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Liability for Past Environmental Contamination and Privatization

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1. Introduction

Under the former communist regimes in the Central and Eastern Europe, economic activities severely degraded the environment throughout the region. Various types of economic facilities C industry, agriculture, military operations C severely contaminated the air, water, and soil surrounding their sites by emitting and dumping numerous pollutants. Therefore, most commercial and industrial sites in Central and Eastern Europe are presently contaminated, if not severely so. Such contamination was widely reported shortly after the communist regimes fell.

Strangely enough, privatization agencies in Central and Eastern Europe responsible for the transfer of ownership over these facilities were taken aback by investors= concerns over the liability for any remediation of this widespread and severe contamination. Foreign investors were especially concerned by the potential liability for two reasons. First, they correctly believed that governments wished to tap the foreign investors= Adeep pockets@ for financing the cleanup of this large-scale degradation (Goldenman, 1995). Second, foreign investors recalled their previous experiences in Western industrialized economies over retroactive liability for environmental contamination, such as Superfund liability for hazardous waste contamination in the United States (World Bank/OECD, 1992).

After acknowledging the investors= concerns, privatization agencies responded with policies to reallocate liability for the cleanup costs. First, they responded with price reduction policies, but only on an ad hoc basis. Later, privatization agencies in some countries developed more systematic and thoughtful policies, such as indemnification of private liability using reimbursement schemes (Kružíková and Drobnik, 1993). Moreover, governments decided to gather more complete information on cleanup decisions before rushing into compensation schemes.

These government policy decisions were designed to facilitate the privatization process and presumably to increase the sales revenues generated by direct sales, auctions, and other privatization methods. Investors facing liability for cleanup costs would be expected to discount their bid for a contaminated enterprise commensurate with the extent of required cleanup. Of course, investors did not understand the extent of contamination and therefore cleanup costs with perfect certainty. Instead, most investors understood the level of cleanup costs with great uncertainty. As long as investors are risk-averse, the existence of uncertainty (i.e., risk), will prompt them to seek a risk premium to compensate them for bearing this risk. This risk premium drives down the investor=s bid for a contaminated enterprise. Therefore, an inverse relationship exists between the precision of the investor=s estimation of cleanup costs and the investor=s bid. Given this connection, privatization agencies should be expected to offer greater compensation to investors, in the form of price discounts and indemnification from private liability (e.g., reimbursement for cleanup costs). From this connection, the theoretical section of the paper generates four hypotheses, which the empirical section proposes to test with forthcoming analysis of the privatization process in the Czech Republic.

2. Environmental Liabilities

2.1. Details

Privatization involves the transfer of ownership and control over assets from the state to the private sector. In Central and Eastern Europe, as in other industrialized countries, generally this process transfers <u>all</u> assets and liabilities to the new owner, unless the two contracting parties provide other arrangements, a rule called successor liability (Goldenman, 1995). Although most countries do not explicitly specify environmental liabilities in their laws, some countries, such as the Czech Republic, have explicitly stated this policy. For clarification, environmental liabilities fall into two

broad categories: (1) contamination caused by current operations and (2) contamination stemming from past operations (i.e., preceding privatization). This analysis focuses exclusively on the second type of liability, commonly called past environmental damage (PED).[1] This type of environmental contamination divides into four categories (Goldenman, 1995):

(1) on-site environmental contamination (e.g., soil contamination),

(2) off-site environmental contamination (e.g., groundwater aquifer contamination),

(3) injuries and illnesses suffered by employees of a facility, and

(4) damages to third parties (e.g., health problems born by neighboring residents).

The responsibility for any or all of these components of past environmental damage may be transferred to the new owner of a property (i.e., investor) as a liability. In other words, the investor must pay for the cleanup of this environmental contamination and/or compensate injured workers and damaged third parties.

Potential investors in state-owned enterprises in Central and Eastern Europe obviously did not wish to bear the burden of these liabilities. In a study of 1,000 large North American and West European firms, half of those who evaluated sites in Central and Eastern Europe rejected them partially on environmental grounds (The Economist, 1993). According to a World Bank/OECD survey of potential investors, liability for past environmental contamination ranked as the most important environmental concern (World Bank/OECD, 1992).

