Privatization under Political Interference: Evidence from Eastern Germany

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Abstract

Can privatization authority be successfully delegated to a privatization agency? To address this question we examine the liquidation policy of the German privatization agency. The theoretical part develops a dynamic model of optimal liquidation under incomplete political insulation of the privatization agency. We explore how external political interference affects its liquidation policy and derive testable implications for the distribution of liquidation decisions and privatization prices. The empirical part uses micro data on 1,804 privatization contracts and 1,097 liquidation decisions to verify the model predictions. The data confirm the view that political liquidation constraints are an important determinant of privatization outcomes.

JEL Classification: D8, P2, P3

Keywords: Privatization, Political Uncertainty, Timing of Liquidation Decisions

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1 Introduction

Can the authority to privatize state-owned enterprises be successfully delegated to an independent agency similar to the delegation of monetary authority to an independent central bank? The German privatization agency Treuhandanstalt with its independent statute has more than once been compared to the Bundesbank.[1] Opposing testimony argues that its position to withstand political interference was in fact weak and that it usually had to give in to large sales subsidies once the liquidation option became politically obsolete.

The theoretical part of the paper undertakes an analysis of the optimal liquidation policy of a privatization agency under incomplete political insulation. How should the privatization agency adjust its liquidation policy to the risk of political interference and a sequential loss of its decision autonomy? This paper develops a fully dynamic framework which can address this question. The framework implies various testable implications for the intertemporal distribution of the liquidation decisions and the distribution of privatization prices.

In the empirical part, we confront the model implications with new micro data on 1,804 German privatization contracts and 1,097 liquidation decisions. The data support the model implication. We conclude that liquidation constraints played an important role in the privatization process and is crucial for understanding the distribution of privatization outcomes. We find in particular that large firms and firms in industries with high sectorial unemployment profited disproportionately from liquidation constraints and could only be sold with large sales subsidies. This subsidy bias towards large state-owned enterprises (SOEs) increased over time and suggests a sequential erosion of the agency's decision autonomy. We also find evidence that political intervention risk accelerated the liquidation process and increased the dispersion of privatization outcomes by frequently suspending the quality threshold for privatization.

An important debate of the privatization literature concerns the optimal speed of economic transition. A fast transition in Eastern Germany was partly achieved by a policy of swift and massive liquidation.[2] Aghion, Blanchard, and Carlin (1994) criticize the speed of transition as too fast because of the job losses it implied. By contrast, the model presented here can rationalize such a policy. A privatization agency facing an erosion of its decision autonomy will try to accelerate the liquidation process in order to preempt high sales subsidies in a

[1] See for example Czada (1993, p. 156).

[2] Treuhandanstalt decided to liquidate approximately 30 percent of all SOEs.

later stage of the privatization when liquidation is no longer politically feasible.

The paper also relates to a larger literature that emphasizes political insulation as an important comparative advantage of private over public ownership (Sappington and Stiglitz, 1987; Shapiro and Willig, 1990; Willig, 1990). The dynamic perspective in our model highlights transition problems that exist before private ownership is established. Different privatization methods and institutional structures provide varying degrees of insulation during the transition. 'State-led restructuring' as advocated by Carlin and Mayer (1994) faces the risk that the political process distorts the investment and restructuring process.[3] The problem of political insulation appears particularly acute for countries in both economic and political transition. As Boycko, Shleifer, and Vishny (1993) pointed out, the main benefit of voucher privatization in Russia was its commitment value and the loss of control that it entailed for the state bureaucracy.

Compared to other Central and Eastern European countries, Germany offers a best case scenario for the political autonomy of the privatization agency. Partial political insulation could be reached by a strong representation of West German industry managers in the privatization agency.[4] Generous unemployment benefits were used to soften the resistance to firm liquidation. Nevertheless, Czada (1993) finds direct evidence for increasing 'external constraints' on the decision process of the privatization agency in a survey of 300 executive managers. Czada's survey data suggest that the external pressure on the internal decision making process was initially small, but increased over time. To what extent these external constraints are reflected in the privatization outcomes remains an open question and the subject of our analysis.

The rest of this paper is organized as follows. We first review the privatization and liquidation process in the German privatization program in Section 2. Section 3 develops a dynamic model of optimal liquidation under political intervention risk. We characterize the dynamically optimal liquidation decision and summarize the empirical implications in four testable propositions. New contractual data are discussed in Section 4.1, and Section 4.2 describes the methodology. The empirical implications are examined in Sections 4.3 to 4.6. Section 5 concludes.

[3]The potential for state-led restructuring has also been questioned by Dyck (1995) in a model that accounts for the information problem faced by state-led restructuring. For an early warning against political interference, see Bös (1992).

[4]According to Wolfgang Seibel (1993, p. 138), all regional chief executive officers (Niederlassungsleiter), all industry directors (Branchendirektoren), and 61.5 percent of all divisional directors (Abteilungsleiter) of the privatization agency were recruited from private industry.

2 The German Wholesale Program: Privatization vs. Liquidation

In March 1990 the privatization agency Treuhandanstalt (THA) was created by the East German government prior to German unification. The agency received an independent statute in the unification treaty and was formally supervised by the Federal Ministry of Finance. The THA was directed by a 23-member supervisory board that included the five prime ministers of the new 'Bundesländer,' trade-unionists, and prominent business people. The board of directors and the executive officers were largely recruited from the West German business community.

The THA adopted a wholesale method for privatization. Potential buyers submitted their entire entrepreneurial plan for firm development and a bid was approved based on the entire business plan rather than on the basis of maximum sales proceeds alone (Priewe, 1993).[5] The sales contracts typically specified investment and employment pledges of the investor. In most cases contractual penalties were specified for violation of the pledges.

Table 1 presents summary statistics for the German privatization program. The privatization process gained momentum after the German unification in October 1990 and proceeded at high speed. Up to January 1994, a total of 6,245 SOEs had been sold, and 3,219 had been liquidated. Many liquidations included those of holding companies after their major assets had been sold (Restliquidationen). Excluding the liquidation of holdings reduces the number of liquidation decisions to 1,812. In 1,920 cases the SOEs had been returned to previous owners or to local government. A portfolio of 951 SOEs was left for sale at the end of our sample period in January 1994. We can compare the liquidation decisions to successful sales. The quarterly sales of SOEs decreased from 931 privatizations in the third quarter of 1991 to 166 privatizations in the fourth quarter of 1993. The number of liquidations peaked with 351 cases in the first quarter of 1992 with few liquidation decisions after third quarter of 1992. Most liquidation decisions were made in an early phase of the privatization program.

When should the privatization agency liquidate a SOE? Liquidating a SOE in an early stage of the privatization process implies that the chance of finding a buyer are severely reduced since buyer search and matching requires time. Prolonged search on the other hand implies two countervailing risks. In the absence of a buyer, who can restructure the firm,

[5]To allow for a clear model exposition in Section 3.1, we abstract from heterogenous managerial abilities of the bidder and assume that the privatization agency maximizes revenue. For a framework which accounts for heterogenous managerial ability, see Dyck (1995).

its profitability is likely to deteriorate. The accumulating losses have to be absorbed by the privatization agency. A second risk may results from imperfect political insulation of the privatization agency. In a prolonged buyer search a SOE is more likely to find external political support against its liquidation and the privatization agency is likely to lose its liquidation option.

3 Privatization under Political Interference

How should the privatization agency react to its sequential loss of decision autonomy? The following section provides an analysis of the decision problem of the privatization agency with respect to optimal timing of liquidation decisions. We examine in particular how political risk of losing liquidation options due to political interference affects the policy of the privatization agency. The empirical implications are summarized in four testable propositions about the cross sectional and intertemporal distribution privatization prices and firm liquidations.

