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How Does Law Affect Finance? An Examination of Financial Tunneling in an Emerging Market

Bernard Black [*]
Vladimir Atanasov [†]
Conrad S. Ciccotello [‡]
Stanley B. Gyoshev [**]

[*]University of Texas at Austin, Law School
[†]College of William and Mary, Mason School of Business
[‡]Georgia State University
[**]Exeter University

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* Corresponding author: Mason School of Business, College of William and Mary, P.O. Box 8795, Williamsburg, VA 23187, vladimir.atanasov@mason.wm.edu

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Abstract

We study the mechanisms through which securities law affects financial tunneling, both theoretically and empirically. We model how two common forms of financial tunneling, dilutive equity offerings and below-market freezeouts, affect market prices; and how legal rules affect these forms of tunneling. We report evidence from a natural experiment provided by Bulgarian securities law changes in 2002. These changes rescue a collapsing market by limiting both forms of tunneling. Following the legal changes, share prices jump for firms at high risk of tunneling, relative to a low-risk control group; minority shareholders participate equally in secondary equity offers, where before they suffered severe dilution; and freezeout offer prices (measured as offer price/sales) quadruple. We thus make progress on unbundling tunneling and the laws which affect it, and present concrete evidence on the role of legal regulation in limiting tunneling in emerging markets.

Keywords: financial tunneling, preemptive rights, freezeouts, corporate governance, securities law; legal institutions; emerging markets

JEL codes: G32, G34, K22

1. Introduction

Prior research (e.g., La Porta, Lopez-de-Silanes, Shleifer and Vishny, 1997, 1998, 2002), Demirguc-Kunt and Maksimovic, 1998) provides evidence that the legal environment is a significant factor in explaining capital market growth and development. In economies where securities and corporate laws offer investors better protection, stock markets are more liquid, companies more often finance projects by publicly issuing shares, and ownership is less concentrated. Most of this research, however, offers limited insight into the specific mechanisms by which law affects financial markets. Both legal protections and financial market development are typically estimated in the aggregate and evaluated across countries. Specific laws are not linked to specific market outcomes.

This paper seeks to unbundle "tunneling" (extraction of value from firms by controlling shareholders) and the laws which affect it, both theoretically and empirically. Prior tunneling models are two-period models which cannot distinguish between different forms of tunneling (e.g. Burkart, Gromb, and Panunzi, 1998; ; Shleifer and Wolfenzon, 2002La Porta, Lopez-de-Silanes, Shleifer, and Vishny, 2002; Bertrand, Mehta, and Mullainathan, 2002; Djankov, La Porta, Lopez-de-Silanes and Shleifer, 2005; Cheung, Rau, and Stouraitis, 2006). We extend this work by developing an equilibrium multiperiod model, which lets us separate operational from financial tunneling (for a tunneling taxonomy, see Johnson et al., 2000). We examine two forms of financial tunneling – dilutive equity offerings and below-market freezeouts -- show how the availability of each form relates to legal regulation, and why control of dilutive offerings is a necessary complement to control of freezeouts.

We also provide evidence on how securities law affects financial tunneling, relying on a natural experiment offered by a 2002 change in Bulgarian law, which limited both of these

tunneling methods. Bulgaria went through mass privatization in 1998. Due to gaps in its initial securities laws, financial tunneling prior to 2002 was widespread. Legal changes, promised by a new government in late 2001 and adopted in June 2002, filled the gaps in Bulgarian securities law that had permitted dilutive offerings and discounted freezeout prices. We rely on this natural experiment to examine how law affects financial tunneling. We compare the effect of the law on a treatment group of firms with a private controlling shareholder (private control firms). We use firms with majority government ownership (SOEs) as a control group, because these firms are at lower risk of financial tunneling.

The results are striking. Prior to 2002, when private control firms issue equity, almost all shares are purchased by controlling shareholders, often at a large discount to market value. Post-2002, equity offerings are subscribed to roughly prorata by minority and majority shareholders. Prior to 2002, formal freezeouts are at an average of less than 35% of market value, which was already often depressed by prior dilutive offerings and investor anticipation of future tunneling. Informal freezeouts ("going dark" transactions) are common, at effective prices approaching zero. During 1999-2001, more than half of all the firms on the Bulgarian Stock Exchange go dark or conduct freezeouts, while stock market valuations. Post-2002, freezeouts of minority shareholders decline in frequency, and when they occur, are at premiums consistent with those in developed markets (DeAngelo, DeAngelo and Rice, 1984). The ratio of freezeout price to sales roughly *quadruples*. The decline in financial tunneling also impacts the Bulgarian stock market. Tobin's *q* values and price-earnings ratios for private control firms increase sharply at the time of law adoption, relative to SOEs. Share liquidity, which had been declining before the legal changes, also increases.

This paper thus provides evidence that specific legal provisions can affect two common forms of financial tunneling, dilutive equity offerings and freezeouts. Our effort to unbundle tunneling is most closely related to the efforts by Acemoglu and Johnson (2005) to unbundle the institutions that support a market economy, by La Porta, Lopez-de-Silanes, and Shleifer (2006) to assess which aspects of securities law predict stronger securities markets, and by Gilson and Gordon (2003) to assess the relative dangers to minority investors from operational and financial tunneling. Related empirical work on financial tunneling includes Baek, Kang, and Lee (2006) and Bates, Lemmon, and Linck (2006).

For international investing and asset pricing research, our results support one suggested justification for the home country bias (e.g., Kang and Stulz, 1997). Tunneling risk importantly affects prices, and locals may be better equipped to evaluate this risk at the firm level. From a policy perspective, the contrast between the post-privatization but pre-2002 collapse of the Bulgarian market and its post-2002 revival suggest the importance of legal control of financial tunneling for the development of securities markets in emerging markets (Black, 2001).

The remainder of the paper is structured as follows. Section 2 develops a model of how operational and financial tunneling through dilutive offerings and below-market freezeouts affect equilibrium prices in financial markets. Section 3 applies the model to the Bulgarian context. Section 4 describes the data. Section 5 provides empirical results on the effect of the 2002 legal changes on financial tunneling mechanisms (equity dilution and freezeout). Section 6 provides results on equity valuation and liquidity. Section 7 concludes.

2. A Theoretical Model of Financial Tunneling

We study here two specific forms of financial tunneling -- dilutive equity offerings and freezeouts. Prior research linking law and finance generally measures legal protection in the

aggregate by constructing an index of various protections and rights (*e.g.*, La Porta et al. 1998). Empirical studies connect the overall level of investor protection to measures of firm valuation, ownership structure, or dividend payments (for a survey, see Denis and McConnell, 2003). To our knowledge, only Nenova's (2005) study of Brazil has linked a specific law, which protects minority shareholders against tunneling (in her case, freezeouts), to equity market outcomes. Table I summarizes recent research on financial tunneling and describes the tunneling methods used in Bulgaria.

In this section we develop an equilibrium model of how these two common forms of tunneling affect share prices, and how law can affect these forms of financial tunnelingfreezeout.

Our model, while simple, is nonetheless a significant extension of prior work. We offer the first multiperiod model of tunneling, the first model of financial tunneling as such, and the first to address different types of financial tunneling, how specific forms of tunneling (dilution and freezeout) affect equilibrium share prices, and how these forms of tunneling interact. Prior models are two period models, which cannot distinguish between operational and financial tunneling or between forms of financial tunneling (Burkart, Gromb, and Panunzi, 1998, Shleifer and Wolfenzon, 2002, La Porta, Lopez-de-Silanes, Shleifer and Vishny, 2002, Bertrand, Mehta, and Mullainathan, 2002; Djankov, La Porta, Lopez-de-Silanes and Shleifer, 2005; Cheung, Rau, and Stouraitis, 2006).

Our effort to model how specific legal rules affect tunneling and thus asset prices has no direct precursors (at least we cannot think of any).[1] Prior models address the effect of law in a highly stylized way. A single parameter captures the cost of tunneling (e.g., Shleifer and

[1] A followup paper, Atanasov, Durnev, Fauver, and Litvak (2007), addresses in more detail how law affects preemptive rights. Our effort is indirectly related to Litvak (2007), who uses Monte Carlo simulation to study the effective cost to investors of various default penalties in venture capital partnership agreements.

Wolfenzon, 2002). This cost increases with the degree of tunneling, as it must, for the model to have an interior solution. But the cost is not specific to legal constraints. It could arise from law, reputational costs, future difficulty in raising capital, or other sources. Nor, of course, is this cost associated with particular legal rules. In contrast, we model how specific legal rules -- including those conveying preemptive rights, minority shareholder veto rights, appraisal rights, and minimum price rules for share offerings and freezeouts -- affect the extent of financial tunneling. In our view, as the field of law and finance matures, a more robust effort to link specific laws to financial market outcomes is essential. Our model offers a first step.

A. Model Setup

There are N firms in the economy, indexed by n, and three relevant time periods, indexed by t (t = 0, 1, or 2). Table II summaries the notation in the model. Each firm has $S_{n,t}$ shares outstanding. Unless specified otherwise, we develop the analysis for a typical firm and suppress the n-subscript. Without loss of generality we assume that the firm initially has one share outstanding ($S_0 = 1$). The firm has a controlling shareholder C, who initially owns α_0 shares, and minority shareholders m, who initially own the remaining $(1 - \alpha_0)$ shares. Similar to La Porta et al. (2002), we take the proportion α_0 as exogenous. This is appropriate for Bulgaria following its 1998 mass privatization, in which the government auctioned shares and investors could choose the price they would pay but not the number of shares on offer. For models which endogenize ownership, see Bebchuk (1999) and Shleifer and Wolfenzon (2002).