In response to these concerns, government agencies in Central and Eastern Europe have implemented alternative mechanisms of allocating liability for past environmental contamination. One

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[1] See Boyd (1996) for an excellent analysis of how these two types of liabilities may be connected.

mechanism offers a price reduction to the new owner. Presumably, this discount is commensurate with the anticipated cleanup costs. With another mechanism, the state indemnifies the private owner for all or part of the cleanup costs related to past environmental contamination, given certain restrictions, such as future compliance with environmental regulations. In this case, the state bears all or some of the cleanup costs. Regardless of the level of indemnification, the government may choose to perform the remediation itself or simply reimburse the investor for its cleanup costs. With a third mechanism, the state sets aside a portion of the sales revenues generated by a specific enterprise and earmarks these funds for reimbursement of cleanup costs born by the new owner. These arrangements are generally called escrow accounts.

2.2. Theoretical Representation

In all cases except full indemnification, the investor is left to face an uncertain liability. This uncertainty then prompts a risk-averse investor to alter its bid for any enterprise suspected of contamination. A risk-neutral investor reduces its bid by the expected liability costs. However, a risk-averse investor reduces its bid by this amount plus a risk premium.[2] In order to attract investors, privatization agencies presumably must respond to this risk-averse behavior, regardless of the chosen re-allocation mechanism or compensation scheme.

The following three sections model formally this effect of risk-aversion on an investor=s bid in the face of uncertain cleanup costs. The first of these sections displays how a risk-averse investor decreases its willingness-to-pay for an enterprise or increases its desire for compensation when facing uncertainty by including a risk premium in its bid. More important, this section highlights the

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[2] Boyd (1994, p. 41) notes this type of investor behavior.

importance of investor information about uncertain liability costs. As an investor gains greater information on these uncertain costs (i.e., as his/her cost estimate becomes more precise), the risk associated with this liability declines. Consequently, a better informed investor requires less compensation because it involves a smaller risk premium. Since all liability mechanisms, except full indemnification, involve this uncertainty and thus generate a risk premium, choices over these mechanisms made by government agencies should reflect this relationship between information and the level of risk premium.

The following three sections develop three models to capture the choice of liability re-allocation mechanism and the parameters of each mechanism. The first model concerns the case of complete uncertainty regarding liability costs, where the state imposes all liability on the private investor yet compensates the investor with a price reduction. The second model considers the dichotomy between complete uncertainty and complete certainty, where the state chooses between imposing full liability on the private investor and fully indemnifying the investor. The third model generalizes the first two models by adding the possibility for the state to offer partial indemnification. From these three models, theory generates four hypotheses, which forthcoming empirical analysis will test.

3. Complete Uncertainty and Price Reduction

Imagine that a risk-averse investor wishes to purchase a currently state-owned enterprise. Prior to this potential purchase, the investor has an initial level of wealth, W:

W = initial level of investor wealth.

Disregarding any possible environmental liabilities, the investor knows with certainty the underlying value of the enterprise, based on the present value of the future profit stream, denoted N,

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N = present value of the enterprise=s future profit stream.

The investor correctly believes that it is responsible for all liabilities associated with the enterprise, including environmental liabilities. However, the investor only imperfectly understands the extent of contamination at the facility and thus imperfectly observes the present value of the cleanup costs, denoted as C,

C = level of cleanup costs.

Instead, the investor knows only the distribution of these costs. More important, the subjective distribution depends on the amount of information about cleanup costs known by the investor. Define I as the metric that captures the amount of information:

I = metric for information about cleanup costs known by the investor,

so that I increases as information improves. Given this definition, costs are randomly distributed according to the probability distribution function $f(C|I)$ along the following interval:

$C \in [C_{min}, C_{max}]$.

