
Firm Age Dummies	no	yes	yes	no	yes	yes
Industry Dummies	no	yes	yes	no	yes	yes
Firm Size Dummies	no	yes	no	no	yes	no
Interaction Sector*Age	no	no	yes	no	no	yes
R^2	0.01	0.05	0.17	0.01	0.43	0.48
N	538	538	538	538	538	538
Sample Period for Estimation of Dependent Variables: 1990-2001						
7 <= G <= 12	**-0.11**	**-0.06**	**-0.08**	**0.41**	**0.34**	**0.34**
	-2.24	*-1.17*	*-1.63*	*2.73*	*2.53*	*2.46*
13 <= G (Bad Governance)	**-0.28**	**-0.19**	**-0.20**	**0.60**	**0.64**	**0.61**
	-3.65	*-2.36*	*-2.58*	*2.55*	*2.93*	*2.73*
Firm Age Dummies	no	yes	yes	no	yes	yes
Industry Dummies	no	yes	yes	no	yes	yes
Firm Size Dummies	no	yes	no	no	yes	no
Interaction Sector*Age	no	no	yes	no	no	yes
R^2	0.01	0.07	0.16	0.01	0.24	0.27
N	1030	1030	1030	1030	1030	1030



Notes: Income over Assets compared to Mean for same Sector and Age group. Sample Size (number of firms) for each Governance Category Indicated on the Graph. Source: Compustat Quarterly Files for Accounting Data and Gompers, Ishii and Metrick (2003) for Governance Data.



Notes: Regression Beta of Capex on Aggregate Investment, adjusted for Sector and Age groups. Sample Size (number of firms) for each Governance Category Indicated on the Graph. Source: Compustat Quarterly Files for Accounting Data and Gompers, Ishii and Metrick (2003) for Governance Data.



Notes: The distribution of firms in 3 groups is shown on figures 1 and 2: There are 538 firms, 84 have good governance (category 1), 368 have normal governance (category 2), and 86 have bad governance (category 3). The model matches the size, the average profit margin and the average beta for each group, as estimated in Table 1, sample 1980-2001, columns 3 and 6.