Define the firm's "intrinsic value", assuming counterfactually that no operational or financial tunneling is possible, as $V_{no\text{-}tun}$. The controlling shareholder engages in operational (or "cash-flow") tunneling, stealing a fraction d_{cf} of the firm's pre-tunneling cash flow. The firm has intrinsic income per share of $E_{no\text{-}tun}$. Minority shareholders, however, observe only the firm's

income at $t = 0$ after cash flow tunneling: $E_{obs} = E_{no-tun}(1 - d_{cf})$. Observed earnings can also be interpreted as cash flows or dividends. Let shareholders value shares using a simple no-growth discounted cash flow model, and a discount rate r, which we assume does not depend on the level of tunneling. This implicitly assumes that cash flow tunneling is expected to be permanent. The firm's per-share value to minority shareholders, with operational tunneling but no financial tunneling, $V_{no\text{-}fin}$, equals:

$$V_{no-fin} = E_{obs} * \frac{1}{r} = V_{no-tun}\left(1 - d_{cf}\right) \quad (1)$$

In equilibrium, minority shareholders value the firm at $t = 0$ based on its observed income E_{obs}, but also taking into account the risk of future financial tunneling. We assume that investors know the probability and severity of financial tunneling, and thus price shares correctly on average, but do not know which firms will engage in financial tunneling.

The controller can also engage in financial tunneling through share dilution or freezeout. For simplicity, we assume that dilution happens only once (at $t = 1$) and that freezeout occurs only at $t = 2$ and only following a dilutive offering. There is a probability π_d that at $t = 1$, the controlling shareholder will cause the firm to issue i new shares to its existing shareholders at a price $P_{dilut,}$ which is at a discount d_{dilut} to the firm's intrinsic value before financial tunneling $V_{no\text{-}fin}$. The controlling shareholder will acquire any shares not purchased by other shareholders. If a dilutive offering occurs, there is a further probability π_f that at time $t = 2$, the controlling shareholder will acquire all minority shares through a tender offer at a price P_{freeze} that is below

the firm's intrinsic post-dilution but pre-freezeout value $V_{no\text{-}freeze}$ by a fraction d_{freeze}. These probabilities are known to minority shareholders at $t = 0$.[2]

We next summarize the market prices and intrinsic values that arise in the model. Market prices (P variables) are less than intrinsic pre-tunneling values (V values) because they reflect shareholder anticipation of possible future tunneling. Intrinsic values are observable to shareholders, but are not achievable in market transactions. We have defined $V_{no\text{-}tun}$ as the intrinsic per-share value of the firm with no tunneling and $V_{no\text{-}fin}$ as the per-share value with cash-flow tunneling but no financial tunneling. Let $V_{no\text{-}freeze}$ be the firm's per-share value after a dilutive offering in a world without freezeouts, and V_{freeze} be the per-share value in a freezeout transaction. We have defined P_{dilut} as the price at which new shares are issued at t = 1. Let the equilibrium market price of minority shares at time t be P_0 at $t = 0$, P_1 at $t = 1$ (after the dilutive offering is completed); and P_{freeze} be the freezeout price at $t = 2$. Once a freezeout is completed, these series converge, so $P_{\text{freeze}} = V_{freeze}$.

B. Specific Financial Tunneling Mechanisms.

In this sub-section we model tunneling through dilution and freezeout, and develop the links between legal rules (including rules which establish preemptive rights, appraisal rights, minority shareholder vetos, and minimum prices for share offerings and freezeouts), and financial tunneling risks and outcomes.[3]

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[2] We do not model the determinants of the probabilities of dilution and freezeout π_d and π_f. These probabilities can depend on characteristics of the firm and controller, including share ownership α_0, nature of the controller (private or government), firm size, and other factors. These probabilities may also depend on each other, on the dilution and freezeout discounts d_{dilut} and d_{freeze}, and the extent of cash-flow tunneling. For example, investors might judge that a firm with high cash-flow tunneling also has a high likelihood of financial tunneling. Investors might also infer from a dilutive offering that a future freezeout is now more likely.

[3] For convenience, we refer to these rules as securities law. In Bulgaria, they are included in the securities law, but in other countries, similar rules may be part of securities law, corporate law, stock exchange rules.

B.1. Period 1: Dilution

At time $t = 1$, the firm issue i shares at a discounted price $P_{dilut} = V_{no\text{-}fin} * (1 - d_{dilut})$. Because investors anticipate possible dilution and tunneling, market value $P_0 < V_{no\text{-}fin.}$ The discount to intrinsic value d_{dilut} will not be directly observed, and will exceed the observable discount to market price d_1. The minority shareholders acquire a fraction $k*(1- \alpha_0)$ of the newly issued shares, where $k \in [0, 1]$ is the fractional take-up of shares by minority shareholders, relative to the number they would need to acquire to maintain their percentage ownership. Since the shares are offered at a discount to instrinsic value, the controlling shareholder has an incentive to discourage or prevent other shareholders from acquiring them, to the extent permitted by law. The participation parameter k thus depends on preemptive rights and other legal protections for minority shareholders against dilutive share offerings.

After the offering, the minority shareholders own the following proportion of the company:

$$(1-\alpha_1) = \frac{(1-\alpha_0) + k(1-\alpha_0)i}{(1+i)} = \frac{(1-\alpha_0)[1+k*i]}{(1+i)} \qquad (2)$$

After the issuance, the firm's freezeoutvalue, assuming no freezeout, is $[1 + i*(1- d_{dilut})]*V_{no\text{-}fin}$ and the number of outstanding shares is $(1 + i)$. The per-share intrinsic value of minority shares, without anticipation of a freezeout or further dilution, drops to:

$$V_{no-freeze} = \frac{\left(1+i*\left(1-d_{dilut}\right)\right)}{1+i} * V_{no-fin} = \left(1 - d_{dilut}\frac{i}{(1+i)}\right)V_{no-fin} \qquad (3)$$

Minority shareholder wealth declines as follows.

Proposition 1. The wealth transfer D_{dilut} from minority shareholders to the controlling shareholder in a dilutive offering (as a fraction of the no-financial tunneling intrinsic value of minority shares $V_{no\text{-}fin}$) equals:

$$D_{dilut} = \left[1 - \alpha_0\right] d_{dilut} \frac{i}{1+i}(1-k) \qquad (4)$$

Proof: See Appendix.

If there are no legal protections against dilutive share offerings, then d_{dilut} can approach 1, k can approach 0, and i can approach ∞; so $D_{dilut} \approx (1 - \alpha_0)$. The controlling shareholder can acquire an arbitrarily large number of shares at an arbitrarily low price, thus expropriating the minority shareholders' entire initial ownership of the firm $(1 - \alpha_0)$. Most legal systems, however, include some rules that limit outright looting of the entire wealth of minority shareholders. Based on Equation (4) these rules can be classified into three main groups: rules that affect k and attempt to make it closer to one, rules that regulate d_{dilute} and attempt to reduce it toward zero, and rules that may limit i.

The rules that regulate k and seek to ensure that all shareholders can acquire new shares pro rata are called preemptive rights. Preemptive rights are common in many markets and come in variety of flavors. If the legal system provides for effective preemptive rights (preferably rights that are transferable and traded on a exchange in the form of warrants) and the legal system effectively restricts other forms of tunneling (so that shareholders who exercise preemptive rights do not risk having their investment appropriated in another way), a significant discount d_{dilut} will induce essentially complete take-up of shares, thus k approaches 1 and the fractional wealth loss to minority shareholders D_{dilut} approaches zero, regardless of the price at which new shares are offered. The controller's incentive to make a dilutive offering disappears.

The second legal strategy, which seeks to prevent issuance of under-priced shares (thus reduce d_{dilut}), can be implemented two ways. One approach is direct regulation of the offer price; another is to require minority shareholder approval of related party transactions, which would include a new share issuance to the controlling shareholder without preemptive rights. Minimum

price statutes are rare, but one example is the Russian corporate law (see Black and Kraakman, 1996).[4] If new shares must be issued at the current market price and this market price reflects intrinsic value, or else minority shareholders have veto rights over new issuances, which they will exercise if the new issuance is significantly below-fair value price, then $d_{dilut} \approx 0$ and minority shareholders suffer no wealth loss, regardless of who acquires the shares.[5] However, minimum price rules which rely on market price provide only limited protection in illiquid or easily-manipulated markets (see the Appendix for a discussion).

No existing law that we are aware of sets numerical limits on the number of newly issued shares in an equity offering. The law usually regulates i by granting shareholder approval rights when equity issues exceed a certain threshold (e.g. 20% for NYSE-listed firms) or requiring supermajority approval to amend the company's charter to increase the total number of shares the company can issue.

B.2. Period 2: Freezeout.

We next analyze the post-dilution scenario in which, at $t = 2$, the controlling shareholder takes the company private and freezes out the minority shareholders at a discount d_{freeze} to the no-freezeout intrinsic value of the shares. After the freezeout, there will be no further financial tunneling, so the V series of "intrinsic" values (which assume no further financial tunneling) converges to the P series of prices (which anticipate future tunneling): The controller pays a discounted freezeout price P_{freeze} for the minority shares:

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[4] In the United States, the 1940 Investment Company Act regulations for equity offerings of closed-end funds require offerings at or above net asset value of the fund.

[5] If minority shareholders have *both* veto rights and effective preemptive rights, and are sufficiently protected against financial tunneling, they may not veto an offer at a discount to current market value if the newly-raised capital will be invested in positive NPV projects. In practice, in developed markets which provide effective preemptive rights, notably the U.K., offerings at a small discount to market are the norm.

$$P_{freeze} = V_{no-freeze}\left(1 - d_{freeze}\right) = V_{no-fin}\left[1 - d_{dilut}\frac{i}{1+i}\right]\left(1 - d_{freeze}\right) \qquad (5)$$

The freezeout affects minority shareholder wealth as follows:

Proposition 2. The wealth transfer D_{freeze} from minority shareholders to the controlling shareholder in a freezeout (as a fraction of no financial tunneling value $V_{no\text{-}fin}$) equals:

$$D_{freeze} = \frac{\left(1-\alpha_1\right) * V_{no-freeze} * d_{freeze}}{V_{no-fin}} = \frac{\left(1-\alpha_0\right)\left[1 + k * i\right]}{(1+i)}\left[1 - d_{dilut}\frac{i}{1+i}\right]d_{freeze} \qquad (6)$$

Proof: See Appendix.

With no legal protections, the controlling shareholder can offer an arbitrarily low freezeout price, so d_{freeze} approaches 1, and the minority shareholders' remaining wealth is expropriated. However, many countries' laws offer some protection against discounted freezeout offers. The law can limit d_{freeze} via appraisal rights, fiduciary duty rules, or by requiring minority shareholder approval of the freezeout price.