As the information metric increases, probability mass shifts towards the mean or expected value of the distribution, $\hat{C}$,

$\hat{C}$ = mean or expected level of cleanup costs,

as shown in Figure 1. It is assumed that information has an unbiased effect on the investor=s expected value of cleanup costs; i.e., $\hat{C}$ is independent of I. Information instead sharpens the precision of the investor=s calculation of cleanup costs. Put differently, increased information reduces the uncertainty of cleanup costs. In mathematical terms, a distribution involving greater information, $f(C|I')$, second-order stochastically dominates a distribution involving less information, $f(C|I'')$, where $I' > I''$(Rothschild and Stiglitz, 1970; Rothschild and Stiglitz, 1971). In other words, $f(C|I'')$ represents

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a mean-preserving spread of $f(C|I')$.[3]

The investor values its wealth according to a strictly concave von Neumann-Morgenstern utility function, $U(\bullet)$,

$U(\bullet)$ = investor⹂s utility function.

Prior to the potential purchase, the investor enjoys a reservation utility level, $\bar{U}$,

$\bar{U} = U(W)$ = reservation utility level.

To purchase the enterprise, the investor is willing to pay a maximum price of P,

P = maximum willingness to pay for enterprise,

which is defined more completely below.[4] After the purchase, the investor has a net wealth, Y,

$Y = W + N - C - P$ = net wealth after purchase.

The investor is assumed to maximize its expected utility from the purchase, EU,

$EU(Y|I) = \int_C U(Y)\, f(C|I)\, dC$ = expected utility from the purchase of the enterprise.

Next consider the role of the privatization agency. It seeks to sell the enterprise to the investor. In this effort, it seeks to maximize its own-country welfare, represented by net revenues from the sale of the enterprise. The investor⹂s underlying valuation of the enterprise and the

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[3] Bluffstone and Panayotou (1998) also examine the effect of information about cleanup costs on an investor⹂s bidding for a state-owned enterprise.

[4] Thomas (1994) considers the case of many risk-neutral investors wishing to purchase a state-owned enterprise in an auction setting. In this setting, heterogenous information about the net value of the enterprise causes the winning bid to fall below the expected value of the enterprise. Nevertheless, each investor observes its unique level of net value with certainty, unlike the formulation of this paper.

subjective distribution of cleanup costs is common knowledge. In addition, the agency knows the investor=s utility function. In this case, the agency can extract all the rents from the investor by forcing the investor to pay a price so high that the investor only enjoys an expected utility exactly equal to its reservation utility:

$$EU(W+N-C-P) = \int_C U(W+N-C-P) \, f(C|I) \, dC = \bar{U}.$$

This equality constraint defines P, the investor=s maximum willingness to pay for the enterprise.[5] Note that expected utility cannot fall below $\bar{U}$, otherwise the investor will not purchase the enterprise.

To capture the investor=s behavior under uncertainty, the certainty equivalent of purchasing the enterprise with its uncertain cleanup costs is structured in the following way:

$$U(W+N-[\hat{C}+\pi(I)]-P|I) = EU(W+N-C-P|I),$$

where information, I, is fixed at a certain level. In other words, the investor is indifferent between accepting the outcome $W+N-[\hat{C}+\pi(I)]-P$ with certainty and the outcome $W+N-C-P$ with uncertainty. The variable $\pi(I)$ is positive, since the investor is risk-averse, and depends on I, since EU depends on I. It also represents the risk premium associated with the uncertain purchase,

$$\pi(I) = \text{risk premium associated with uncertain purchase.}$$

The risk premium is the difference between the expected level of net wealth and the certainty equivalent of the uncertain purchase:

$$\pi(I) = E(W+N-C-P|I) - \{W+N-[\hat{C}+\pi(I)]-P\} = (W+N-\hat{C}-P) - \{W+N-[\hat{C}+\pi(I)]-P\},$$

for a given level of I.

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[5] This assumption is not critical to the final result. Instead, the final result demands only that the final price paid depends positively on the investor=s maximum price (i.e., willingness-to-pay).

Now consider the effect of cleanup costs and uncertainty on the investor=s bidding behavior. When no cleanup costs are born or the distribution collapses all its probability mass at C=0, the investor=s bid equals the underlying value of the enterprise: P = N. When cleanup costs are positive but certain at their mean, $\hat{C}$, the investor sets its bid at P = N - $\hat{C}$. When cleanup costs become uncertain, use of the certainty equivalent identifies the investor=s bid in the following way:

$$U(W) = \bar{U} = EU(W+N-C-P|I) = U(W+N-[\hat{C}+\pi(I)]-P|I).$$

The equality of the two endpoints of this equation indicate that P = N - $\hat{C}$ -$\pi(I)$; i.e., the investor pads his/her bid with a risk premium, which depends on the investor=s information on cleanup costs.