3.1 The Model

The privatization agency faces three types of uncertainty: about the profitability of SOEs, about future selling opportunities, and about its ability to liquidate SOEs. First, profit uncertainty is a common assumption in models of optimal investment decisions.[6] But it appears as particularly important for a period of economic transition when firms undergo extensive restructuring. Second, uncertainty about selling opportunities represents the randomness in matching a buyer and a SOE. Potential buyers have to engage in an extensive search efforts prior to the acquisition of a SOE. This search process may be complicated by the lack of reliable accounting data and legal uncertainty due to unspecified ownership rights.[7] Third, the privatization agency faces political uncertainty about its ability to undertake firm liquidations. Soaring unemployment in the economic transition can lead to political intervention and restrictions on the agency's decision autonomy.

To obtain a tractable analytical framework, we make specific assumptions about the stochastic processes that govern each type of uncertainty. The profit flow of a SOE under continued public ownership is denoted by Π_t and can be decomposed into a non-stochastic lower loss limit $\overline{\Pi} < 0$ and a stochastic component Ψ_t. The stochastic component follows a

[6] For a survey of dynamic investment models see Dixit and Pindyck (1994).

[7] Legal uncertainty about ownership existed in the German privatization process for firms whose former owners were dispossessed by the communist government. Former owners could claim restitution of their ownership rights. Uncertainty about the validity of such claims interfered with the privatization procedures.

geometric Brownian motion with a drift parameter α and a variance parameter σ.

$$\begin{aligned} \Pi_t &= \overline{\Pi} + \Psi_t \\ d\Psi_t &= \alpha \Psi_t dt + \sigma \Psi_t dw_t \end{aligned} \tag{1}$$

To assure a finite present firm value, we assume that the discount rate exceeds the drift parameter α for the profit growth ($r > \alpha$). The initial profit flow at the beginning of the privatization program is denoted by $\Pi_0 = \overline{\Pi} + \Psi_0$. It is convenient to assume that the profit flow follows a geometric Brownian motion. This allows for an analytical solution to the optimal liquidation policy. The negative lower bound $\overline{\Pi} < 0$ implies that the firm value can become negative. The privatization agency influences the profit flow of the SOE only through liquidation decisions.[8] A firm liquidation terminates the firm's profit flow at a fixed liquidation cost $C_L > 0$. It is assumed that the liquidation cost does not exceed the present value of the SOE for the lowest possible profit level, that is $-C_L > \overline{\Pi}/r$.

The availability of the liquidation option is jeopardized by an exogenous political process. For simplicity, we model political intervention as an independent Poisson process, I_t^p, with a constant probability p that the liquidation option is eliminated. Let T_P denote the time when the liquidation option is lost.

$$I_t^p = \begin{cases} 1 & pdt \\ 0 & 1 - pdt \end{cases} \tag{2}$$

The privatization agency chooses a liquidation time T_L for those SOEs without liquidation constraint. The optimal choice of the liquidation time maximizes the present value of the expected cash flow. Assuming that the discount rate r is constant, we can write the reservation value of the privatization agency for an SOE as

$$\begin{aligned} F(\Psi_t, I_t^p) &= \max_{\{T_L\}} E_t \left[(1 - I_t^p) V_t^0 + I_t^p V_t^1 \right] \\ V_t^0 &\equiv \int_t^{T_L} e^{-r(s-t)} \Pi_s ds - e^{-r(T_L - t)} C_L \\ V_t^1 &\equiv \int_t^{\infty} e^{-r(s-t)} \Pi_s ds. \end{aligned} \tag{3}$$

with stochastic transitions equations (1) and (2). The reservation value of the privatization agency is given either by the firm value V_t^0 for an optimal liquidation policy or by the firm value V_t^1 in the absence of the liquidation option.

[8] This appears as a realistic assumption for mass privatizations, in which the privatization agency cannot influence operational business decisions of SOEs for administrative and informational constraints. In the German privatization, additional liability considerations impaired such interference. For details on the restructuring management, see Schwalbach (1993, pp. 189-193).

We assume that potential buyers arrive sequentially. The matching of an SOE and a potential buyer is modeled as an independent Poisson process

$$I_t^m = \begin{cases} 1 & mdt \\ 0 & 1 - mdt \end{cases}, \tag{4}$$

where m denotes the matching probability. The time of the successful matching is denoted by T_M. Potential buyers have a comparative advantage in restructuring an SOE, and the firm's profit flow under private ownerships exceeds the profit flow under continued state ownership. We assume an asymmetric bargaining situation in which the buyer can make an offer and the privatization agency accepts or rejects it. The buyer then bids the reservation value $F(\Psi_t, I_t^p)$ of the privatization agency and the privatization agency accepts the bid. Under this asymmetric bargaining situation, the entire surplus of ownership transfer goes to the buyer. While this assumption might seem somewhat extreme, considerable bargaining asymmetry is plausible for a mass privatization program in which the privatization agency confronts severe administrative constraints.[9] Under tight administrative constraints the privatization agency may have to restrict its sales efforts to approving buyer offers.[10]

Let the switching time $T^{\min} \equiv \min\{T_M, T_P, T_L\}$ be defined as the time of the first event of either matching, intervention, or liquidation. The privatization revenue for the firm then follows as

$$R(\Psi_t, I_t^p, I_t^m) = \begin{cases} F(\Psi_{T_M}, 0) & \text{for} \quad T_M = T^{\min} \\ -C_L & \text{for} \quad T_L = T^{\min} \\ F(\Psi_{T_M}, 1) & \text{for} \quad T_P = T^{\min} \end{cases}.$$

The buyer will offer the reservation value $F(\Psi_{T_M}, 0)$ for a SOE that can still be liquidated. SOEs for which the privatization agency lost the liquidation option only yield $F(\Psi_{T_M}, 1)$. If no buyer is found until the optimal liquidation time T_L, the SOE is liquidated at a cost $-C_L$.

[9] For a discussion of tight administrative constraints in the German privatization process, see Kloepfer (1993, pp. 55-57).

[10] A negotiating team of the THA sold up to three firms a week and relied heavily on information provided by the buyer.

3.2 Dynamic Optimization

The dynamic optimization problem of the privatization agency implies the following Bellman equation:[11]

$$rF(\Psi_t,0)dt = \max_{\{T_L\}} \{\Pi_t dt + E_t\left[dF(\Psi_t,0)\right]\} \tag{5}$$

$$\begin{aligned} E_t\left[dF(\Psi_t,0)\right] &= p\left[F(\Psi_t,1) - F(\Psi_t,0)\right]dt + \\ &\quad +\alpha\Psi_t F_\Psi(\Psi_t,0)dt + \tfrac{1}{2}\sigma^2\Psi_t^2 F_{\Psi\Psi}(\Psi_t,0)dt. \end{aligned}$$

The Bellman equation has a straightforward economic interpretation. If the privatization agency discounts capital at rate r, the left-hand side of equation (5) represents its required mean return from public ownership over the time interval dt. The right-hand side denotes the expected return of continued ownership. It consists of the profit flow Π_t and the expected change in the reservation value $E_t[dF(\Psi_t,0)]$. The expected change in the reservation value can be decomposed into the expected cost of a loss of the liquidation option $p[F(\Psi_t,0) - F(\Psi_t,1)]dt$, the expected change in the reservation value $\alpha\Psi_t F_\Psi(\Psi_t,0)dt$ due to profit flow changes, and the usual second derivative term of order dt. Optimality requires that the expected return equals the required mean return.