One approach is to stipulate that the freezeout price cannot be lower than the market price before the freezeout is announced – a "market price rule." A market price rule can be effective if the company's shares trade in an efficient and liquid market, where share price manipulation is not possible. Even then, the controlling shareholder can suppress the market price by engaging in cash-flow tunneling or by paying no dividends. The controller can then freezeout minority shareholders at this suppressed price. When the market is inefficient, illiquid, or subject to price manipulation, the "market rule" will provide even weaker protection (see Appendix for discussion of price manipulation).

An alternate way to limit the freezeout discount d_{freeze} is to use liquidation value or discounted cash flow (*DCF*) valuation to compute the "fair value" of minority shares, and require a freezeout to be at a price no lower than "fair value." The valuation could be conducted

either by the securities agency or by a court through shareholder exercise of appraisal rights. Still, a controlling shareholder can indirectly manipulate the minimum price by depressing reported earnings or engaging in cash-flow tunneling.

Requiring the freezeout price to be the greater of market price or fair value can provide more protection for minority shareholders. For the controlling shareholder to freezeout the minority at a discount, she must both manipulate the market price and engage in misreporting or operational tunneling. If the practical limits on operational tunneling are stricter than those on manipulative trading (or vice-versa), minority shareholders are better off than with only a market price rule (only a fair value rule).

A self-enforcement approach (Black and Kraakman, 1996) would require majority-of-minority shareholder approval of the freezeout. Minority shareholders will generally approve a freezeout only if the price offered equals or exceeds the no-freezeout value of their shares. In developed countries with a minority approval rule, minority shareholders will often approve the freezeout only if they receive a premium, so d_{freeze} will often be less than zero. However, shareholders may approve a freezeout price at a positive discount when they have limited liquidity for their shares, or fear that if they reject a freezeout offer, the controlling will find another means to extract value. An alternate self-enforcement mechanism would give veto power to independent directors. If they are truly independent and satisfy their fiduciary duties, they should reject a freezeout price that is less than fair value.

B.3. Interaction of Dilution and Freezeout

In the analysis above we assume that k and d_{freeze} are independent. Even so, there is a potential interaction between dilution risk and freezeout risk. Assume that preemptive rights exist and let minority shareholders purchase shares in an equity offering pro-rata, but freezeout

rules are weak and let minority shareholders be frozen out at a large discount d_{freeze}. Assume also that cash flow tunneling is capped at its current level.

If a dilutive freezeout is not possible, minority shareholders will rationally participate in the new equity issue, thus preventing dilution of their existing holdings. In contrast, if the risk of a dilutive freezeout is high enough and the expected freezeout discount is large enough, minority shareholders will rationally not exercise their preemptive rights, because the near-term gain by buying shares for less than market value will be offset by expected loss in a future freezeout. To participate would "throw good money after bad." For minority shareholders to rationally exercise preemptive rights, the offering price must be less than the expected share value after the dilutive offering, taking into account the subsequent freezeout case (with probability π_f). A shareholder will participate if:

$$\left(1 - d_{dilut}\right) \leq \frac{1 + i(1 - d_{dilut})}{1 + i}\left(1 - \pi_f d_{freeze}\right) \qquad (7)$$

Thus, if d_{freeze} and π_f are sufficiently high, preemptive rights will be ineffective at preventing dilution, and hence at limiting the compound effect of dilution followed by freezeout. Thus, protections from equity dilution will work only in conjunction with protections against freezeout. Anti-freezeout statutes thus play a dual role in reducing the effect of financial tunneling. They both directly reduce expropriation in freezeouts and allow minority shareholders to rationally exercise preemptive rights and reduce equity dilution.

C. Financial Tunneling and Equity Valuations

We next model the effect of financial tunneling on equilibrium equity prices.

The firm's value to minority shareholders with cash-flow tunneling alone is $V_{no\text{-}fin}$. To simplify the algebra, we assume that a dilutive offering, if it occurs, will involve a large number of shares ($i >> 1$). Then the post-dilution per share value without freezeout risk will be $V_{no\text{-}fin}$*[1

– d_{dilut}] and the minority shareholders' fractional loss of wealth from the dilutive offering will be $D_{dilut} = d_{dilut}(1 - k)$. Including the risk of freezeout, investors will realize the following payoffs:

$V_{no\text{-}fin}$ with probability $(1 - \pi_d)$

$[1 - d_{dilut}(1 - k)]V_{no\text{-}fin}$ with probability $\pi_d(1 - \pi_f)$

$[1 - d_{dilut}(1 - k)]\ (1 - d_{freeze})\ V_{no\text{-}fin}$ with probability $\pi_d * \pi_f$

We can combine these payoffs to determine the equilibrium market price at time $t = 0$.

Proposition 3. If dilutive offerings, when they occur, are large (i >>1) , the market price of minority shares at t = 0 will equal:

$$P_0 = V_{no-fin} \times \left\langle 1 - \pi_d * \left\{ 1 - \left[1 - d_{dilut}\,(1 - k) \right](1 - \pi_f d_{freeze}) \right\} \right\rangle \qquad (8)$$

The fractional difference between market price with and without anticipated financial tunneling can be called the financial tunneling discount d_{fin}, which is:

$$d_{fin} = \pi_d * \left\{ 1 - \left[1 - d_{dilut}\,(1 - k) \right](1 - \pi_f d_{freeze}) \right\} \qquad (9)$$

Then $P_0 = V_{no\text{-}fin} * (1 - d_{fin})$. Combining operational tunneling and financial tunneling, the price of minority shares at t=0, relative to their no-tunneling "intrinsic value," will be:

$$P_0 = V_{no-tun} * (1 - d_{cf})(1 - d_{fin}) \qquad (10)$$

We next derive an important result that allows us to separate the valuation effects of cash-flow and financial tunneling by looking at observed Price/Earnings (PE) ratios. We assume that, to a first order, tunneling does not affect the discount rate r. In our no-growth model, the PE ratio with no tunneling will be $P_{no\text{-}tun}/E_{no\text{-}tun} = 1/r$. Both forms of tunneling affect share prices. But:

Proposition 4: If tunneling does not affect discount rate r, then cash-flow tunneling does not directly affect PE ratios while financial tunneling does.

The PE ratio with only cash-flow tunneling $PE_{no\text{-}fin}$ will be:

$$PE_{no-fin} = \frac{P_0}{E_{obs}} = \frac{E_{obs}\dfrac{1}{r}}{E_{obs}} = \frac{1}{r} \qquad 11$$

In contrast, the PE ratio with financial tunneling PE_{fin} will be:

$$PE_{fin} = \frac{P_0}{E_{obs}} = \frac{E_{obs}\dfrac{1}{r}\left(1 - d_{fin}\right)}{E_{obs}} = \frac{1}{r}\left(1 - d_{fin}\right) \qquad 12$$

Proposition 4 lets us distinguish between the valuation effects of cash-flow and financial tunneling. The two methods affect PE multiples differently. Legal changes that reduce cash-flow tunneling need not affect PE ratios while changes that alter financial tunneling affect PE ratios directly.

D. Model Comparative Statics and a Numerical Example

Combining Equation (9) with Equation (10) we get the following expression for observed PE ratios in an economy with financial tunneling:

$$PE_{fin} = PE_{no-tun}\left\langle 1 - \pi_d * \left\{1 - \left[1 - d_{dilut}\left(1 - k\right)\right]\left(1 - \pi_f d_{freeze}\right)\right\}\right\rangle \qquad (13)$$

Observed PE ratios are affected by five parameters: k, d_{dilut}, d_{freeze}, π_f, and π_d. In the comparative statics below we focus on the first three parameters: k, d_{dilut}, and d_{freeze}. A full model

of the drivers of the probabilities of financial tunneling π_f and π_d is beyond the scope of our paper and is left for future work.[6]

We formulate the following Proposition for the effect of k, d_{dilut}, and d_{freeze} on PE_{fin} ratios.

Proposition 5. The partial first derivatives of PE_{fin} with respect to k, d_{dilut}, and *d_{freeze} equal:*

$$\frac{\partial PE_{fin}}{\partial k} = PE_{no-tun}\pi_d d_{dilut}\left(1-\pi_f d_{freeze}\right) \tag{14}$$

$$\frac{\partial PE_{fin}}{\partial d_{dilut}} = -PE_{no-tun}\pi_d\left(1-k\right)\left(1-\pi_f d_{freeze}\right) \tag{15}$$

$$\frac{\partial PE_{fin}}{\partial d_{freeze}} = -PE_{no-tun}\pi_d\pi_f\left[1-\left(1-d_{dilut}\left(1-k\right)\right)\right] \tag{16}$$

Proposition 5 provides several empirical predictions. An increase in minority investor participation k, perhaps through improved preemptive rights, has a positive effect on PE_{fin}. This effect is stronger when the probability of dilution or the expected discount on newly issued shares is large. Large freezeout probability and discount reduce the effect on PE of increasing k. In the extreme, when $\pi_f * d_{freeze}$ is large enough, Inequality (7) will be violated, k will be zero, and legal rules that affect dilution will no longer affect PE.

Decreasing d_{dilut} or d_{freeze} has a positive effect on PE ratios. However, the positive effect of decreasing d_{dilut} (d_{freeze}) is reduced when the discount on the other form of financial tunneling transaction d_{freeze}(d_{dilute}) is larger. These results are consistent with protections against dilution

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[6] For a formal model of the determinants of operational tunneling see Durnev and Kim (2005). They show that the extent of operational tunneling is a function of controlling shareholder ownership and firm investment opportunities and need for financing. Growth in sales is a proxy for investment opportunities. Need for financing is measured as the gap between growth in assets and ROE/(1-ROE). Both measures are biased by operational tunneling effects and do not describe the costs of financial tunneling well. The probability of financial tunneling will reflect the cost and benefits of initiating dilutive equity issues and freezeouts. The costs of financial tunneling may include damages on firm reputation, political pressure from the government, loss of access to equity financing, and possibly reduced access to debt financing. These costs may depend not only on the firm's behavior, but on the behavior of other firms in the market, and on legal rules.

and freezeout working in tandem to bring equity valuations closer to intrinsic value. Addressing them together generates more wealth for minority shareholders than dealing with each issue separately.