FIG. 4: RESPONSE TO POSITIVE LABOR SHOCK, Z

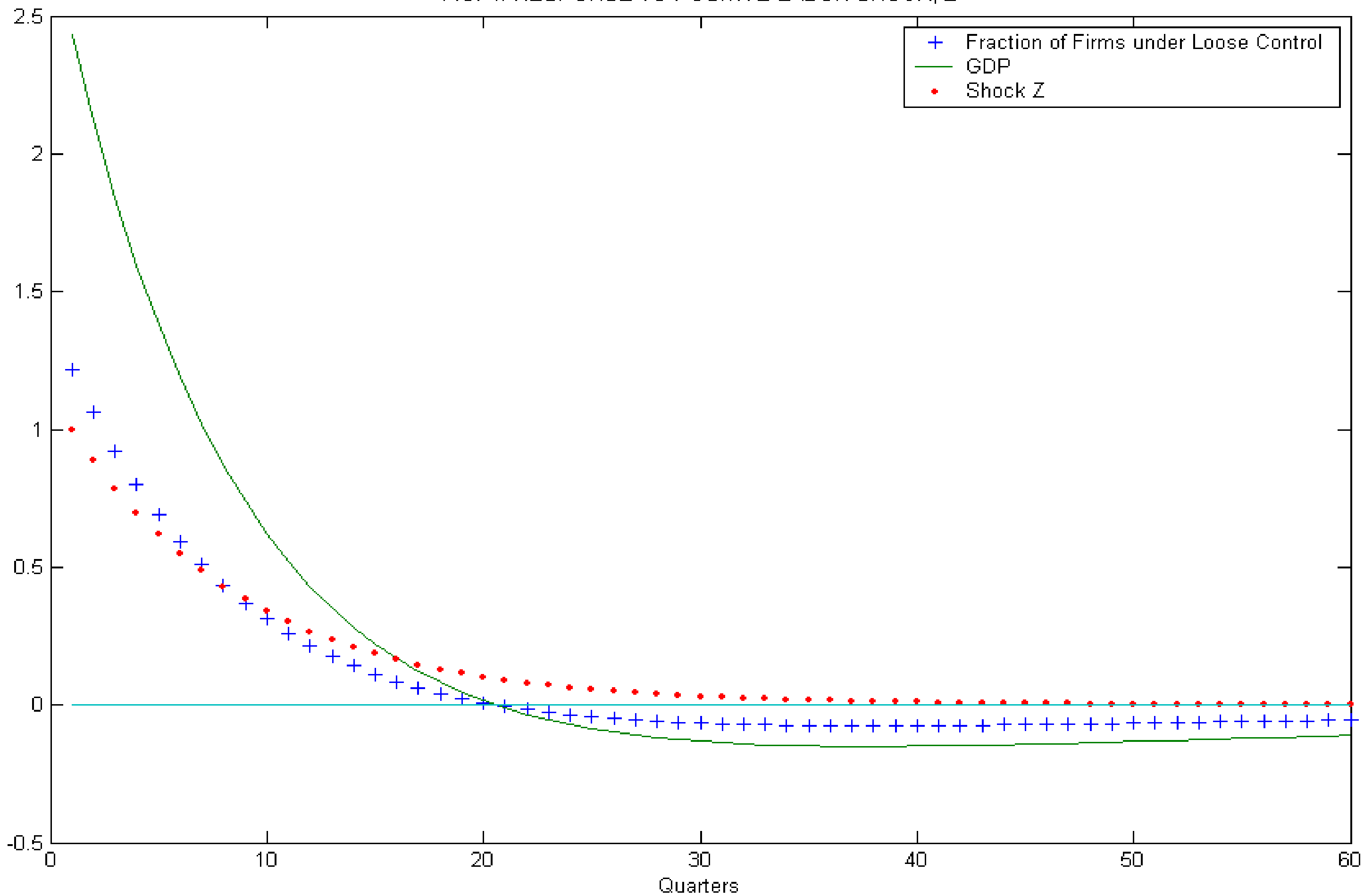
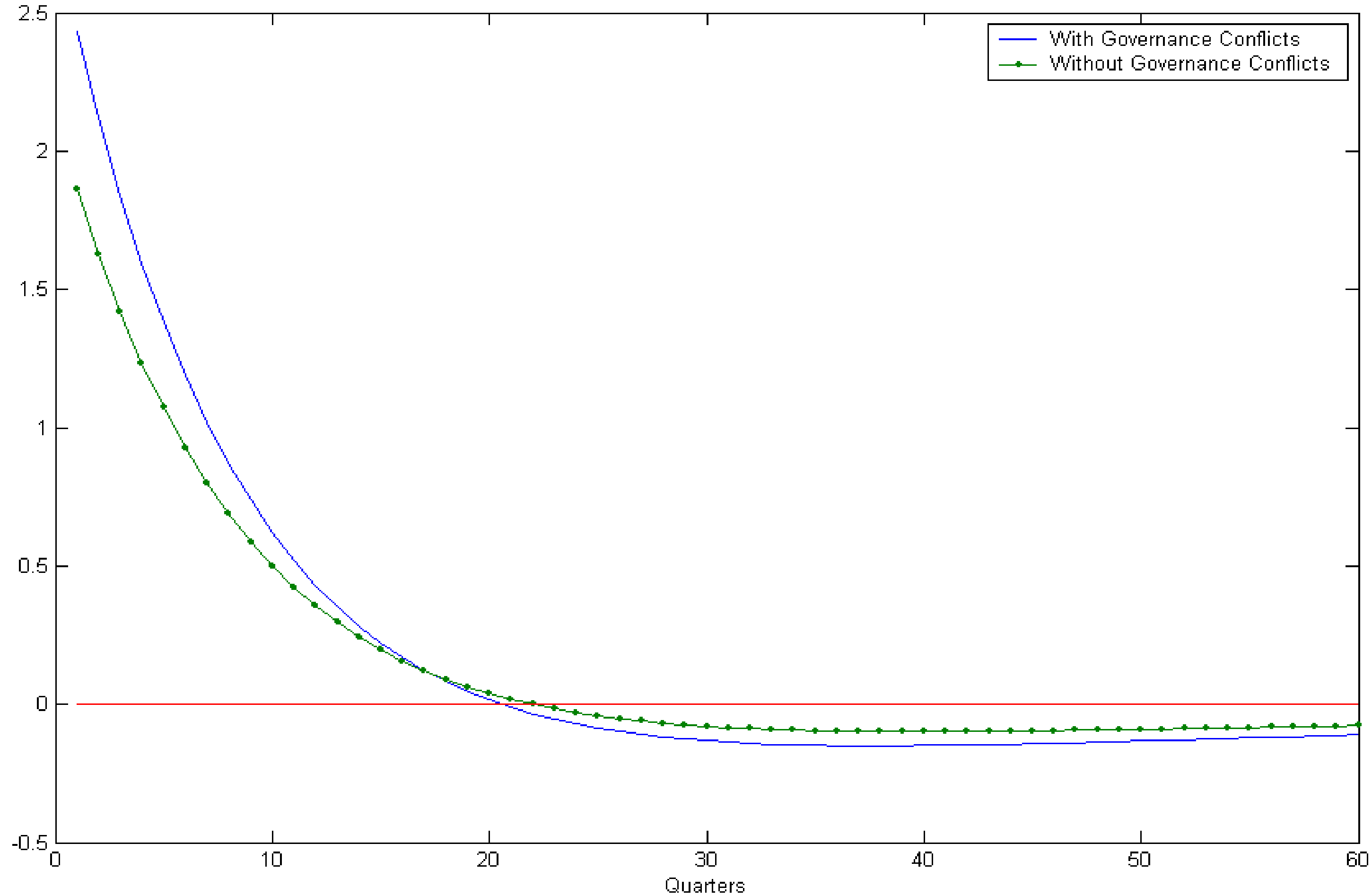