The reservation value after political intervention can be calculated directly as

$$F(\Psi_t,1) = E\left[V_t^1\right] = \frac{\overline{\Pi}}{r} + \frac{\Psi_t}{r-\alpha}. \tag{6}$$

Substituting equation (6) into the Bellman equation (5) yields a linear second-order differential equation with the following general solution:

$$F(\Psi_t,0) = \frac{\overline{\Pi}}{r} + \frac{\Psi_t}{r-\alpha} + B_1\Psi_t^{\beta_1} + B_2\Psi_t^{\beta_2}, \tag{7}$$

where B_1 and B_2 are undetermined coefficients. The characteristic roots β_1 and β_2 are given by the quadratic equation

$$\mathcal{Q} = \tfrac{1}{2}\sigma^2\beta(1-\beta) + \alpha\beta - (r+p) = 0. \tag{8}$$

The quadratic equation has one positive root $\beta_1 > 1$, and the second root β_2 is negative. The solution for the two coefficients B_1 and B_2 and the quality threshold Ψ_{T_L}, at which the

[11] In the time interval dt, $F(\Psi_t,0)$ changes to $F(\Psi_t+d\Psi_t,0)$ with the probability $1-pdt$ and to $F(\Psi_t+d\Psi_t,1)$ with probability pdt. Thus

$$F(\Psi_t,0) = \Pi_t dt + e^{-rdt}\left\{(1-pdt)E\left[F(\Psi_t+d\Psi_t,0)\right] + pdtE\left[F(\Psi_t+d\Psi_t,1)\right]\right\}.$$

Expanding the right-hand side using Ito's Lemma and retaining only terms of order dt, we obtain equation (5).

privatization agency undertakes the firm liquidation, are determined by equation (7) and the following three boundary conditions:

$$\lim_{\Psi_t \to \infty} F(\Psi_t, 0) = \lim_{\Psi_t \to \infty} F(\Psi_t, 1) \tag{9}$$

$$F(\Psi_{T_L}, 0) = -C_L \tag{10}$$

$$F_\Psi(\Psi_{T_L}, 0) = 0. \tag{11}$$

The boundary condition (9) requires that for arbitrarily high profit flows the liquidation option has no value as its exercise is never desired. Equation (10) states that the reservation value of the agency at the optimal liquidation time T_L equals the (negative) liquidation cost. The so-called smooth pasting condition is expressed in equation (11). For the optimal liquidation time T_L, local variations in the realization of the state variable Ψ_t do not change the reservation value for the firm.[12]

3.3 Optimal Timing of Liquidation Decisions

Using equations (7) to (11) we can now solve for the quality threshold Ψ_{T_L} at which the privatization agency stops the search process for a buyer and liquidates the SOE. We ask in particular how political risk affects the required quality threshold $\Pi_{T_L} = \overline{\Pi} + \Psi_{T_L}$ above which an SOE qualifies for continued buyer search.

The boundary condition (9) implies $B_1 = 0$ for the coefficient of the positive root β_1. Conditions (10) and (11) jointly determine the liquidation threshold for the profit process as

$$\Psi_{T_L} = \frac{\beta_2 (r - \alpha)}{1 - \beta_2} \left(C_L + \frac{\overline{\Pi}}{r} \right) > 0. \tag{12}$$

The optimal liquidation time T_L is implicitly defined as the time when the stochastic component Ψ_t of the profit process reaches the value Ψ_{T_L}. For a firm profit flow lower than $\Pi_{T_L} = \overline{\Pi} + \Psi_{T_L}$, continued search for a buyer is not optimal. The boundary conditions (10) and (11) determine the coefficient B_2 in equation (7). The reservation value of the privatization agency with a liquidation option follows as

$$F(\Psi_t, 0) = \frac{\overline{\Pi}}{r} + \frac{\Psi_t}{r - \alpha} + \frac{(-\beta_2)^{-\beta_2} (r - \alpha)^{-\beta_2}}{(1 - \beta_2)^{1 - \beta_2}} \left(-C_L - \frac{\overline{\Pi}}{r} \right)^{1 - \beta_2} \Psi_t^{\beta_2}. \tag{13}$$

The first two terms in equation (13) characterize the present value of the future profit flow without the liquidation option. The third term denotes the increase in the reservation value

[12] For a no-arbitrage interpretation of the smooth pasting condition, see Dixit and Pindyck (1994), pp. 130-133.

for the SOE if liquidation is an option. The value of the liquidation option depends on the difference between the profit loss under liquidation $-C_L$ and the present value $\overline{\Pi}/r$ of the maximal loss flow. Higher liquidation costs decrease the value of the liquidation option.

Determining the effect of political intervention risk on the optimal liquidation policy is straightforward. According to equation (8), the negative root β_2 decreases if the probability of intervention p increases. Equation (12) implies that the liquidation threshold Ψ_{T_L} for the profit process increases. Thus,

$$\frac{\partial \beta_2}{\partial p} < 0 \quad , \quad \frac{\partial \Psi_{T_L}}{\partial p} > 0.$$

The expected return of continued operation on the right-hand side of equation (5) is depressed by the additional risk of the loss of the liquidation option. Figure 5 graphs the value function of a firm for two different levels of political intervention risk. The firm's reservation value in the case of higher political risk is lower for any level of the profit flow. Political risk, therefore, decreases the agency's reservation price and the privatization revenue even for firms that can still be liquidated, but might acquire political protection in the future. The reservation price of the privatization agency has to account for the risk of losing the liquidation option if the search for a buyer continues. If an SOE obtains political protection against liquidation, the reservation value of the privatization agency decreases to the linear schedule given by $F(\Psi_t, 1)$. The firm price can now fall below the liquidation cost $-C_L$ and large sales subsidies are possible privatization outcome.

The negative effect of political intervention on privatization revenue has been named the Kvaerner effect. During the German privatization program, the Norwegian company Kvaerner lowered its offer and demanded particularly high subsidies for buying an East German shipyard following political intervention against the shipyard's liquidation (Schmidt, 1993, p. 230).

3.4 Revenue Implications

The model has specific implications for the price patterns in different groups of SOEs. Higher political risk lowers the reservation price of the privatization agency along the time path of possible sales. However, political risk has a relatively minor influence on firms with a high profit flow $\overline{\Pi}+\Psi_t$ for which the liquidation option is unlikely to be exercised. The difference in the reservation price becomes substantial between firms with and without liquidation options as we consider low quality firms. This is evident from the widening gap between $F(\Psi_t, 0)$ and

$F(\Psi_t, 1)$ for a decreasing profit flow parameter Ψ_t. As long as the privatization agency retains the liquidation option, the $F(\Psi_t, 0)$ schedule determines the privatization price. Frequent political intervention with its loss of the liquidation option implies lower privatization prices on the $F(\Psi_t, 1)$ schedule. Large sales subsidies below the liquidation costs $-C_L$ become more likely under higher political risk. We summarize these considerations in the following statement:

Implication 1 (Subsidy Patterns). *Groups of SOEs with frequent political intervention should be characterized by high sales subsidies for low-quality firms.*

Implication 1 concerns the cross-sectional privatization pattern. Incomplete political insulation of the privatization agency is reflected in a subsidy bias towards low-quality firms in industry groups with high political intervention risk. But differences in the political intervention risk also affect the time series behavior of the privatization revenue. As the loss of political insulation occurs as a dynamic process, industries with a higher intervention risk encounter a stronger decrease in the average privatization revenue. Equations (5) and (6) imply that the expected change in the reservation value decreases in the risk parameter p for an unprotected SOE and is constant for a protected SOE:

$$\begin{aligned} \frac{d}{dp} E_t \left[dF(\Psi_t, 0) \right] &< 0 \\ \frac{d}{dp} E_t \left[dF(\Psi_t, 1) \right] &= 0. \end{aligned}$$