To put these comparative statics results in perspective, assume that a company operating in an economy with poor legal protections has an intrinsic $PE_{no\text{-}tun} = 20$, d_{dilut} and $d_{freeze} = 0.6$, $k = 0$, and π_d and $\pi_f = 0.75$. The resulting PE_{fin} ratio is only 8.30 and the company trades at a 59% discount to its no-financial-tunneling value. Now, imagine that protections against both dilution and freezeout are improved, so that the probabilities of dilution and freezeout remain unchanged, but k increases to 1, and d_{dilut} and d_{freeze} drop to 0.2. The wealth effects for minority shareholders will be large. The company's observed PE_{fin} ratio will more than double to 17.75, which is only an 11.25% discount to the $PE_{no\text{-}tun}$ of 20.

II. Applying the Theoretical Framework to Bulgaria - Empirical Predictions

In this section we apply our theoretical framework to analyze the weaknesses of the Bulgarian law governing dilutive offerings and freezeouts pre 2002 and evaluate the 2002 improvements in these minority investor protections. Then, we formulate testable predictions about the impact of the 2002 changes on financial tunneling and share values.

A. An Analysis of Preemptive and Appraisal Rights in Bulgarian Law

In Bulgaria prior to 2002, there were no minimum price rules for secondary equity issues, and thus no limits on d_{dilut}. Preemptive rights existed but these rights were not transferable. Even if preemptive rights rules had been stronger, freezeout rules were weak enough so that most minority shareholders would rationally not participate in equity offerings. Thus, we expect k to be close to 0. There was also no realistic possibility for an equity offering to raise capital from outside investors. We are not aware of any such offerings during the period from the 1998 mass

privatization until the 2002 reforms. So the reputational cost of a dilutive offering, in reduced future access to equity capital, was not an important constraint.

Minimum price rules in a freezeout were so weak that many controlling shareholders did not need to use the two-stage process of dilution accompanied by freezeout described in Equation (6). They could expropriate most minority shareholder wealth via freezeout alone. The tender offer rules required only that the freezeout price could not be lower than the three-month weighted average stock price. The Bulgarian market was also very illiquid. There were several means by which controlling shareholders could freezeout minority shareholders at a discount d_{freeze} that approached and sometimes effectively equaled 1. One was to execute large block trades with related parties at depressed prices during the 3-month period prior to the freezeout. These block trades would form the vast percentage of trading during the three-month period, and de facto set the appraisal price.

In many cases, a company's shares did not trade at all in the three months preceding a freezeout. This allowed controllers to de-list the company without making any offer to minority shareholders. Companies undergoing bankruptcy procedures could also be delisted, with no check on whether these companies were actually insolvent. A controlling shareholder could then use the bankruptcy process to squeeze out at minority shareholders at a zero price.

If a Bulgarian company is delisted (goes dark), minority shareholders formally retain their shares. However, once the company is delisted, it is not subject to the securities laws, which govern public corporations. Private firms are governed by the Bulgarian Commercial Code, which offers no protections against dilutive offers or freezeouts, and does not require disclosure of company financials to shareholders. A going dark transaction is likely to be equivalent to a freezeout at close to a zero price.

In the summer of 2001, a newly elected government headed by the former Bulgarian king came into power. One priority outlined by the new government was to improve the functioning of capital markets. In December 2001 the government proposed to the Bulgarian Parliament several changes to the securities laws. Table III summarizes these changes, which became effective in June 2002.

The first main change involved strengthening preemptive rights. An increase in firm equity could be implemented only through providing tradable preemptive rights (warrants) to all shareholders. These warrants had to be listed and traded on the Bulgarian Stock Exchange.

The second major change was the regulation of going-private transactions. The law now recognizes three critical ownership levels: 50%, 67%, and 90%. A tender offer for all minority shares becomes mandatory when a shareholder reaches each of these critical levels, and a controlling shareholder can de-list a company only when reaching 90% ownership or greater. The law also requires a majority of the minority shareholders to vote to approve the terms of the mandatory tender offer. Finally, minority shareholders are now entitled to receive a minimum fair price for their shares in a tender offer. The fair price is calculated using a combination of *DCF* and comparison to peer firms. The freezeout price must exceed the greater of this fair price or the three-month trade-weighted average stock market price (excluding block trades) to set a lower limit on the freezeout price. Since block trades are now disregarded in computing the market price, manipulating the market price is more difficult.

The changes in the law were accompanied by a reorganization and dramatic increase in the powers of the securities regulator. The newly established Bulgarian Financial Supervision Commission (FSC) succeeded the Bulgarian Securities and Stock Exchange Commission (SSEC) with the goal of protecting the interests of minority investors. Since its creation the FSC has

both enforced the 2002 Law and drafted several important regulations that strengthen and clarify the protections built in the law. These changes are consistent with arguments made by Glaeser, Johnson, and Shleifer (2001) and Black (2001) on the importance of a strong securities regulator in an emerging market.

For example, the FSC reviews all tender offers and has often required majority shareholders to increase the freezeout price, before the FSC will approve the transaction. Also, in early 2003 the FSC issued rules for computing freezeout prices. These rules distinguish between companies with liquid and illiquid stocks. For liquid stocks the minimum price is based on a combination of the market price and *DCF* and peer-multiple valuations. For illiquid stocks the minimum price is based only on DCF and peer multiple valuations. The freezeout price must also equal or exceed estimated liquidation value.

B. Empirical Predictions and Framework to Test Them

Our theoretical model and the discussion of Bulgarian legal changes imply that 1) the improved legal protections will reduce the effectiveness of financial tunneling via equity dilution and freezeout, and 2) the reduction in financial tunneling will lead to increased equity valuations. We now translate these predictions into a testable framework.

Our first empirical prediction about the link between law and financial tunneling is that minority participation in equity issues *k* will increase following the legal changes in Bulgaria. We cannot observe *k* directly. However, we observe the controller's pre-offering ownership (α_0), post-offering ownership (α_1), and the number of new shares issued (*i*), so we can estimate *k*. The relationship between *k* and α_0, α_1, and *i* is described by the following equation:

$$1 - \frac{(1-\alpha_1)}{(1-\alpha_0)} = \frac{i}{(1+i)}(1-k) \qquad (17)$$

Proof: See Appendix.

The left-hand-side of Equation (17) can be interpreted as a measure of dilution. It equals 1 if minority shareholders are completely diluted ($k = 0$) and 0 if they participate pro rata in new issues. It will be negative if the firm raises capital principally from outside investors ($k > 1$). The term $i/(1+i)$ is a measure of equity increase. A regression of the dilution measure on the equity increase measure will provide an estimate of the exclusion parameter ($1 - k$). If the 2002 changes in preemptive rights are effective, we expect shareholder participation to increase after the changes and ($1 - k$) to decline.

Our second empirical prediction about the link between law and financial tunneling is that after the legal changes the average discount in freezeouts d_{freeze} to decrease or even turn negative (freezeout at a premium). We can test this prediction partly by documenting the extent of going dark transactions pre-2002. These transactions were essentially implemented at $d_{freeze} = 1$ and banned by the 2002 legal changes. We can also compare the average discount in freezeout tender offers before the legal changes with such transactions afterwards.

Our main prediction about the link between financial tunneling and valuation is that the expected reductions in dilution and freezeout discounts following the legal changes will translate into increased observed PE ratios. We focus on PE ratios because as stated in Proposition 4, PE ratios are directly affected only by financial tunneling and remove, at least to a first order, the possible effect of changes in operational tunneling. Proposition 5 shows that PE ratios can be positively impacted by an increase in k and/or a decrease in d_{dilut} or d_{freeze}. Our estimating strategy will be to compare the PE ratios of firms pre- and post-2002 (following the legal changes).

A simple comparison of PE ratios before and after the legal change has a major weakness. Other policy changes or events during the same period could also affect equity valuations. For example, the new Bulgarian government also set to zero the capital gains tax for securities traded on the Bulgarian Stock Exchange, effective from the beginning of 2002. This reduction of taxes should increase equity valuations and PE ratios for all listed companies.

Our identification strategy is to implement differences-in-differences (DiD) estimation (see Bertrand, et al., 2004). Based on Proposition 5, the effect on PE of the 2002 legal changes will be higher for companies that are at higher risk of financial tunneling. We expect that companies with a controlling private owner are at higher risk of financial tunneling, especially freezeout, than government controlled firms. If so, the government-controlled firms offer a control group. We predict that PE ratios for firms with a controlling private owner will increase around the time of the law change, relative to PE ratios for government controlled firms. The effect of other legal changes, such as the change in capital gains tax, will be captured by the PE ratio for the control group.

More specifically, we estimate the following DiD equation, using Bertrand et al. (2004) notation:

$$PE_{igt} = A_g + B_t + cX_{igt} + \beta LawInt_{gt} + \varepsilon_{igt} \qquad (18)$$

where the *i* indexes companies, *g* indexes groups of companies that have ex ante different probability of financial tunneling, *t* indexes time period, *A* and *B* are group and time fixed-effects, *X* is a matrix of firm-level controls, and *LawInt* is a dummy identifying the effect of the law on each group of companies. The β coefficient on the high-tunneling-risk group then measures the differential effect of the law changes on PE ratios beyond the effect of other concurrent changes.

III. Data and Summary Statistics

Testing our model requires firm-level stock ownership, accounting, trading, and price data. The record of all Bulgarian companies that have ever been publicly listed on the Bulgarian Stock Exchange (BSE), their listing date, and delisting date (if any), are obtained from the online database provided by the Bulgarian Financial Supervision Commission. A total of 1,040 firms participated in the Bulgarian mass privatization process and were listed on the exchange in May 1998. We exclude 191 firms which never traded or filed financial reports, and nine companies which were acquired or went bankrupt in 1998 and have no data available. Our sample consists of the remaining 840 firms that were listed in May 1998.

The Bulgarian mass privatization was executed via voucher auctions. The creation of large privatization funds, in which individuals invested, plus separate participation by more than two million individual investors, created a variety of post-privatization ownership structures. Atanasov (2005) and Miller and Petranov (2000) provide more details about the Bulgarian mass privatization process.