Since information reduces the uncertainty of cleanup costs (i.e., increase the precision of the investor=s cost estimate), it must reduce the investor=s risk premium: $[d\pi(I) / dI] < 0$. Conversely, $\pi(I)$ rises as I falls. Therefore, P falls as I degrades. To prove this point, fix P at P* = N - $\hat{C}$, the correct level when costs are certain. At this level P*, when C is uncertain, $\pi(I) > 0$ and EU < $\bar{U}$. Even though the latter condition holds, the theory can employ the assumption of second-order stochastic dominance and the definition of certainty equivalent to prove the inverse relationship between $\pi(I)$ and I. Let $I' > I''$, then the following relationships hold:

$$U(W+N-[\hat{C}+\pi(I')]-P^*|I') = EU(I',P^*) > EU(I'',P^*) = U(W+N-[\hat{C}+\pi(I'')]-P^*|I'').$$

The inner inequality of this equation follows directly from the assumption of second-order stochastic dominance. The left-hand and right-hand equalities follow directly from the definition of certain equivalent. The two endpoints of the equation reveal that $\pi(I') < \pi(I'')$, when $I' > I''$, since no other parameters would permit the inequality.[6] Therefore, $\pi(I)$ rises and P falls as information degrades.

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[6] This analysis is similar to previous research on the effect of risk on utility that began with Rothschild and Stiglitz (1970) and Rothschild and Stiglitz (1971).

Finally, note that the investor must adjust its bid down from $P^* = N - \hat{C}$ to $P = N - \hat{C} - \pi(I)$ in order to achieve its reservation utility, $\bar{U}$.

As long as the investor is liable for cleanup costs, the investor=s concern about cleanup costs, including any uncertainty, becomes the agency=s concern. In order to attract investors, the agency must accommodate the investors= expected cleanup costs and the risk premium stemming from the uncertain cleanup costs. This accommodation comes in the form of price reductions. Since the risk premium depends negatively on investor information about cleanup costs, this model predicts that the price paid by an investor falls (the price reduction rises) as information degrades, which represents the first testable hypothesis.

Hypothesis # 1: The price reduction offered by a privatization agency to an investor rises as the investor=s information on cleanup costs degrades.

Forthcoming empirical analysis will test for a systematic negative relationship between investor information and price reductions.

This model considers the scenario where the investor faces all of the liability and the government offers price reductions as compensation. The next model considers the scenario where the government may additionally choose to accept all of the liability, that is, completely indemnify the investor of private liability. This liability re-allocation mechanism may be quite attractive to the privatization agency since price discounts reduce sales revenues, including discounts linked to risk premiums.

4. No Indemnification versus Complete Indemnification

As a nice contrast to the previous model, consider the case where the privatization agency chooses between no indemnification, while offering a price discount, and complete indemnification,

without any price discount. Given the first policy option, the investor faces all of the risk generated

by uncertain cleanup costs and requires a risk premium in compensation. Given the second policy

option, the investor faces none of the risk and requires no risk premium; however, the state bears the

cleanup costs and other costs, such as administrative expenses.

When the state considers indemnification as a policy option, its own-country welfare must

include the costs associated with indemnification. Assume that the cleanup costs, C, are independent

of who pays them. In addition to cleanup costs, the state faces other expenses associated with

indemnification, denoted as K,

K = indemnification expenses.

These expenses may include administrative expenses for operating any reimbursement program. They

also may include costs claimed as past environmental contamination by the investor yet generated

after privatization. This possibility is quite feasible since it may be very difficult, if not impossible,

to separate past and current environmental contamination, which causes a moral hazard problem.[7]

 Less obviously, indemnification may generate higher future cleanup costs by undermining the polluter

pays principle and degrading deterrence of future contaminating activities.[8]

The agency chooses between zero and complete indemnification. Let m represent the choice

to indemnify completely, m = 1, or not to indemnify, m = 0: m $\in$ {0,1}. The agency=s sales revenues

net of state-born cleanup costs and indemnification expenses are denoted as R, which depend on the

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[7] See Boyd (1996) for an excellent discussion on this point.