By assumption investors bid the reservation price of the privatization agency. Dynamically eroding decision autonomy implies that the average sales price should decrease over time and this decrease should be stronger for groups of SOEs with higher political risk. We summarize as follows:

Implication 2 (Time Patterns). *Groups of SOEs with frequent political intervention should show a steeper intertemporal decrease of their average sales price.*

3.5 The Liquidation Density

The eroding political insulation of the privatization agency influences the liquidation behavior of the privatization agency. Higher political risk increases the liquidation threshold and firms are liquidated earlier than they would be in the absence of political intervention. We can determine a closed form solution for the distribution of the time interval until liquidation

is undertaken. We first determine the so-called *passage time* until a geometric Brownian motion Ψ_t reaches the liquidation threshold Ψ_{T_L}. Consider a firm with an initial profit flow $\Pi_0 = \overline{\Pi} + \Psi_0$ at time t_0 and let $n(.)$ denote the density function of a normal distribution. The distribution of the passage time $g(t,p)$ until liquidation can be calculated as[13]

$$g(t,p) = x_0[\sigma^2(t-t_0)^3]^{-\frac{1}{2}} n\left[\frac{x_0 + (\alpha - \frac{1}{2}\sigma^2)(t-t_0)}{\sigma\sqrt{t-t_0}}\right],$$

where $x_0 \equiv \ln(\Psi_0) - \ln(\Psi_{T_L})$. The distribution of the passage time states probabilities for a firm that does not face the possibility of a buyer match. Since the matching process prior to liquidation is an independent Poisson process, the liquidation density follows as

$$f(t,p,m) = e^{-m(t-t_0)} g(t,p). \tag{14}$$

The liquidation density accounts for the possibility that a SOEs escapes liquidation through a buyer match. Figure 5 graphs the liquidation density for two different levels of risk. Higher political risk shifts the liquidation density to the left and moves the average liquidation date forward. The privatization agency accelerates the liquidation process in rational anticipation of the risk to lose the liquidation option. A lower matching rate m moves the average liquidation date backward. If we assume that the intervention risk and the matching rate are negatively correlated across groups of SOEs, cross-sectional comparisons in the intervention risk may produce ambiguous results for the average liquidation date.

In order to isolate the role of political risk, it is more useful to estimate the average passage time, which is independent of the matching rate. We denote by $L(j)$ the set of liquidated SOEs of group j, by $\#L(j)$ the number of set elements and by $T_L(i,j)$ the liquidation time of a firm i. For an estimate $\widehat{m}(j)$ of the matching rate in group j, we determine the average passage time $PT(j)$ from the liquidation distribution in equation (14) as

$$PT(j) = \frac{1}{\#L(j)} \sum_{i \in L(j)} e^{\widehat{m}(j)[T_L(i,j)-t_0]} \left[T_L(i,j) - t_0\right]. \tag{15}$$

The model prediction is summarized as follows:

Implication 3 (Liquidation Pattern). *Groups of SOEs with higher political risk should face liquidation relatively faster with a lower passage time until liquidation.*

[13] To arrive at the solution for the passage time, we define a Brownian motion process as $W_t = \ln(\Psi_t)$. The drift of W_t follows as $\alpha_w = \alpha - \frac{1}{2}\sigma^2$. A Brownian motion reaches an absorption barrier at a distance $x_0 \equiv \ln(\Psi_0) - \ln(\Psi_{T_L})$ below the initial value in a passage time whose distribution is derived by Ingersoll (1987, pp. 351-353).

The ability of the privatization agency to preempt political interference by faster liquidations renders such interventions counterproductive. Political interest groups should therefore be expected to challenge the mandate and the role of the privatization agency and not only lobby for protection of a particular industry. The delegation of privatization authority not only accelerates the privatization process but also polarize the political conflict.

3.6 The Variance Effect of Political Interference

The following section explores the model implications for the second moment of the revenue distribution across different industries. Both the risk of losing the liquidation option and its loss imply a lower reservation value of the privatization agency. As pointed out before, groups of SOEs with higher rates of political intervention should therefore be characterized by a lower average privatization price due to more privatizations of low quality firms. The suspension of the liquidation option increases at the same time the variance of the revenue distribution in groups with frequent political interference. Variations in the level of political interference across different industries thus induce a negative correlation between average privatization price in a group of SOEs and the intra-group price variance.

Formally, let $N(j)$ denote the set of privatized firms in group j and $R(i,j)$ the privatization price of firm i. The average privatization price of group j then follows as

$$R(j) = \frac{1}{\#N(j)} \sum_{i \in N(j)} R(i,j)$$

and the intra-group price variance is given by

$$\mathrm{VAR}(j) = \frac{1}{\#N(j)} \sum_{i \in N(j)} \left[R(i,j) - R(j)\right]^2 .$$

A higher political intervention rate p decreases the average group price and increases the intra-group price variance. A lower matching rate tends to have the same effect. The slower stock reduction allows for a larger dispersion of the state variable Ψ_t and provides time for more political interventions. A negative correlation between intervention risk and the matching rate reinforces the variance effect of political intervention summarized in implication 4:

Implication 4 (Variance Effect). *Groups of SOEs with higher political intervention risk should be characterized by both lower average privatization prices and a higher intra-group price variance.*

4 Evidence on Privatization Outcomes

The following empirical part of the paper confronts the model implications with micro data on privatization prices and the liquidation decisions of the German privatization agency. First, we discuss the data. Second, we justify our method of grouping SOEs according to their political risk. The following sections examine the empirical validity of each of the model implications.

4.1 Data

The contract-controlling division of the THA provided micro data on individual sales contracts. A second data set was obtained from the BVS (Bundesanstalt für Vereinigungsbedingte Sonderaufgaben)[14] with information about the timing of liquidation decisions.

The contractual data contain privatization contracts from 17 major industries and include only those cases in which the entire company was sold.[15] Complete privatization accounted for a total of 2,614 contracts. Of these, 1,804 contained legally binding employment pledges, and 1,614 had both employment and investment pledges. The contract-controlling division recorded pledges only when pledges constituted legal claims against the investors. Pledges went unrecorded whenever promises of investors represented a mere statement of intent. Contracts with unrecorded employment pledges are excluded from the sample.

The contractual data allow the calculation of a sales price for each SOE. The price calculation has to account for the various side payments implied by the contractual arrangement. Financial restructuring prior to privatization included the creation of balance sheets and the injection of equity capital to obtain a positive capital stock (Ausgleichsverbindlichkeiten) for viable SOEs. All financial arrangements that changed this equity assignment in the last balance sheet prior to the sale were counted as side payments such as additional debt redemption or capital injection. The price calculation does not include any debt that SOEs had prior to the German monetary union of July 1990 (Altkredite). This preexisting debt is treated as a liability of the THA. In cases where the buyer agreed to take over such old debt, it is counted as revenue for the THA.

The second data set on 1,812 liquidated SOEs allows us to document the timing of liquidation decision. It records all liquidations in which the entire SOEs was subject to the

[14] The BVS is the successor organization of the THA.

[15] Excluded are SOEs of which the buyer acquired only some company divisions while the remaining divisions were liquidated by the THA.

liquidation procedure and excludes liquidations of holding companies without remaining assets.[16] The liquidation date is the day on which the board of directors (Vorstand) of the privatization agency took a liquidation decision. The data set reduces to 1,097 observations if we concentrate on SOEs in the 17 major industries for which we have contract data.