The most important data for our study are ownership levels and the outstanding shares at year-end for the companies in our sample. A unique feature of Bulgaria and some of the other transitional economies in Eastern Europe is that ownership levels and securities trades are recorded by a Central Depository. The Bulgarian Central Depository contains complete ownership and trading data for all Bulgarian public companies. We were able to obtain from the Central Depository year-end ownership levels of the largest shareholder for each company and also the breakdown of shareholder ownership by type (state, private companies, individuals, financial intermediaries) for 1998 to 2003. Stock trading and price data are compiled directly from the BSE tapes. We have trade data from the BSE through the end of 2002. We obtain

individual firm financial data for the years 1999-2002 from annual reports. Tender offer prices are collected from news tapes provided by the BSE, which are available beginning in 2001.

Figure 1 reports the number of companies traded on the Bulgarian Stock Exchange for each year in the period 1998-2003. We divide the 840 sample firms into four size quartiles and then follow the number of still-listed companies in each original quartile through time. The number of listed firms drops dramatically in 2000 and 2001, and stabilizes in 2002 and 2003. Delisting is more pronounced in smaller firms. Of the 210 firms in the largest quartile, 150 are still trading in 2003, compared to only 40 of the 210 firms in the smallest-size quartile.

A total of 80,000 trades were executed from initial listing in May 1998 through December 2002. The market is thin with an average of fewer than 100 trades per security for the whole period.

IV. Analysis of the Link between Law and Financial Tunneling

We now turn to the empirical analysis of the interaction between the 2002 legal change and financial tunneling. Section A analyzes dilution from equity offers. Section B discusses going dark and freezeout transactions.

A. Dilution

We do not have data on the offer prices for most equity offerings so we cannot document the changes in d_{dilut} due to the changes in the law. We can only say that based on a limited number of announcements in the BSE news tapes, the issue prices in the pre-law period were clustered at the nominal value of 1 lev per share, even for companies that traded at prices above 10 levs before the issue announcement.[7]

[7] For example, the shares of Sopharma, AD traded around 13 lev immediately before it announced an equity issue at 1 lev a share in December 2000.

Instead of looking at the discount of newly issued shares, we rely on Equation (17) to test for a possible change in minority shareholder participation in equity offerings. We construct on a year-by-year basis the dilution measure 1- $(1-\alpha_1)/(1-\alpha_0)$, where we substitute the ownership of the largest shareholder of the firm for α_1 and α_0 . We then construct the equity increase measure $i/(1+i)$ based on the shares outstanding S on a year-by-year basis: $i = (S_1 - S_0)/S_1$. We regress the dilution measure on equity increase (*EquityInc*) and an interaction term *law2002*EquityInc*, where *law2002* is a dummy equal to 1 for years 2002 and 2003, and zero otherwise. [8]

Table IV reports the results of the equity dilution regressions for firms without majority government control. The sample is 142 firms which increases shares outstanding by at least 20% year-over-year. The results are strong and consistent with our first empirical prediction that dilution would decline following the changes to minority investors' preemptive rights. Our estimate for $(1 - k)$ in the pre-2002 period is close to 1 (thus, our estimate for k is roughly zero). This implies that minority shareholders are (on average) completely excluded from new equity issues. After 2002, the estimate of $(1 - k)$ is close to 0, meaning that k is close to 1. The drop in $(1 - k)$ provides evidence that the 2002 changes basically eliminate dilution. Minority shareholders (or new investors who purchase warrants from minority shareholders) on average fully participate in new issues and no wealth is expropriated via dilution. The post-2002 estimate

[8] We pool the pre- and post-2002 observations in order to report and F-test whether the estimates of $(1 - k)$ pre-2002 are statistically different from the estimates post-2002. Results are similar if we estimate the regressions separately for the pre-law-change and post-law-change samples.

of (1 - *k*) is consistent with companies issuing shares primarily to raise capital, rather than to dilute minority investors.[9]

The documented increase in *k* is consistent with our prediction that the legal changes will reduce shareholder dilution. Based on our model, this reduction is due to the combined work of both the changes in the preemptive rights and freezeout rules. The reduction in freezeout makes shareholders more likely to participate in new offerings, while the securitization of preemptive rights allows shareholders with small stakes to sell their rights to better capitalized investors.

Table IV excludes 11 cases involving equity increases at by government-controlled firms. The government uses equity offerings to raise capital rather than dilute minority shareholders both before and after the law change --the government's ownership percentage declines after an equity offering. The predicted value of k for these 11 firms is around 1.5, both before and after the law change. and remains largely constant from pre-2002 to post-2002. Thus, our examination of the post-law change in behavior is limited to non-government controlled firms.

B. Freezeouts

We begin the analysis of freezeouts by examining de-listings before the 2002 legal changes. Table V shows that more than 500 firms are delisted in this period. Almost 80% of the firms (402 out of 509) do not trade in a three-month window before the delisting date. They simply go dark, with no tender offer. In these firms the pre-2002 market-based rule that the freezeout price should be higher than the three-month weighted average stock price offers no

[9] One possible concern in interpreting Table IV is that different types of firms issue equity pre-2002 and post-2002. We address these concerns by separating firms into three categories: firms that did not issued equity at all, firms that issued equity pre-2002, and firms that issued equity post-2002. We estimate unreported multinomial logit models to determine whether the firms in these categories differ in percent owned by the largest shareholder, percent owned by the state, and market capitalization. We do not find significant pre- versus post-differences in which firms issued shares. In both periods larger firms with less state ownership and larger privately owned control blocks were more likely to issue equity.

protection to minority shareholders. As discussed in Section II.A, due to weaknesses in Bulgarian corporate law for private companies, for these firms, the effective freezeout discount d_{freeze} is close to 100%.

The summary statistics in Table V imply that certain firm characteristics are related to the probability of delisting or conducting a formal freezeout.[10] Consistent with Figure 1, delisted firms are much smaller. They are also much less likely to be controlled by the government. This suggests an interesting tradeoff for minority shareholders in a firm with the government as a controlling shareholder. On one hand, government control could lead to high agency costs if the government is a poor monitor. This could manifest itself through poor performance and operational tunneling by management. On the other hand, the expected level of operational tunneling under government control may be no worse than under private control, and government control reduces the probability of catastrophic wealth loss via freezeout (based on the discussion in Section IV.B), shareholders in government-controlled firms may be less likely to suffer dilution as well. In the early stages of the Bulgarian market, the benefits of government majority ownership may well have outweighed the costs.

Of the 509 delisted firms, 107 firms have at least one trade in a three-month window before their delisting. These firms were larger and more liquid than the "going dark" firms. To de-list these companies, the controlling block-holders often took advantage of another weakness of the market-based rule and engaged in dilutive offerings prior to the freezeout, manipulative block trades with related parties during the three-month price measurement period, or both.

Table VI provides evidence of apparent manipulative trading, in which large block trades reduced the weighted-average stock price in the three months before delisting. Table VI lists

[10] The univariate summary statistics results are confirmed by unreported multivariate logit models of delistings.

examples of large trades (at least 50x daily trading volume) in frozen-out companies, during the 3 months prior to delisting. These large trades occur at an average discount of approximately 81% to the trade-weighted price of other trades during the six months prior to freezeout. The block trades represent an average of 89% of trading volume during the three months preceding delisting, is 0.89. The freezeout price, including the large manipulative trades, will be at an average discount d_{freeze} of 0.81*0.89 = 72% to the price excluding these trades (see Appendix equation (A6)). Table VI provides a rare glimpse of apparent market manipulation in connection with a tender offer (Hermalin and Schwartz, 1996). Recall that the un-manipulated market price is already below intrinsic share value due to operational tunneling and anticipated risk of dilution and freezeout. We thus see another interaction between legal rules – the effectiveness of a market price rule for freezeouts depends, among other things, on legal control of manipulative trades.

We next analyze how the terms of freezeouts change after the 2002 legal changes. The BSE news tapes cover tender offers from 2001. Table VII provides data for the nine announced freezeout tender offers completed during 2001, before the law changes, and the 19 offers announced afterwards.[11] We exclude one post-law case where the controlling shareholder offered more than an 800% premium in a revised tender offer. The pre-2002 tender offers premiums are close to zero and are never revised upwards due to shareholder or regulator pressure. The post-law change in offer premiums is striking. Even excluding the 800%-premium outlier, the average post-law premium is more than 40% for initial offers and over 60% for final offers. The final offer premium compares favorably with the 56% average premium documented

[11] There are five tender offers that are completed between January and May 2002. During this period, although the law changes were not formally effective yet, the FSC used its approval rights and essentially enforced the upcoming laws. Therefore, we combine the five transitional period offers with the post-law offers.

by DeAngelo et al. (1984) for going-private transactions in the United States (U.S.). Half of the offers (10 of 20 post-law change offers, including the outlier) are revised upwards to secure minority shareholder and regulator agreement of the tender offer price. These results are consistent with our empirical prediction that the freezeout discount d_{freeze} would decline after the legal changes. Indeed, the discount becomes highly negative (a large premium) on average.

The increased premium following the law changes is both statistically and economically significant, but *understates* the effect of the law change on minority shareholder wealth. The premium is computed based on the stock price before the tender offer. As noted above, pre-law prices were sometimes manipulated downwards, and as we show below, PE ratios for privately controlled firms increase dramatically post-law. The premium may also be a poor measure of firm value in an illiquid market.

To address these issues we also report in Table VII the ratios of initial and final offer price to sales in the year before the tender offer.[12] The mean (median) Final Offer Price to Sales ratio increases by more than four times, from 0.16 (0.07) to 0.65 (0.30). The vast majority of this increase does not result from an overall increase in share prices. In the final two rows of Table VII, we also report average and median values for "Mean-Adjusted Offer Price to Sales" ratios. To compute the mean-adjusted ratio, we divide the Offer Price/Sales for each freezeout offer by the average Price/Sales of non-frozen-out firms in the freezeout year. The before to after comparison of Mean-Adjusted Price/Sales ratios can be understood as a difference-in-difference estimate, where the control group is non-frozen out firms. . The increase in average and median ratios for this measure is similar to the increase in raw price/sales ratios, and the difference in

[12] To be consistent with Proposition 4, we would have used PE ratio. However, the most of the firms in our small sample of tender offers do not report positive earnings and have undefined PE ratios. To avoid reducing sample size even further we analyze Price/Sales ratios instead.

medians remains significant. In robustness checks, we obtain similar results if we divide by the median Price/Sales ratio of non-frozen out firms.