[8] See Boyd (1996) for an excellent discussion on this point.

indemnification choice:

$$R(m) = P - mC - mK = \text{agency's net revenues.}$$

In this case, the agency may face uncertain cleanup costs. The agency is assumed to be risk neutral and chooses to maximize the expected value of R. When the state offers no indemnification and the investor faces the risk, the bid price is $P(m=0) = N - \hat{C} - \pi(I)$ and the agency's net revenues are $R(m=0) = N - \hat{C} - \pi(I)$. When the state offers complete indemnification and the investor faces no risk, the bid price is $P(m=1) = N$ and the agency's expected net revenues are $R(m=1) = N - \hat{C} - K$.

The state selects complete indemnification when $R(m=1) > R(m=0)$, which implies it selects $m = 1$ when $K < \pi(I)$. As the investor's information on cleanup costs falls, the risk premium climbs; therefore, the likelihood of selecting indemnification rises. The contrary result follows when information improves. These results represent two hypotheses.

Hypothesis # 2: As the investor's information on cleanup costs falls, the likelihood of the privatization agency offering indemnification rises.

Hypothesis # 3: As information improves, the likelihood of offering a price discount rises. Forthcoming empirical analysis will test these hypotheses.

The next theoretical section generalizes the indemnification policy option and generates a fourth and related hypothesis.

5. Degree of Partial Indemnification

The final model generalizes the two previous models by including partial indemnification, while retaining the policy options of zero or full indemnification and a price discount.

In this general model, the privatization agency is able to offer any level of indemnification between none and full: $m \in [0,1]$. As the level of indemnification rises, the cleanup costs born by the

state, mC, rise, as do the state=s indemnification expenses, mK. As the level of indemnification rises, the cleanup costs born by the investor, (1-m)C, fall, as does the expected level of cleanup costs, (1-m)Ĉ, as shown in Figure 2. In response, the investor raises its bid price due to these lower expected costs.

Greater indemnification also generates second-order stochastic dominance, which lowers the risk premium, prompting the investor to raise its bid price. If $m' > m''$, the distribution $f(C|I,m')$ second-order stochastically dominates the distribution $f(C|I,m'')$ because the first distribution more greatly reduces the scope of the investor=s exposure to liability than does the second distribution. Similar to information, greater indemnification tightens the investor=s cost estimate, in this case by reducing the spread between the minimum and maximum values of cleanup costs. As shown in Figure 2, $(1-m')C_{min}$ and $(1-m')C_{max}$ are closer together than are $(1-m'')C_{min}$ and $(1-m'')C_{max}$. Unlike information, indemnification alters the expected value of cleanup costs.

Of course, second-order dominance holds even after adjusting for the difference in expected cleanup costs. The following equation captures the necessary adjustment:

$$E[(1-m')C+z|I,m'] = E[(1-m'')C|I,m''],$$

where z represents the shift parameter to preserve the means between the two distributions associated with indemnification levels m' and m''. Given this adjustment, second-order stochastic dominance implies the following relationship between the two levels of expected utility associated with indemnification levels m' and m'':

$$\int_C U(W+N-[(1-m')C+z]-P)\ f(C|I,m')\ dC > \int_C U(W+N-[(1-m'')C]-P)\ f(C|I,m'')\ dC\ ,$$

when $m' > m''$. This mean-preserving spread does not alter the level of expected costs; instead, it

affects only the riskiness associated with the two distributions.[9]

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[9] A simple example illustrates the mean-preserving adjustment and residual second-order stochastic dominance. Assume that cleanup costs are uniformly distributed over the interval [100,1000]. Consider two levels of indemnification: $m' = 50$ % and $m'' = 25$ %. Before adjustment, the 50%-indemnification policy generates an expected level of 275 and a post-indemnification interval of [50,500] and the 25%-indemnification policy generates an expected level of 412.5 and a post-indemnification interval of [75,750]. The shift parameter necessary to preserve the means between the two distributions is 137.5. After adjustment, the 50%-indemnification policy generates a post-indemnification interval of [187.5, 637.5], which obviously second-order stochastically dominates the 25%-indemnification interval of [75,750].