FIG. 5: GDP RESPONSE TO LABOR SHOCK Z



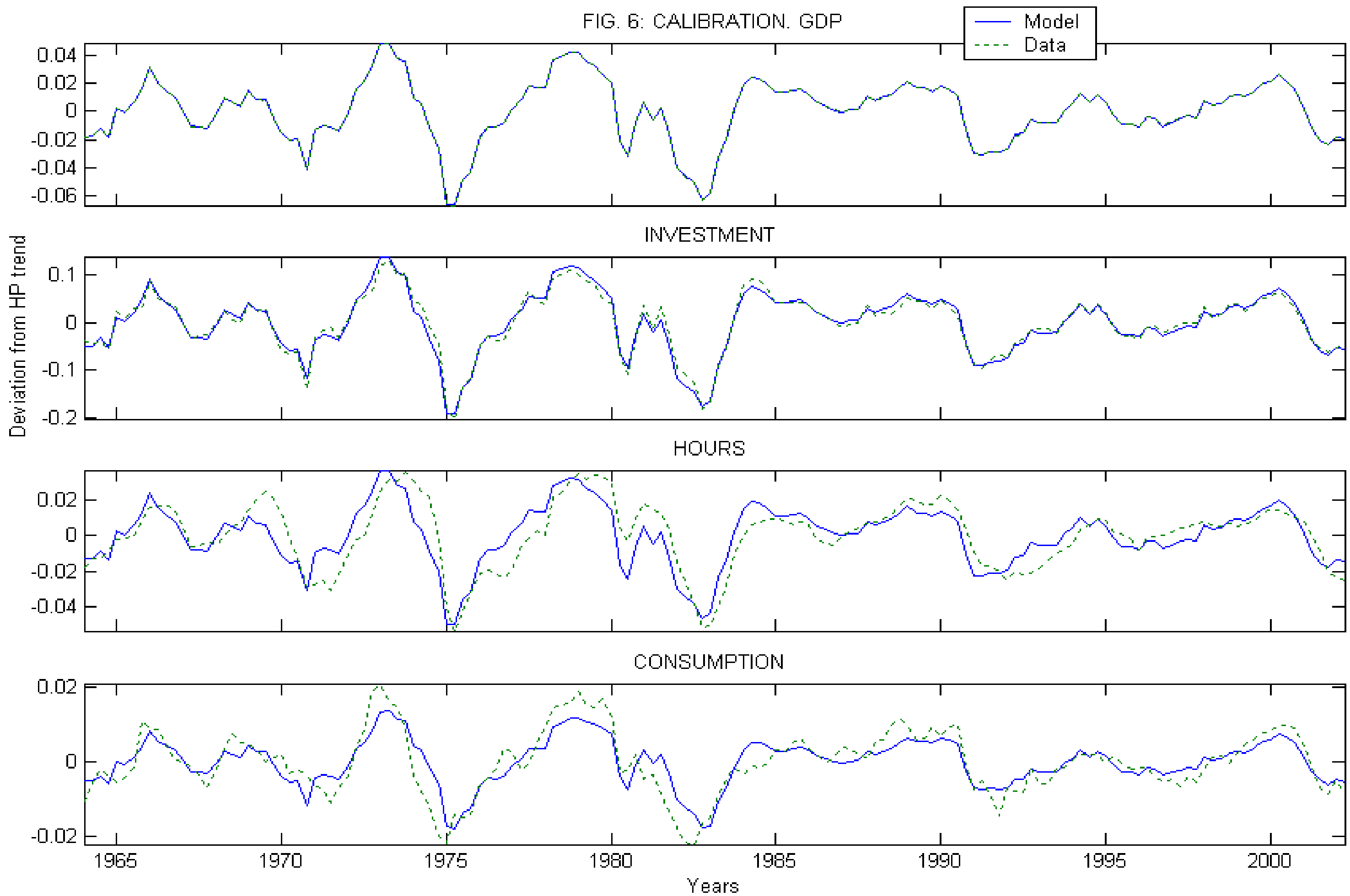


FIG. 6: CALIBRATION. GDP
Model
Data
0.04
0.02
0
-0.02
-0.04
-0.06
INVESTMENT
0.1
0
-0.1
-0.2
Deviation from HP trend
HOURS
0.02
0
-0.02
-0.04
CONSUMPTION
0.02
0
-0.02
1965
1970
1975
1980
1985
1990
1995
2000
Years

FIG. 7: FRACTION OF FIRMS UNDER LOOSE CONTROL

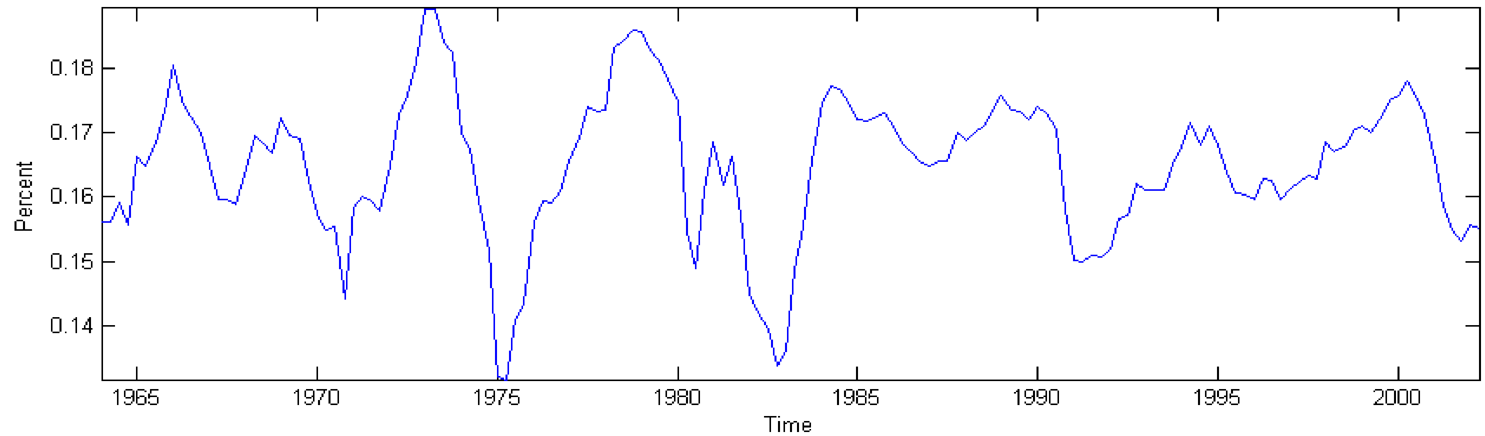


FIG. 8: IMPLIED AND ACTUAL SOLOW RESIDUALS