V. Changes in Equity Valuation after the 2002 Law Changes

The previous section established the effect of improved preemptive rights and freezeout price rules in limiting minority shareholder expropriation through dilutive equity issues and freezeouts. We now turn to documenting the valuation effects of the decrease in financial tunneling. An event study technique is not feasible, partly because, as is often the case for legal reforms, it is difficult to pinpoint an exact "event" date since statutory adoption involves multiple events (Bhagat and Romano, 2002). Moreover, there were other potentially significant events at about the same time as the events that directly involve the new securities law rules. In addition, most Bulgarian firms trade once a month or less, so we cannot reliably estimate abnormal returns using daily data. Given these constraints, we examine broader event windows, and use difference-in-differences (DiD) estimation, comparing tunneling-vulnerable firms to a control group of less-vulnerable firms, to control for other relevant events that could affect equity values. We study PE ratios rather than share prices based on Proposition 4, which states that PE ratios measure the direct effect of only financial tunneling, while stock price returns reflect the combined effect of operational and financial tunneling.

For effective use of DiD estimation, we need to identify groups of firms that face different risks of financial tunneling pre-2002 and as a result will be affected by the legal changes differently. We do not explicitly model the factors which affect the probability of freezeout and dilution. Still, based on the summary statistics in Table V and anecdotal evidence, we expect that government-controlled firms will have a low probability of financial tunneling. In contrast, firms with a private majority block-holder will have a high probability of financial

tunneling. We therefore separate the firms in our sample in three categories: firms with majority government ownership, which will be the baseline group; firms with a majority private owner; and firms without any majority owner. All firms will be affected by the reduction in capital gains tax and other macro-economic events, but government-controlled firms will be least affected by the legal changes affecting dilutive offerings and freezeouts, while firms with controlling private owners will be most affected by these changes.

We calculate PE ratios on a quarterly basis as the average stock price for the quarter divided by earnings per share for the previous fiscal year. We include firms that have at least one non-missing PE ratio in the pre-law period (starting with the first quarter of 2000) and one in the post-law period (through fourth quarter of 2002). We also replace the *X* matrix of firm-level controls in Equation (18) with a firm fixed effects specification, which also controls for the group fixed effects *A*. We use quarter dummies to capture overall changes in share prices.

DiD estimation results are reported in Table VIII. Due to the uncertainty of the timing of the legal changes impact on valuation, we estimate four models. Model 1 compares PE ratios for all quarters through September 31, 2001 with all post-September 31, 2001 quarters. Model 2 uses a cutoff date for the pre-versus-post law analysis of December 31, 2001, while Model 3 compares the pre-September 31, 2001 period with the post-December 31, 2001 period. Finally, Model 4 drops the interaction variables to show the average post-law increase in PE ratio for all firms.

The results from the first comparison show that privately-controlled firms on average increase their PE ratios by 12 to13 units, as captured by the coefficient on *Postlaw*priveown50*. The values of the estimated coefficients translate into higher than 100%increase in valuations for privately-controlled firms. The effect of the law on PE ratios for non-majority-controlled firms is

still positive, but much smaller in size and not significant in all specifications. With this specification, the coefficient on the post-law dummy measures the post-law change in PE ratio for the omitted class of government-controlled firms. This coefficient is negative and not statistically significant in all specifications. These results are consistent with our empirical prediction that observed PE ratios would increase due to an increase in k (more shareholder participation in secondary offers) and/or a decrease in fractional discounts of secondary offers or freezeouts (d_{dilut} or d_{freeze}).

In separate regressions (not reported), we compare government-controlled firms to all other firms. Coefficient are similar, but standard errors increase, and the before-to-after change becomes insignificant, perhaps because there is variation in tunneling risk within the firms without controlling private owners.

Figure 2 presents the Differences-in-Differences comparison visually. For PE ratio, we restrict our analysis to firms with earnings above 0.01 lev, and thus well-behaved PE data for all eight quarters in 2001-2002. We have 17 such firms, ten with a controlling private owner, and seven that are either controlled by the government or have no majority shareholder (Other Firms). Because there are only two government-controlled firms, we bundle them together with the non-majority-controlled firms.

Figure 2 shows, for each quarter, the average PE ratio for Privately Controlled Firms and Other Firms, respectively, normalized to 1.0 in the first quarter of 2001. The average PE ratio for Privately Controlled firms triples from the fourth quarter of 2001 to the first quarter of 2002. The increase in PE ratio is over 400% measured from the fourth quarter of 2001 to the fourth quarter of 2002. In contrast, the PE ratios for Other Firms remain largely unchanged.

Because the number of firms with complete PE data is small, in the right half of Figure 2 we also show the change in Price/Sales ratios. We have 28 firms with complete Price/Sales ratio data — 16 Privately Controlled Firms and 12 Other Firms. Price/Sales ratios for Privately Controlled Firms increase noticeably from the fourth quarter of 2001 to the first quarter of 2002, and increase further by the end of 2002, while the Price/Sales ratios for Other Firms stay unchanged. The change for Privately Controlled Firms over the full period is an economically significant 60%. The smaller effect on Price/Sales ratios may arise because this ratio is affected by operational tunneling. For example, transfer pricing affects profits, and thus stock price, more strongly than it affects sales. When majority owners lose the opportunity to extract wealth from minority shareholders through financial tunneling, they may partly compensate by increasing the level of operational tunneling.

This evidence suggests that the changes in minority legal protections have the greatest impact on firms at high risk for financial tunneling – privately controlled firms. Thus, one important link between legal protections and stock market valuation appears to involve control of financial tunneling. In establishing this link, we complement the prior research on the positive relationship between capital market development and legal protections in cross-country studies by La Porta et al., 1998, 2002.[13]

VI. Summary

This paper examines how law affects finance through the control of financial tunneling. We first develop a simple model of financial tunneling through dilutive equity offerings and

[13] Research relating the liberalization of financial markets and economic growth in developing economies is the remaining link in the chain between law and economic growth (see Bekaert et al., 2005). While we do not formally examine that link in this paper, our results do suggest this is a worthwhile avenue for future research.

freezeouts. In the model, investors rationally discount the prices they pay for shares, and may rationally decline to participate in dilutive share offerings when legal protection against freezeout is inadequate. We test the model's predictions with data from the emerging market of Bulgaria, where a legal change in protection against dilutive offerings and freezeouts during the sample period provides a natural experiment. Unlike most prior studies on emerging markets, which are limited to macro- (economy) level analysis or case study evidence of expropriation, we perform a detailed empirical analysis on a sample of more than 800 companies.

Relying on detailed trade, price, and ownership data, we document widespread financial tunneling in Bulgaria after the "Big Bang" privatization (1999-2001). Minority shareholders rarely participate in dilutive offers and freezeout is widespread during this period. Changes in Bulgarian laws in 2002 restrict both forms of tunneling. After adoption of the new rules, minority dilution via equity issuances virtually disappears, and the mean price of freezeouts, measured by price/sales ratio, quadruples.

Our model also predicts that reduction in financial tunneling will result in higher equity valuation. Consistent with that prediction, we find higher post-law PE ratios for those firms most likely at risk for financial tunneling.

Appendix. Model Proofs and Extensions

Proof of Proposition 1.

The minority shareholders initially hold (1-α_0) shares. These shares are each worth $V_{no\text{-}fin}$ without financial tunneling. The dilutive issuance causes minority shareholders to lose a proportion $d_{dilut}\frac{i}{1+i}$ of this per-share value. They also purchase a fraction *(1-α_0)*k* of the newly issued shares at the discounted offering price and make a per-share profit on these shares (as a proportion of $V_{no\text{-}fin}$) equal to (post-dilution per-share value - price paid), for total gain of:

$$(1-\alpha_0)k * i\left[1 - d_{dilut}\frac{i}{1+i} - (1-d_{dilut})\right] = (1-\alpha_0)k * d_{dilut}\frac{i}{1+i} \qquad \text{(A1)}$$

The combined effect of the loss on original holdings and gain on newly acquired shares is given by Equation (4).

Q.E.D.

Proof of Proposition 2.

Prior to the freezeout, the minority shareholders own (1 -α_1) shares which are worth $V_{no\text{-}freeze}$ each. In the freezeout, the minority shareholders will lose a fraction d_{freeze} of this value. Proposition 2 follows directly after plugging in the expressions for post dilution ownership (1-α_1) and post-dilution minority value $V_{no\text{-}freeze}$ given by Equations (2) and (3) respectively.

Q.E.D.

Proof of Equation (17)

Start with Equation (2) for minority ownership after dilution (1 -α_1), and divide both sides by (1 -α_0)

$$\frac{(1-\alpha_1)}{(1-\alpha_0)} = \frac{[1+k*i]}{(1+i)} \qquad \text{(A2)}$$

Now multiply by -1 and add 1 to both sides to reach:

$$1 - \frac{(1-\alpha_1)}{(1-\alpha_0)} = 1 - \frac{[1+k*i]}{(1+i)} \qquad \text{(A3)}$$

Equation (17) is then straightforward to derive after rearranging terms.

Q.E.D.