Therefore, this constructed second-order stochastic dominance affects only the investor's risk premium. As with information, greater indemnification reduces the investor's risk premium, $\pi(I,m)$: $(\partial\pi / \partial m) < 0$. Moreover, I reasonably assume that indemnification is less productive at reducing risk as the level rises: $(\partial^2\pi / \partial^2 m) > 0$; i.e., m reduces $\pi(I,m)$ at a declining rate.[10] Moreover, I assume that the level of indemnification and investor's information on cleanup costs act as substitutes for reducing the risk premium:

$$[\partial^2\pi / (\partial m \partial I)] > 0.$$

In other words, indemnification becomes less meaningful for reducing risk as the investor becomes better informed about the cleanup costs.[11,12]

The investor's bid price is the following:

$$P = N - (1-m)\hat{C} - \pi(I,m).$$

Greater indemnification reduces the expected level of cleanup costs, which is reflected in $(1-m)\hat{C}$, and lowers the riskiness of uncertain costs (while adjusting for lower expected costs), which is reflected in $\pi(I,m)$. The agency's expected net revenues are the following:

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[10] This assumption places restrictions on the utility function and permits the existence of an optimal level of indemnification.

[11] This assumption also places restrictions on the utility function.

[12] Bluffstone and Panayotou (1998) examine the privatization agency's choice over the level of indemnification, while implicitly considering an investor's risk premium. Yet, their formulation does not reveal this relationship in a setting similar to this paper's setting.

$R(m) = P - m\hat{C} - mK.$

Substituting P into R(m),

$$R(m) \quad = N - (1-m)\hat{C} - \pi(I,m) - m\hat{C} - mK$$

$$= N - \hat{C} - \pi(I,m) - mK.$$

Maximizing expected net revenues with respect to the level of m shows that the agency should set the level of m so that the following relationship holds:

$$- [\partial\pi(I,m) / \partial m] = K.$$

Let m* denote this maximizing level for m.

Since the level of indemnification and investor=s information about cleanup costs are substitutes, m* is inversely related to the level of I. This result represents the fourth testable hypothesis.

Hypothesis # 4: As the investor becomes better informed about cleanup costs, the privatization agency lowers the level of indemnification.

Forthcoming empirical analysis will test this hypothesis.

Lastly, this general model formulation includes previous results as testable hypotheses. At high levels of information, the state may optimally choose to offer no indemnification:

$$- [\partial\pi(I,m) / \partial m] \le K \text{ at } m = 0.$$

At low levels of information, the agency may optimally choose to offer full indemnification:

$$- [\partial\pi(I,m) / \partial m] \ge K \text{ at } m = 1.$$

6. Empirical Analysis of Testable Hypotheses

6.1. Summary of Hypotheses

In sum, the series of three models generates four testable hypotheses. First, when the state

offers only price discounts without indemnification, the degree of price discount is inversely related

to the amount of information known by the investor. Second (and third), when the state is deciding

between zero and full indemnification, it is more likely to offer zero (full) indemnification as the

amount of information rises (falls). Fourth, when the state is selecting any level of indemnification

(including zero, partial, and full), it raises the level of indemnification as the investor=s information

falls. The following section proposes how to test empirically these hypotheses.

6.2. Selection of Czech Republic as Research Site

To test the above hypotheses, I propose to examine decisions made by the Czech Ministry of

Privatization and its successor, the Czech Ministry of Finance. Although many countries in Central

and Eastern Europe have responded to investors= concerns over past environmental contamination

with various liability re-allocation mechanisms, the Czech Republic serves as the best case study for

empirical analysis for two unique reasons. First, the Czech Republic has compiled meaningful data

on environmental liabilities because it has re-allocated liability in a systematic manner; other countries

have responded to investors= concerns in an ad hoc manner (Goldenman, 1995). Second and more

important, the Czech government has offered liability re-allocation, in this case reimbursement for

cleanup costs, to both foreign and domestic investors (Goldenman, 1995).   Other national

governments have offered liability re-allocation only to foreign investors. Such evidence certainly

supports the hypotheses since foreigners would most likely represent the least-informed type of

investor. Yet, the Czech data allows even stronger evidence to be offered.