4.2 Methodology

To make the privatization prices comparable across SOEs of different size and quality, we form the ratio of the price to the employment pledge (future employment as of 1994) specified in the contract. This ratio is referred to as the per capita price (PCP) of a SOE. The employment pledges represent a forward-looking measure of plant size. Similarly, the investment pledges are divided by the employment pledges and denoted as the per capita investment (PCI). Finally, the role of employment preservation in the privatization contracts is measured by the ratio of employment pledges to original employment in 1990 and denoted as preserved employment (PE).

Table 2 presents summary statistics of these three contractual variables for 17 industries. The data show considerable variation for the average PCP across industries. The average price for a workshop position ranges from a negative sales price (subsidy) of DM $-29,800$ in the textile industry to a revenue of DM $13,700$ in the construction industry. Seven industries show negative average sales prices. The PE in SOEs is particularly low in the optical industry at only 33 percent.[17] Note that PE measures the preserved employment only for firms that were successfully privatized and excludes SOEs that were liquidated. PE therefore understates the industry-specific employment loss.

An important parameter of our model is the probability $p(j)$ of a SOEs in group j to obtain political protection against its liquidation. This parameter is not directly measurable. The following analysis assumes that large firms find it easier to obtain political protection. Economies of scale in the rent-seeking competition between small and large firms may justify this assumption. We divide firms into three size groups, with small firms having less than 50 employees, the medium size with between 50 and 500 employees and large firms with more than 500 employees in 1990. It is assumed that $p(j)$ increases with each size groups.

[16] The liquidation of holding companies is usually referred to as "Mantelliquidation" or "Restliquidation" and accounts for 1,904 cases.

[17] Schmidt (1993) reports that the council of experts of the THA (Leitungsausschuß) proposed liquidation of the entire microelectronic and optical industry. This proposal met with protest from the federal state governments of Saxony, Thuringia, and Brandenburg and was abandoned.

Second, the ability to obtain political protection will generally increase with the level of sectorial unemployment that pertains to a certain industry. We therefore divide firms into a group A with low, a group B with average and a group C with high sectorial unemployment. Group A is composed of the construction and construction supply industry, group C of the textile, leather and optical industry. All other sectors form group B. We assume that the parameter $p(j)$ is low for group A and high for group C. This industry sorting is largely independent of the firm size sorting. Group A (group B, group C) comprises 16.93 (22.41, 17.09) percent small, 65.36 (62.16, 63.25) percent medium and 17.71 (15.43, 19.66) percent large SOEs.

4.3 Implication 1: Subsidy Patterns

The theoretical part of the model predicts that industry groups with frequent political intervention should be marked by a frequent privatization of low-quality SOEs that sell only at the cost of high subsidies. To examine this model implication, we first divide each size group and each industry group into four price quantiles. Quantile 1 contains the 25 percent of SOEs with the highest PCP, Quantile 4 the 25 percent with the lowest PCP, and Quantile 2 and 3 the two 25 percent groups in between. Table 3 shows the average PCP, PCI and PE for each price quantile for small, medium and large firms.

The two higher price quantiles show no clear size effect for the PCP. In the highest price quantile the average PCP increases from DM $50,300$ for small firms to DM $61,000$ for the group of large firms. For the lowest price quantile, however, we find a substantial subsidy bias toward large SOEs. The (negative) price for the lowest price quantile decreases from DM $-28,500$ per employee for small SOEs to DM $-114,600$ in the case of large SOEs. The PE decreases as the size of the SOE increases for all price quantiles. Thus, large SOEs had the more severe reductions in their workforce.

The quantile analysis is repeated for the industry groups with different sectorial unemployment. Table 4 reports the average PCP, PCI and PE for each price quantile in group A, B and C. Again the variation in the average PCP is small for high quality firms. A substantial difference emerges for the low quality quantile. The average PCP falls from DM -13.900 to DM in group A to -120.700 in group C. The most subsidized firms again have the lowest percentage of employment retention. Only 20 percent of the employees are retained in the low quality quantile of group C compared to 60 percent in group A.

In summary the data confirm the model implications concerning the subsidy pattern. Both the magnitude of the sales subsidies and the subsidy bias toward large SOEs and industries with large sectorial unemployment support the claim that liquidation constraints played an important role in the German privatization process. Large SOEs and SOEs in industries with large sectorial unemployment appear to have benefited from liquidation constraints more frequently than small SOEs. Political intervention risk differed across firm types.

4.4 Implication 2: Time Patterns

We assume that the privatization agency faced a continuous decrease in its decision autonomy with respect to liquidation decision. The theoretical analysis in Section 3.4 predicts a steeper decrease of the average revenue for firms with higher political risk $p(j)$ than for those that cannot procure political protection. Did the subsidy problem deteriorate over time as described by the model?

To examine the implied time pattern, the size and industry groups are divided into six half-year intervals from January 1991 to December 1993. Table 5 reports the average PCP of the 6 groups for each time interval. We observe an intertemporal decrease in the average PCP for all 6 groups. Second, we find that firm groups with higher political risk show indeed a steeper revenue decline. The difference in the slope is statistically significant at a 1 percent level for both the size groups and the industry groups.

The intertemporal decrease in the average PCP as such is not very surprising. Better SOEs could be sold first or the quality of unsold SOEs may have deteriorated in the absence of a buyer. But self-selection and quality deterioration do not explain the systematic difference in the price decrease across groups unless they apply particularly to large SOEs or SOEs in industry group C. Firm specific political intervention risk and the dynamic erosion of the THA's ability to liquidate can easily account for the observed time pattern.

4.5 Implication 3: Liquidation Pattern

Did the privatization agency accelerate firm liquidations in industries with higher intervention risk? To address this question, we estimated the average passage time according to equation (15). We calculated a monthly matching rate as the ratio of the number of privatizations and the stock of SOEs at the beginning of each month and averaged this matching rate for the 24 months from January 1991 to December 1992. Table 6 documents the average monthly matching rates for the size and industry groups. SOEs in group A had a monthly matching

chance of 6.25 percent relative to 1.39 percent for group C. The matching rates are similar across size groups.

The passage time is measured in days relative to the reference date of January 1, 1991. In accordance with our model, large SOEs and SOEs in group C show a lower average passage time until liquidation. The time differences to small SOEs and SOEs in group A are 79 and 382 days, respectively. Conditional on the absence of a matching buyer, large SOEs and SOEs in group C tended to be liquidated early.

We emphasize that a lower relative average passage time does not imply an earlier relative average liquidation date unless the matching rates are equal across size and industry groups. The passage time distribution gives liquidation probabilities for a firm that participates in the sales process (or conditional on the absence of a buyer match), while the liquidation density measures these probabilities for a firm that may escape liquidation by a buyer match. The higher the matching rate, the earlier should be the average liquidation date relative to the average passage time. Small (medium, large) SOEs were liquidated on average after only 319 (343, 307) days and SOEs in group A (group B, group C) after 310 (326, 335) days.

The low average liquidation date highlights the overall speed with which liquidation decisions were undertaken. The privatization agency became fully operational only after the German unification in November 1990. A year later the board of directors had taken more than half of all liquidation decisions. The policy of fast liquidation was plausibly motivated by rational foresight of future liquidation constraints.

4.6 Implication 4: Variance Effect

The variance effect predicts that groups of SOEs with high political risk show a lower average privatization price and a higher intra-group price variance. Again we measure privatization price by the PCP. It is instructive to look first at evidence for the size and industry groups. Table 7 reports the average per capita price in group j, PCP(j), and the intra-group variance of the per capita price, VAR(j). The first moment of the PCP decreases with firm size. This is not surprising given the evidence on the subsidy bias for large firms in Section 4.3. Associated with this subsidy pattern is a substantial increase in the second moment. The variance of the PCP in the group of large SOEs is more than three times higher than in the group of small SOEs. If we sort the SOEs according to sectorial unemployment, a similar variance effect is evident. Between group A and group C the intra-group variance increases

by a factor 5.