Discussion of Market Manipulation

Suppose that a country has a rule requiring shares to be issued at market price and minority shareholders do not expect a freezeout for less than the no-freezeout value of their shares, so shares are priced in the market at $V_{no\text{-}freeze}$.[14] The controlling shareholder can arrange "wash" trades with related parties at a fractional discount d_{wash} below $V_{no\text{-}freeze}$. Assume also that the minimum freezeout price P_{freeze} is calculated as a trade-volume-weighted average price over a specified period (as in Bulgaria before 2002), wash sales represent a fraction v_c of the total trading volume in the stock over this period, and true sales take place at $V_{no\text{-}\text{freeze}}$. Then the minimum freezeout price will be:

$$P_{freeze} = V_{no-freeze} * (1 - v_c) + V_{no-freeze}(1 - d_{wash})v_c = V_{no-freeze}(1 - d_{wash}v_c) \qquad \text{(A4)}$$

If the controlling shareholder can initiate a large volume of manipulative trades, so that $v_c \to 1$, a market price rule will allow the controller to freezeout minority shareholders at a discount approaching d_{wash}. Thus, for a market price rule for freezeouts to prevent dilutive freezeouts, laws must also limit the amount of manipulative trading v_c, the discount d_{wash} at which manipulative trading can be executed, or both, as well as prevent dilutive share offerings.

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[14] If there is a positive probability of a freezeout at a discount or other financial tunneling, the market price P_1, will already be lower than the no-freezeout value $V_{no\text{-}freeze}$, which will make a market price rule even less effective at protecting minority shareholders. See Bebchuk and Kahan (2000).

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Table I
Financial Tunneling Methods and Their Implementation in Bulgaria

Tunneling Method	Research Studies	Implementation in Bulgaria
Dilution	Black, Kraakman, and Tarassova (2000) Baek, Kang, and Lee (2006)	Controlling shareholder initiate a share offering at a price well below the current market price, makes it difficult for minority shareholders to participate, and buys all unsubscribed shares.
Freezeout	Nenova (2005) Gilson and Gordon (2003) Bates, Lemmon and Linck. (2006)	Tender offerat three-month weighted-average stock price. This price is sometimes manipulated through large "wash" sales shortly before tender offer, at prices 70%-80% below the value of minority shares. Company is then delisted.
Going dark (delisting without freezeout)	Marosi and Masoud (2004) Leuz, Triantis, and Wang (2006)	Controlling shareholder causes company to delist. Trading ceases, minority shareholders retain illiquid, often worthless or nearly worthless shares.
Transfer of control via merger	Gilson and Gordon (2003)	N/A
Targeted Repurchases	Kirchmaier and Grant (2005)	N/A

Table II
Notation for Model and Empirical Tests

Symbol	Description
Model variables	
C	Controlling shareholder
m	Minority shareholders
t	Time period (t = 0, 1, or 2)
α_t	Ownership by controlling shareholder at time t Estimated empirically before and after dilutive offering or freezeout based on year-end data.
$E_{no\text{-}tun}$	Intrinsic per share earnings of the firm at $t = 0$ (before cash-flow tunneling)
E_{obs}	Earnings per share observed by minority shareholders at $t = 0$ (after cash-flow tunneling)
r	Minority shareholders' discount rate
$PE_{\text{no-tun}}$	Price/earnings ratio for firm with no tunneling = 1/r
$PE_{\text{no-fin}}$	Price/earnings ratio for firm with cash flow tunneling but no financial tunneling = 1/r
PE_{fin}	Price/earnings ratio for firm with cash flow tunneling but no financial tunneling = 1/r *(1– d_{fin})
P_t	Stock price at time t (t = 0, 1)
P_{dilut}	Price at which new shares are issued in a dilutive offering
P_{freeze}	Price at which minority shares are frozen-out
π_d	Probability of dilutive offering
π_f	Probability of freezeout, given that dilution has already occurred
$V_{no\text{-}tun}$	Intrinsic value of firm's shares with no tunneling
$V_{no\text{-}fin}$	Value of minority shares after operational tunneling but without financial tunneling
$V_{\text{no-freeze}}$	Value of minority shares after dilution, with no anticipation of a subsequent freezeout or additional dilution
V_{freeze}	Value of minority shares after freezeout (= P_{freeze})
i	Fractional number of share issued in a dilutive offering, relative to shares outstanding before the offering. Estimated empirically based on year-end data as $i = (S_{year\_1}\text{-}S_{year\_0})/S_{year\_1}$, for an offering during year 1
k	Fractional participation of minority shareholders in a dilutive offering
d_{cf}	Fraction of actual earnings that is diverted via operational tunneling
d_{fin}	Combined fraction of firm value that is diverted via dilution and freezeout
d_{dilut}	Fractional discount at which new shares are issued in a dilutive offering, relative to pre-dilution firm value $V_{no\text{-}fin}$
d_{freeze}	Fractional discount at which minority shares are frozen out, relative to pre-freezeout firm value $V_{\text{no-freeze}}$
d_{wash}	Discount of "wash sale" price below pre-freezeout value of minority shares $V_{\text{no-freeze}}$
D_{dilut}	Fractional decrease in value of minority shares $V_{\text{no-tun}}$ due to dilutive offering
D_{freeze}	Fractional decrease in value of minority shares $V_{\text{no-freeze}}$ due to freezeout
N	Number of firms in the economy
n	Index variable for each firm (generally suppressed in the model)
$S_{n,\,t}$	Shares of firm n outstanding at time t (assumed in the model to = 1 before dilutive offering).
v_c	Ratio of wash sales to total trading volume within the time period for measuring the minimum freezeout price under a market price rule
Empirical variables	
dilution measure	$1 - (1\text{-}\alpha_o)/(1\text{-}\alpha_1)$. Converges to 1 for total dilution, to 0 for prorata purchase of shares; negative if firm raises capital by issuing shares primarily to outside investors
equity increase	Estimated empirically as $i/(1+i)$. Converges to 1 for large dilutive offerings.

Table III
Changes in Bulgarian Corporation Law in 2002

The changes in the law were introduced to Parliament by the Bulgarian government on December 14, 2001. The first draft of the law was approved by Parliament on February 14, 2002. The final version of the law was accepted by Parliament on June 6, 2002. It was published in the State Gazette and thus became effective on June 21, 2002. Due to the efforts of the Financial Supervision Commission during the January-May 2002 transitional period, firms were effectively subject to the new freezeout rules from the beginning of 2002.

Statute	Pre-2002	2002
Preemptive Rights	Minority shareholders can participate in new equity offerings. If they do not participate, the controlling shareholder can purchase all unsubscribed shares.	Stock warrants are required to be issued upon every capital increase—one warrant for each share. The preemptive rights of shareholders in public companies can still be extinguished if not exercised within the period determined by a general meeting of shareholders. This period cannot be less than one month from publication of the notice to subscribe shares in the State Gazette. The key difference is that shareholders can sell the warrants to other shareholders or third parties, as opposed to having to exercise their preemptive rights by buying the shares themselves. Majority shareholders are now put in the position of having to purchase the warrants in order to increase proportional ownership, rather than just taking control of unsubscribed shares when the minority did not buy them.
Appraisal Rights	In a going-private transaction, a controlling shareholder should offer at least the weighted-average stock price from the last three months of trading	1. A controlling shareholder should extend a mandatory tender offer to remaining shareholders when reaching 50%, 67%, and 90% ownership in the firm. A controlling shareholder can initiate a going-private transaction only when reaching 90%. 2. Minority shareholders should receive a fair price for their shares in tender offers and going-private transactions. A fair price is computed using discounted cash flow and comparable company multiples valuation methods and is compared to the average stock price for the last three months, excluding block trades. Minority shareholders should receive the higher of the two prices. 3. A majority of minority shareholders has to approve going-private transactions. 4. The SSEC/FSC has to evaluate the price in going-private transactions and approve tender offers only if they meet the "fair value" requirements.

Table IV
Dilution and Equity Issuance

Sample is non-government-controlled firms. The dependent variable is minority shareholder dilution in offerings which increase the number of outstanding shares by at least 20% year-over-year.. We define a minority shareholder dilution measure as $(1- (1 - a_1) / (1 - a_0))$, where a_1 and a_0 are the fractional ownership by the largest owner before and after an equity issuance, respectively. We define the increase in equity capital as $EquityInc = i/(1+i)$, where $i = (S_1-S_0)/S_1$ and S_1 and S_0 are shares outstanding at the end of year 1 and year 0, respectively. From Equation (17), the regression coefficient on *EquityInc* is our estimate for $(1 - k)$ pre-2002. L*aw2002*, equals 1 for post-legal change years (2002 and 2003) and zero otherwise. The coefficient on the interaction term *EquityInc* * *law2002* is our estimate for the post-law change in $(1 - k)$. The control variables in Model 2 and 3 are α_0 (pre-offering stake of the largest shareholder), *stateown* (fractional state ownership prior to the offering), and *mktcap* (number of pre-offering shares x share price at the end of the pre-offering year, in millions of Bulgarian lev). Shareholder stakes and number of shares are measured at year-end. P-values are in parentheses. Significant results, at 10% level or better, are in **boldface**.

	Model 1	Model 2	Model 3
Estimate for (1 – k) pre-2002	**1.1637** **(0.011)**	**1.0553** **(0.022)**	1.1320 (0.146)
Change in (1 – k) post-2002	**-1.1978** **(0.001)**	**-1.0110** **(0.008)**	**-1.3923** **(0.013)**
Resulting estimate for (1 – k) post-2002	-0.0341 (0.950)	0.0443 (0.934)	-0.2602 (0.762)
Controls:			
α_0		**-1.1911** **(0.005)**	**-1.8176** **(0.014)**
Stateown		-0.0001 (0.988)	0.0016 (0.914)
Mktcap			0.0074 (0.387)
Intercept	-0.5145 (0.078)	0.1262 (0.733)	0.4206 (0.551)
Number of Observations	142	142	87
Prob. F-stat	0.0007	0.0001	0.0043
Adjusted R^2	0.0867	0.1280	0.1875

Table V
Characteristics of Firms Delisting from mid-1998 through end of 2001

This table shows voluntary Bulgarian firms from May 31, 1998 to December 31, 2001. Delistings occur for two reasons: firm goes dark (requests delisting) after no trading for 3 months, or firm conducts freezeout of minority shareholders. Sample is all 840 firms listed on the BSE in 1998. Privown is fractional stake of the largest shareholder, stateown is fractional state ownership. Privown, stateown, and number of shares are measured at the end of the last year in which the firm is publicly traded. The average (median) number of trades for delisted firms is computed using only the years before delisting.