6.3. Privatization, Past Environmental Contamination, and Reimbursement in Czech Republic

Government responses to investors= concerns about liability for environmental contamination

at formerly state-owned enterprises have varied over time in the Czech Republic. (The appendix

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provides details on the clarification of liabilities.) Prior to March 1993, the Czech government

negotiated responsibility for environmental liabilities on a case-by-case basis. It offered price

discounts and limited indemnification to certain investors on an ad hoc basis. Beginning in March

1993, the Czech government started to address environmental liabilities systematically. Government

Resolution No. 123/1993 established a system for re-allocating liability. First, it defines past

environmental contamination to include only on-site environmental contamination: soil contamination,

groundwater contamination, and hazardous waste dumps. Second, it prohibits price reductions on

the basis of environmental cleanup costs. Third, it authorizes the National Property Fund (part of the

Ministry of Finance) to reimburse investors for cleanup costs by negotiating individual contracts with

new owners. (The appendix provides greater details on this fairly complex process.) Reimbursement

of cleanup costs is limited to 100% of the purchase price or the value of the capital stock of a joint

stock company; any costs beyond this limit remain the responsibility of the new owner. Otherwise,

the National Property Fund has complete discretion about entering into environmental agreements

with new owners. It is neither obliged to offer any assistance nor to offer complete assistance if it

offers any. This discretion allows the forthcoming empirical analysis to test the theoretically-

generated hypotheses.

7. Summary

In sum, this paper examines the link between an investor=s information on the extent of past

environmental contamination (and its related cleanup costs) and government efforts to placate an

investor=s concerns over liability for this contamination. These efforts re-allocate liability using legal

mechanisms such as price discounts and indemnification. From this link, the theoretical section of

this paper generates four hypotheses, which the empirical section of this paper proposes to test with

forthcoming empirical analysis using data on liability re-allocation decisions in the Czech Republic.

APPENDIX

To understand fully the role of environmental liabilities, this appendix describes the Czech privatization process, which began in 1990. The first efforts focused on small enterprises, which did not involve environmental liabilities since this privatization did not transfer any types of liabilities to new owners. Restitution also began in 1990. As with small enterprises, it apparently does not transfer environmental liabilities to new owners (Kružíková and Drobnik, 1993). In 1991, the Czech government began to privatize medium and large enterprises. These transfers were concentrated in two waves of mass privatization involving mostly voucher privatization. Privatization of medium and large enterprises definitely involved environmental liabilities.

Although Czech laws do not establish a specific obligation to remediate past environmental contamination, they do establish general obligations to remediate contamination. Several environmental laws contain provisions addressing the obligation to remediate environmental contamination when required by an environmental authority (Goldenman, 1995). These environmental laws concern on-site and off-site environmental contamination. Other laws speak to other types of liabilities. Under Czech labor laws, a firm is liable for employees= injuries or illnesses sustained during their employment if the damage was caused by a violation of some legal obligation (Goldenman, 1995). Under the Czech civil code, companies are responsible for damages caused to third parties if the harmful activity violated a Czech law before January 1, 1992; after this date, the firm is liable for all damages regardless of the presence or absence of violations (Kružíková and Drobnik, 1993).

The 1991 Large-Scale Privatization Act clearly states that the new owner of a privatized enterprise acquires all assets and *liabilities*. A later amendment explicitly noted environmental

liabilities. To clarify these liabilities, a 1992 amendment to the original act requires that all privatization projects submitted after February 29, 1992, must include an environmental audit which assesses the environmental liabilities of the specific enterprise, in addition to providing a record of previous violations and documenting the degree of noncompliance with current environmental regulations. Later in May 1992, the Czech Ministry of Privatization and the Czech Ministry of Environment jointly issued AGuidelines for Environmental Assessment@, which provide directions for assessment of on-site contamination C with a focus on soil and groundwater contamination.