Formally testing for the variance effect requires a sufficient number of firm groups. To increase the number of observations we thus divided SOEs within each of the 17 industry sectors into a group of large firms with more than 100 employees and a group of small firms with less than 100 employees in 1990. Only the two industry sectors with the lowest number of firms, namely the leather and optical industries, are not split into subsamples to guarantee enough observations in each firm group. Altogether, we obtained 32 firm groups.

The results of a linear OLS regression are shown in table 8. Figure 5 plots the 32 observations. The coefficient β_1 is negative and significant at a 3 percent level. The difference in the price variance across groups is substantial. The 7 groups with the highest price variance have a more than 5 times larger intra-industry PCP variance than the 7 groups with the lowest PCP variance.

The group of large chemical firms has a distinctly higher variance than other groups. This might be explained by the fact that sales contracts for this industry occasionally included ownership in valuable gas and oil pipelines. The large intra-industry variance for the chemical industry might be traced to the firm-specific inclusion or exclusion of such network assets rather than differences in the respective liquidation policy. Excluding large chemical firms from our sample implies that the t-value for the coefficient β_1 increases to 3.766. We conclude that the data confirms the variance effect of firm-specific political risk.

5 Conclusion

Can privatization authority be successfully delegated? We explored this question from the vantage point of a privatization agency, which faces a dynamic decision problem about liquidation decisions under incomplete political insulation. The model implications were confronted with micro data from the German privatization process.

The micro data confirms several cross-sectional and intertemporal model predictions resulting from the political constraints of the agency. In particular we find a subsidy bias towards large firms and industries with large sectorial unemployment and interpret this as evidence for incomplete insulation of the German privatization agency. The relative increase of this subsidy bias suggests that the agency's insulation problem deteriorated over time. Our model also predicts that a privatization agency faced with eroding decision autonomy should accelerate the liquidation process. Cross-sectional evidence for 6 groups of SOEs sug-

gests that the passage time until liquidation was shorter for the groups with higher political intervention risk. We also emphasize that the overall speed of the liquidation decisions is supportive of the acceleration hypothesis. Finally, the variance enhancing effect of political intervention risk for the revenue distribution can be identified in the data.

On a more general level, our analysis illustrates that the degree of political insulation of a privatization agency is an important determinant for privatization outcomes. A successful institutional design must pay particular attention to the political insulation of the privatization agency.

References

[1] Aghion, P., O. Blanchard and W. Carlin, 1994, The economics of enterprise restructuring in central and eastern Europe, discussion paper, no. 1058, Center for Economic Policy Research, London.

[2] Akerlof, G., A. K. Rose, J. Yellen and H. Hessenius, 1991, East Germany in from the cold: the economic aftermath of the currency union, Brookings Papers on Economic Activity, 91(1), 1-87.

[3] Barberis, N., A. Shleifer and N. Tsukanova, 1994, How does privatization work? Evidence from the Russian shops, paper presented at the universities research conference in corporate finance, Cambridge, Mass.

[4] Bös, D., 1992, Privatization in East Germany, IMF, Fiscal affairs department, Washington DC.

[5] Bös, D., 1993. Privatization in Europe: a comparison of approaches, Oxford Review of Economic Policy, vol. 9, no.1, 95-111.

[6] Boycko, M., A. Shleifer and R. Vishny, 1993, Privatizing Russia, Brookings Papers on Economic Activity, 93(2), 139-181.

[7] Carlin, W. and C. Mayer, 1994, The Treuhandanstalt: privatization by the state and market, in: O. Blanchard, K. Froot and J. Sachs, eds., The Transition in Eastern Europe, vol. 2, University of Chicago Press.

[8] Czada, R., 1993, Die Treuhandanstalt im Umfeld von Politik und Verbänden, in: W. Fischer, H. Hax, and H. K. Schneider, eds., Treuhandanstalt - Das Unmögliche wagen, Akademie Verlag Berlin.

[9] Deutsches Institut für Wirtschaftsforschung, 1991, Subventionierung und Privatisierung durch die Treuhandanstalt: Kurswechsel erforderlich, DIW-Wochenbericht, no. 41, 575-580.

[10] Deutsches Institut für Wirtschaftsforschung, 1992, Analyse der strukturellen Entwicklung der deutschen Wirtschaft, Strukturberichterstattung 1992, Berlin.

[11] Dixit, A. and R. S. Pindyck, 1994, Investment under Uncertainty, Princeton University Press.

[12] Dyck, A., 1995, Privatization in Eastern Germany: management selection and economic transition, working paper, no. 95/030, Harvard Business School.

[13] East German privatization: fast and loose, Economist, may 1994, 75-76.

[14] Ingersoll, J. E., 1987, Theory of Financial Decision Making, Rowman and Littlefield.

[15] Kloepfer, M., 1993, Öffentlich-rechtliche Vorgaben für die Treuhand, in: W. Fischer, H. Hax, and H. K. Schneider, eds., Treuhandanstalt - Das Unmögliche wagen, Akademie Verlag Berlin.

[16] Laban, P. and H. Wolf, 1993, Large-Scale privatization in transition economies, American Economic Review, vol. 83, no. 5, 1199-1210.

[17] Laffont, J.-J. and J. Tirole, 1993, A theory of incentives in procurement and regulation, MIT Press.

[18] López-de-Silanes, F., 1993, Determinants of privatization prices, working paper, Harvard University.

[19] Lucke, B., 1994, Die Privatisierungspolitik der Treuhandanstalt - Eine ökonomische Analyse, discussion paper, no. 14/94, Freie Universität Berlin.

[20] Priewe, J., 1993, Privatization of the industrial sector: the function and the activities of the Treuhandanstalt, Cambridge Journal of Economics, vol. 17, no. 3, 333-348.

[21] Sappington, D. and J. Stiglitz, 1987, Privatization, information and incentives, Journal of Policy Analysis and Management, no. 6, 567-582.

[22] Schmidt, K.-D., 1993, Strategien der Privatisierung, in: Fischer, H. Hax and H. K. Schneider, eds., Treuhandanstalt - Das Unmögliche wagen, Akademie Verlag Berlin.

[23] Schwalbach, J., 1993, Begleitung sanierungsfähiger Unternehmen auf dem Weg zur Privatisierung, in: W. Fischer, H. Hax and H. K. Schneider, eds. Treuhandanstalt - Das Unmögliche wagen, Akademie Verlag Berlin.

[24] Seibel, W., 1993, Die organisatorische Entwicklung der Treuhandanstalt, in: W. Fischer, H. Hax and H. K. Schneider, eds., Treuhandanstalt - Das Unmögliche wagen, Akademie Verlag Berlin.

[25] Shapiro, C. and R. Willig, 1990, Economic Rationales for the Scope of Privatization, discussion paper 41, Princeton University.

[26] Sinn, G. and H-W. Sinn, 1992, Jumpstart: economic aspects of German reunification, MIT Press.

[27] Stiglitz, J., 1994, Whither socialism? MIT Press.

[28] Willig, R., 1993, Public versus regulated private enterprise, in: M. Bruno, and B. Pleskovic, eds., Proceedings of the World Bank Annual Conference on Development Economics 1993, World Bank, Washington DC.