This appendix also describes the reimbursement process at the National Property Fund. In order to receive reimbursement from the National Property Fund, the following procedures must be followed. First, the new owner must perform an environmental audit and obtain approval of that audit from the Ministry of Environment (Goldenman, 1995). After receiving this approval, the new owner may apply for reimbursement through an environmental agreement with the National Property Fund, which forwards the application to the Ministry of Environment and the Ministry of Finance. If these ministries agree that a reimbursement contract is worthwhile, the National Property Fund negotiates a contact with the new owner. After signing the agreement with the National Property Fund, the new owner must provide a risk assessment in compliance with Government Resolution No. 393/1994. Based on this risk assessment, the Czech Inspection of the Environment (part of the Ministry of Environment) determines whether or not remediation is necessary; if necessary, it imposes against the new owner a remediation order, which identifies the acceptable standards to be met in the remediation work. After receiving this administrative order, the new owner must complete a tender process for a remediation program that obtains the required environmental standards. Finally, the environmental contract for reimbursement must be approved by the Czech government when it

decides on the specific privatization project (Goldenman, 1995).

Several enterprises and investors have participated in this process. By May 1996, Czech investors had performed over 4,000 environmental audits, implemented over 200 risk assessments, and received over 104 environmental agreements, valued at CZK 102 billion ($ 3.75 billion).

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Figure 1

Effect of Investor's Information on Distribution of Cleanup Costs

Probability

High Information

Low Information

Level of

C min   Ĉ   Cmax   Cleaup
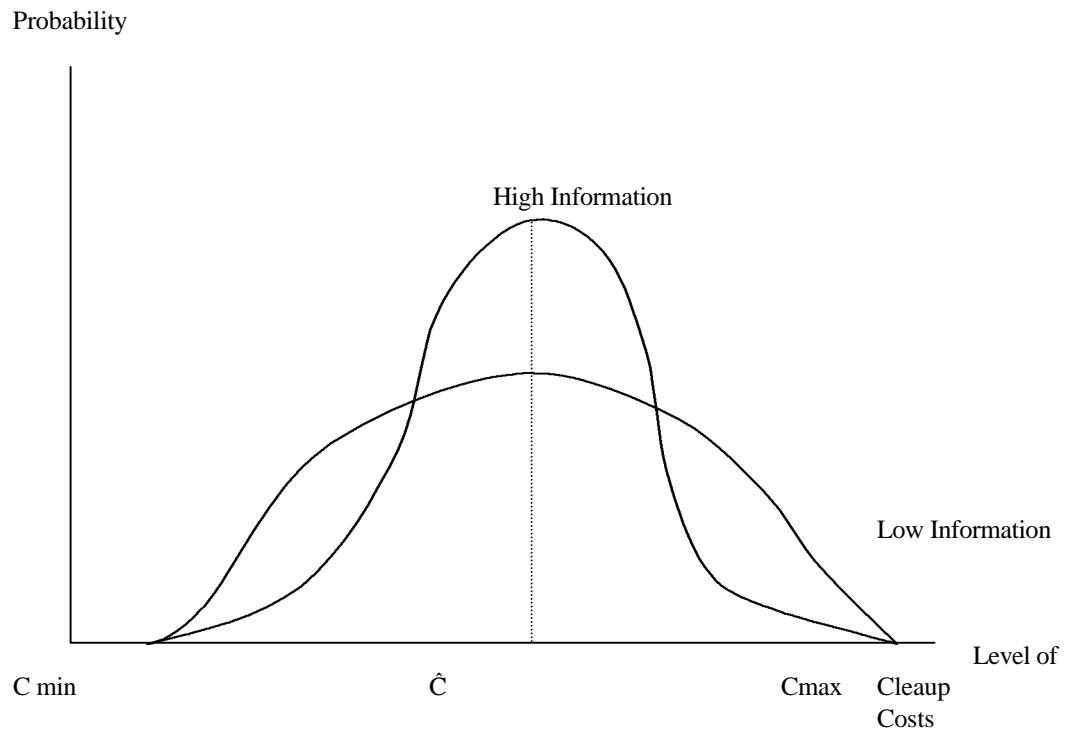   Costs

Figure 2

Effect of Indemnification on Distribution of Cleanup Costs

Probability

High Indemnification

Low Indemnification

Level of Cleanup Costs

m'Cmin   m"Cmin   m'Ĉ   m"Ĉ   m'Cmax   m"Cmax