Table 1

Summary Statistics

Quarter	Privatizations		Restitutions	Liquidations[b]
	All	Sample		
1990:4		30		77
1991:1	[a]1,670	167	[a]491	160
1991:2		252		173
1991:3	931	216	140	222
1991:4	696	178	239	281
1992:1	715	169	152	351
1992:2	591	207	170	331
1992:3	614	176	212	209
1992:4	311	164	136	5
1993:1	240	78	92	3
1993:2	133	56	157	0
1993:3	178	51	98	0
1993:4	166	59	33	0
Total	6,245	1,804	1,920	1,812

Source: Central controlling division of the THA and BVS.

[a]Combined total for 1990:4, 1991:1 and 1991:2.

[b]Exclusive of the liquidation of holding companies (Restliquidationen)

Table 2

Privatization Contracts

	Obs.	Average PCP[a]	Average PE[b]	Average PCI[a]
Chemicals	71	11.0	.49	83.5
Plastics	41	−10.1	.49	63.5
Ceramics	108	−5.6	.55	74.8
Light Metal	61	−24.1	.52	47.3
Steel	48	12.3	.54	35.5
Machinery	289	4.4	.41	40.6
Cars	99	12.5	.54	57.3
Electrical	85	4.0	.50	29.3
Optical	15	−17.7	.33	28.5
Consumer	65	−24.3	.43	40.3
Wood	125	−24.6	.53	42.5
Paper	78	13.3	.53	56.9
Leather	25	−13.8	.37	45.7
Textile	77	−29.8	.37	41.8
Food	233	13.8	.52	69.9
Construction	331	13.7	.66	24.6
Constr. Supply	53	13.3	.62	22.2
Total	1,804	2.03	.52	46.5

[a]In thousands of DM per employee.

[b]In percent of employment in 1990.

Table 3

Firm Size and Subsidy

Average PCP[a]				
Firm Size	Quantile 1	Quantile 2	Quantile 3	Quantile 4
Small	50.3	15.7	5.2	−28.5
Medium	66.4	17.3	1.8	−73.8
Large	61.0	14.1	−12.2	−114.6

Average PCI[a]				
Firm Size	Quantile 1	Quantile 2	Quantile 3	Quantile 4
Small	50.4	38.3	30.5	53.3
Medium	60.0	35.3	35.1	53.3
Large	62.3	41.9	44.9	62.6

Average PE[b]				
Firm Size	Quantile 1	Quantile 2	Quantile 3	Quantile 4
Small	0.65	0.76	0.74	0.56
Medium	0.50	0.61	0.56	0.36
Large	0.43	0.50	0.35	0.22

[a] In thousands of DM per employee.

[b] In percent of employment in 1990.

Table 4

Industry Group and Subsidy

Average PCP[a]

Industry	Quantile 1	Quantile 2	Quantile 3	Quantile 4
Group A	43.6	18.0	6.8	−13.9
Group B	69.3	17.2	−0.1	−82.6
Group C	38.0	1.8	−20.6	−120.7

Average PCI[a]

Industry	Quantile 1	Quantile 2	Quantile 3	Quantile 4
Group A	31.7	23.3	18.2	23.7
Group B	65.6	43.2	43.8	61.6
Group C	58.4	27.9	33.5	43.2

Average PE[b]

Industry	Quantile 1	Quantile 2	Quantile 3	Quantile 4
Group A	0.62	0.72	0.70	0.60
Group B	0.49	0.60	0.54	0.34
Group C	0.41	0.46	0.38	0.20

[a]In thousands of DM per employee.

[b]In percent of employment in 1990.

Table 5

Time Pattern

	Average Quarterly PCP[a]					
	1991:1	1991:2	1992:1	1992:2	1993:1	1993:2
Small	19.3	17.7	8.7	−1.7	−22.6	−16.1
Medium	20.4	22.9	1.3	−11.1	−30.8	−46.5
Large	20.6	11.1	0.0	−11.0	−80.0	−66.9
Group A	19.1	15.4	11.3	6.1	3.4	−9.9
Group B	20.5	21.9	3.1	−9.3	−46.3	−50.8
Group C	22.1	11.1	−29.0	−27.0	−44.9	−80.1

[a]In thousands of DM per employee.

Table 6

Liquidation Pattern

	Privat.	Liquid.	Av. Matching Rate[a]	Av. Passage Time[b]
			$\widehat{m}(j)$	$PT(j)$
Small	944	577	0.0395	581
Medium	1,301	428	0.0404	612
Large	368	92	0.0367	502
Group A	522	62	0.0625	792
Group B	1,933	777	0.0390	580
Group C	158	258	0.0139	410

[a]Average monthly rate for the period 1991:1 to 1992:12.

[b]In days since January 1, 1991.

Table 7

Variance Effect I

	Av. Group Price	Intra-Group Price Variance
	PCP(j)	VAR(j)
Small	10.8	1,450
Medium	3.0	4,217
Large	−13.0	5,537
Group A	13.6	718
Group B	1.0	4,667
Group C	−28.8	4,706

Table 8

Variance Effect II

$$\text{PCP}(j)=\beta_0 + \beta_1\text{VAR}(j)$$

Parameter	OLS Estimate	T-value
β_0	8.4822	(1.645)
β_1	−0.0028	(−2.316)

Adjusted R^2=.12

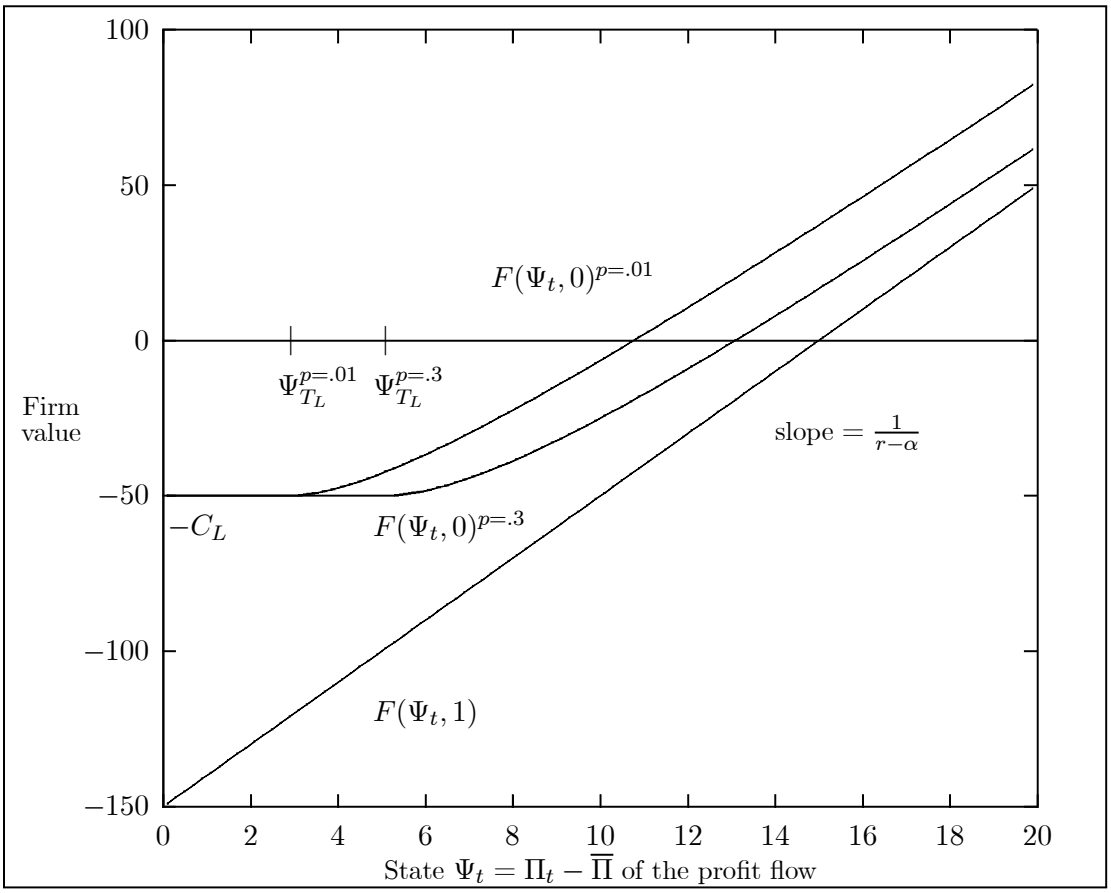

Figure 1: Firm value $F(\Psi_t, 0)$ for two levels of political risk and the firm value $F(\Psi_t, 1)$ for a SOE under liquidation constraints. The parameters are $\Pi_0 = 15$, $\overline{\Pi} = -15$, $C_L = 50$, $r = .1$, $\alpha = 0$, $\sigma^2 = .4$.

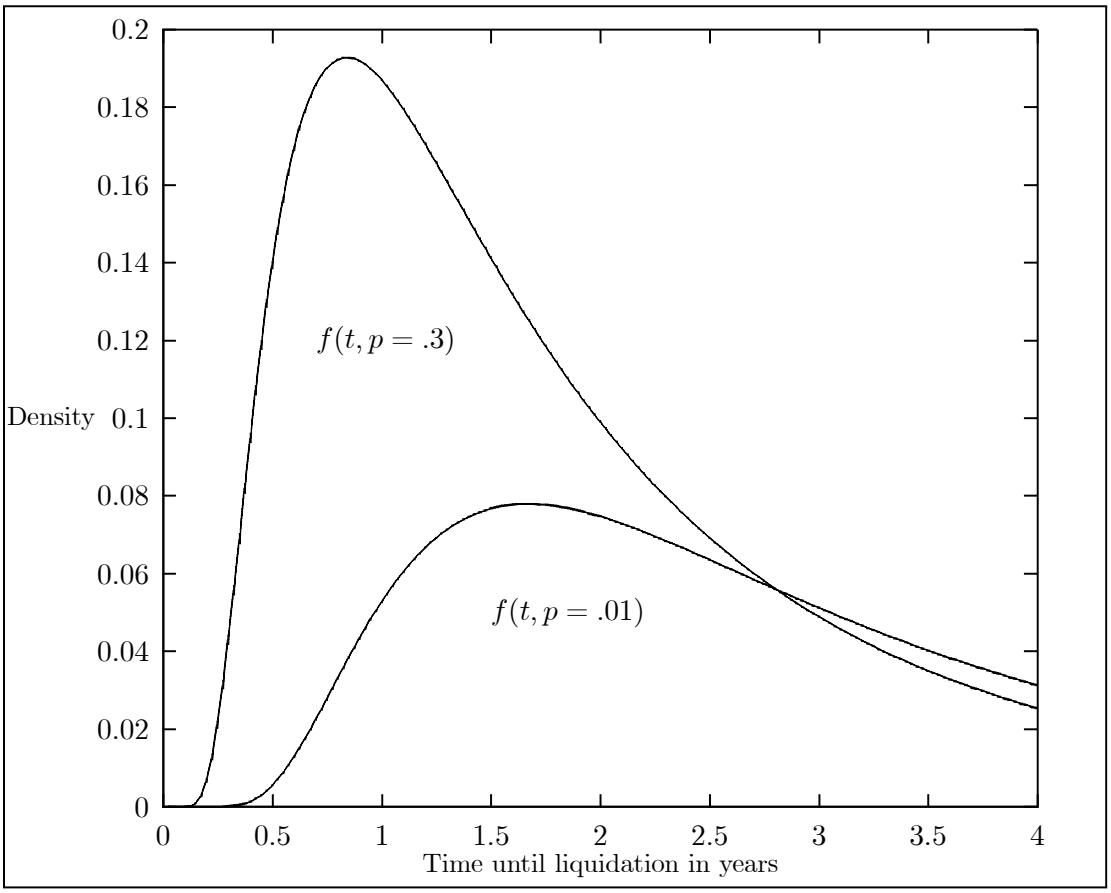

Figure 2: Liquidation density plotted for two levels of political risk. The parameters are $\Pi_0 = 15$, $\overline{\Pi} = -15$, $C_L = 50$, $r = .1$, $\alpha = 0$ and $\sigma^2 = .4$.

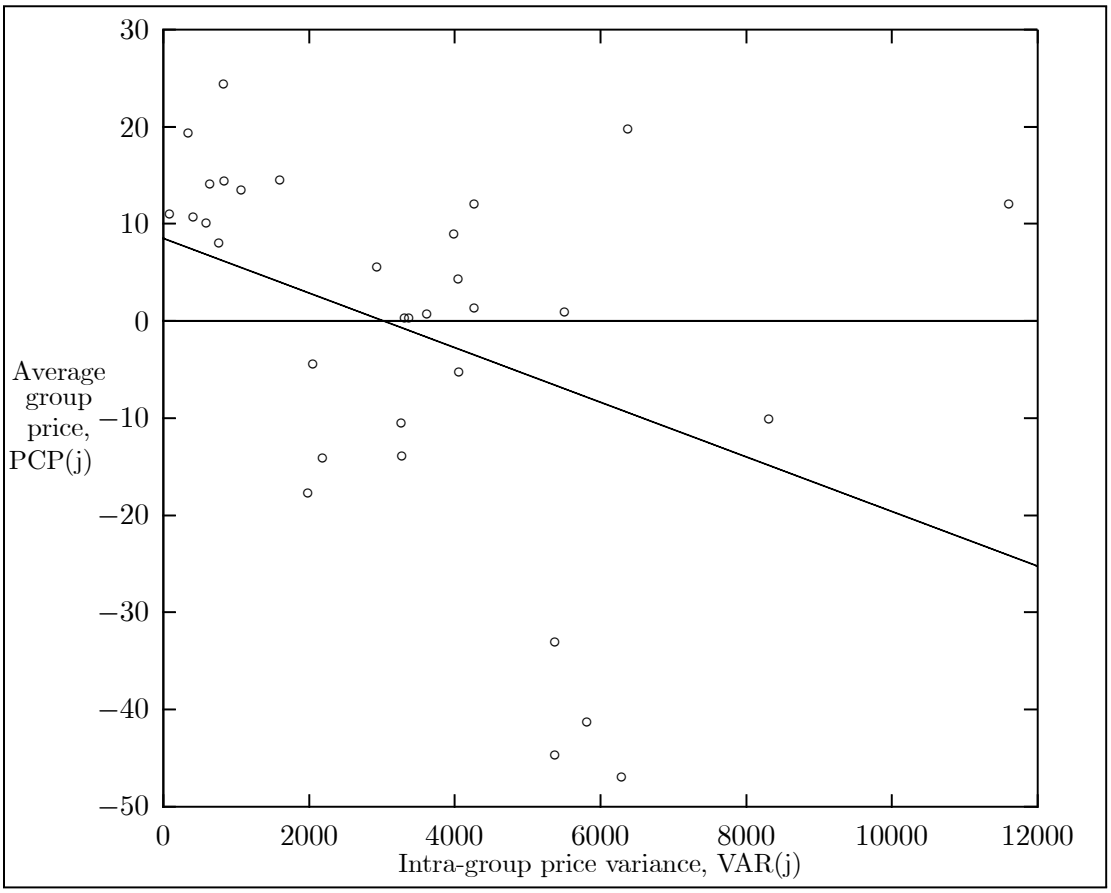

Figure 3: Average group revenue and intra-group revenue variance