Characteristics	**Firms going dark (no trading 3-months before delisting)**	**Firms frozen-out (at least one trade within 3-months before delisting)**	**Firms remaining public at end of 2001**
Mean (median) privown	43.95% (40.19%)	46.90% (43.67%)	49.89% (47.89%)
Mean (median) stateown	9.12% (6.01%)	8.63% (3.44%)	11.94% (6.55%)
No. of firms with government majority ownership	3	2	19
Mean (median) number of shares (firm size), in thousands	74 (55)	522 (87)	788 (238)
Mean (median) number of trades a year	3.97 (2.00)	21.92 (3.00)	23.75 (6.00)
Number of firms	402	107	331

Table VI
Examples of Possible Use of Large Wash Trades to Reduce Delisting Price

The examples are identified from the BSE tapes, by finding companies where there are large trades (50+ times daily trading volume) within three months before delisting. The pre-trade price range is taken over the six months before the last trade. The discount d_{wash} is computed as (weighted average pre-trade price – price of trade)/(weighted average pre trade price). The weight of trade v_c is computed as (size of trade)/sum(size of all trades during 3 months preceding delisting).

Firm Name	Trade date	Delisting date	Pre-Trade Price Range	Price of large trade	Discount of large trade (d_{wash})	Weight of large trade (v_c)
Plastimo, AD	4 Apr 2000	5 Jul 2000	5.00-8.00	1.00	0.857	0.663
Preslav –AH, AD	19 May 2000	25 May 2000	2.68-3.51	1.05	0.610	0.945
Sintermat, AD	4-6 Oct 2000	29 Nov 2000	11.99-13.00	2.50	0.790	0.952
Ropotamo, AD	9 Nov 2000	10 Jan 2001	13.66-20.70	1.12	0.943	0.971
Loviko Chirpan, AD	15 Mar 2000	8 Jun 2000	10.00-10.00	4.16	0.584	0.981
Himatech, AD	14 Aug 2001	4 Sep 2001	10.00-10.00	1.10	0.890	0.762
General Ganetzki, AD	1 Oct 2001	15 Dec 2001	4.00-4.00	0.12	0.970	0.938
Average:					**0.806**	**0.887**

Table VII
Freezeout Tender Offers Before and After 2002 Law Changes

Tender offers are identified using keyword searches in the BSE news archive. The BSE news archive starts identifying tender offers in 2001. We find 33 announcements in the 2001-2002 period. We exclude two announcements with a missing offer price and two firms with no trades in the three months before the announcement. This reduces the sample to nine freezeout offers during 2001 (pre-law change) and 20 offers post-law. In measuring premium to market and initial offer/sales, we exclude one post-law offer in which the final price is revised upwards by over 800%. Market price is the equally weighted average trading price for the three months before the announcement. Premium is computed as (offer price – market price)/(market price).Offer Price to Sales is computed as (offer price)/(sales in year before tender offer). The mean-adjustment of Offer Price/Sales ratios is calculated as the Offer Price/Sales for each firm divided by the average Price/Sales ratio for non-frozen out firms in the same year as the freezeout. P-values for the hypothesis that the premium is zero are in parentheses. Significant results, at 10% level or better, are in **boldface**.

Characteristics	Before 2002 Law	After 2002 Law	P-value of Difference between Pre-Law and Post-Law Values
Summary Statistics of Tender Offers			
Number of tender offers	9	20	
Average premium to market price for initial tender offers	0.1363 (0.233)	**0.4059 (0.003)**	0.162
Median premium to market price for initial offers	0.0382 (0.120)	**0.2014 (0.003)**	0.312
Number of offer prices that are revised upwards	0	10	
Average increase of tender price of revised offers	n.a.	**0.4330 (0.024)**	
Average premium for final offers	0.1363 (0.233)	**0.6291 (0.000)**	**0.039**
Median premium for final offers	0.0382 (0.120)	**0.4526 (0.000)**	**0.030**
Offer Price to Sales Ratios			
Average (median) Offer Price to Sales	0.1557 (0.0670)	0.5346 (0.2223)	**0.092 (0.025)**
Average (median) Final Offer Price to Sales	0.1557 (0.0670)	0.6466 (0.2965)	**0.097 (0.017)**
Average (median) Mean-Adjusted Offer Price to Sales	0.3767 (0.2031)	1.2025 (0.4747)	0.114 (**0.032**)
Average (median) Mean-Adjusted Final Offer Price to Sales	0.3767 (0.2031)	1.4680 (0.6331)	0.118 (**0.017**)

Table VIII
DiD, Firm Fixed Effects Results for PE Ratio Changes

Dependent variable is quarterly PE ratio (average stock price for the quarter/earnings per share for prior year). Observations with earnings per share < 0.01 Bulgarian lev are dropped. Only firms with at least one non-missing PE ratio both before and after the law change are kept. Each regression includes firm fixed effects and time (calendar quarter) dummies. The post-law-change dummy in Model 1 (Model 2) equals one for calendar quarters after September 30, 2001 (December 31, 2001) and zero for prior quarters. The post-law-change dummy in Model 3 equals one for calendar quarters after December 31, 2001 and zero for quarters through and including September 30, 2001. We interact the post-law-change dummy with the following dummies: 1) a dummy for private majority owner, *privateown50* (= 1 if a firm has a non-government majority owner), and 2) a *nocontrol* dummy (= 1 for firms with no majority owner). The omitted group is firms with majority government ownership. Model 4 is similar to Model 3 but omits the period dummies and the interaction terms; the coefficient on post-law-change dummy then gives the average post-law increase in PE ratio for all firms. P-values are in parentheses. Significant results, at 10% level or better, are in **boldface**.

	Model 1	Model 2	Model 3	Model 4
Postlaw*privateown50	**12.2956**	12.7927	**13.4287**	n.a.
	(0.077)	(0.141)	**(0.036)**	
Postlaw*nocontrol	4.5327	3.2671	4.2524	n.a.
	(0.523)	(0.714)	(0.516)	
Postlaw dummy	-2.9979	-3.8063	-3.6234	**5.6341**
	(0.695)	(0.691)	(0.600)	**(0.001)**
Average PE when Post-law-change dummy equals 0	7.3341	8.7414	7.2339	7.2339
Number of firm fixed effects	79	62	61	61
Calendar quarter dummies	11	11	10	10
Number of Observations	541	458	407	407

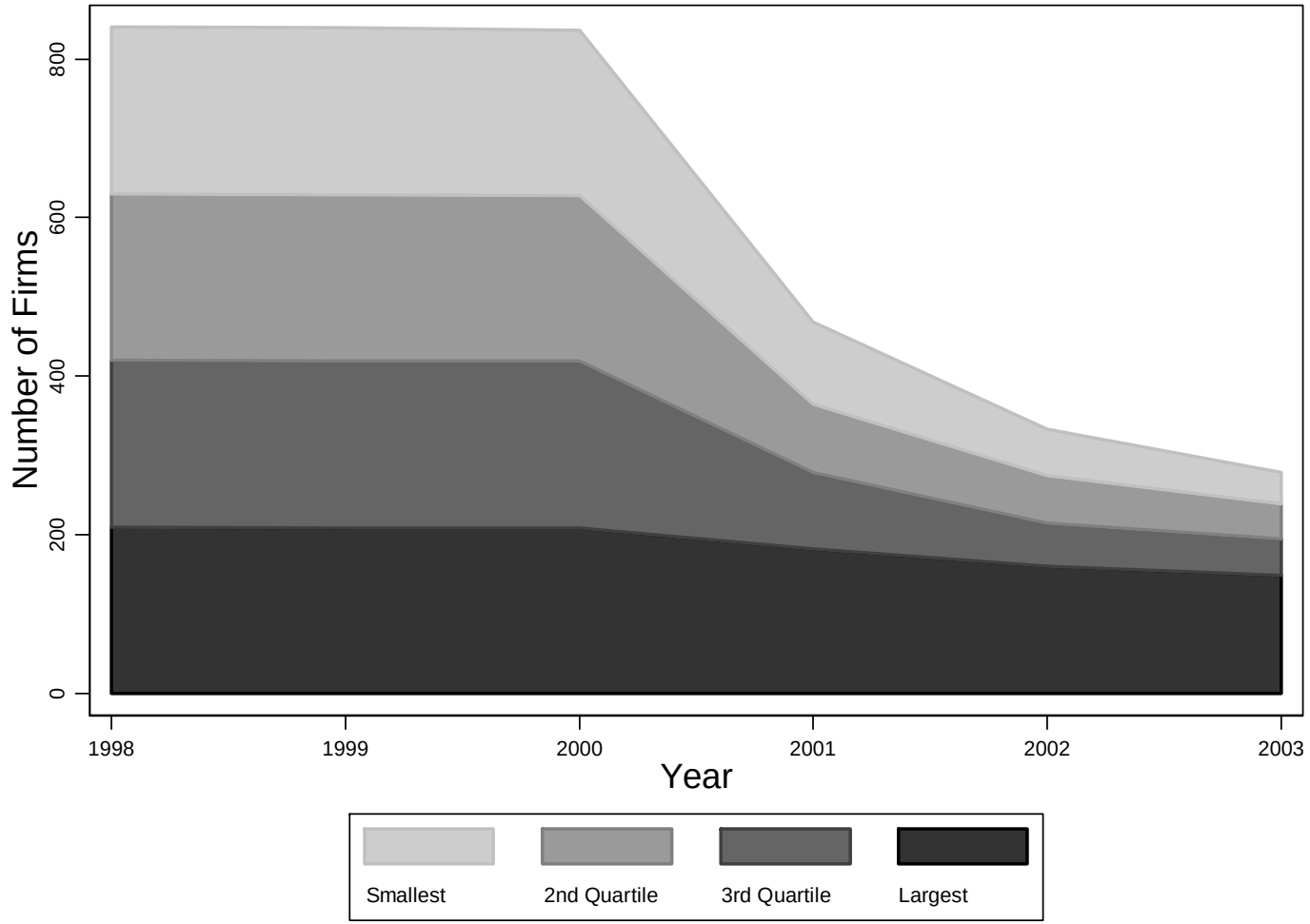

Figure 1. Number of firms listed on the Bulgarian Stock Exchange by Year and Size Quartile

Firm size is measured as book value of equity. The number of firms is measured on December 31 each year.

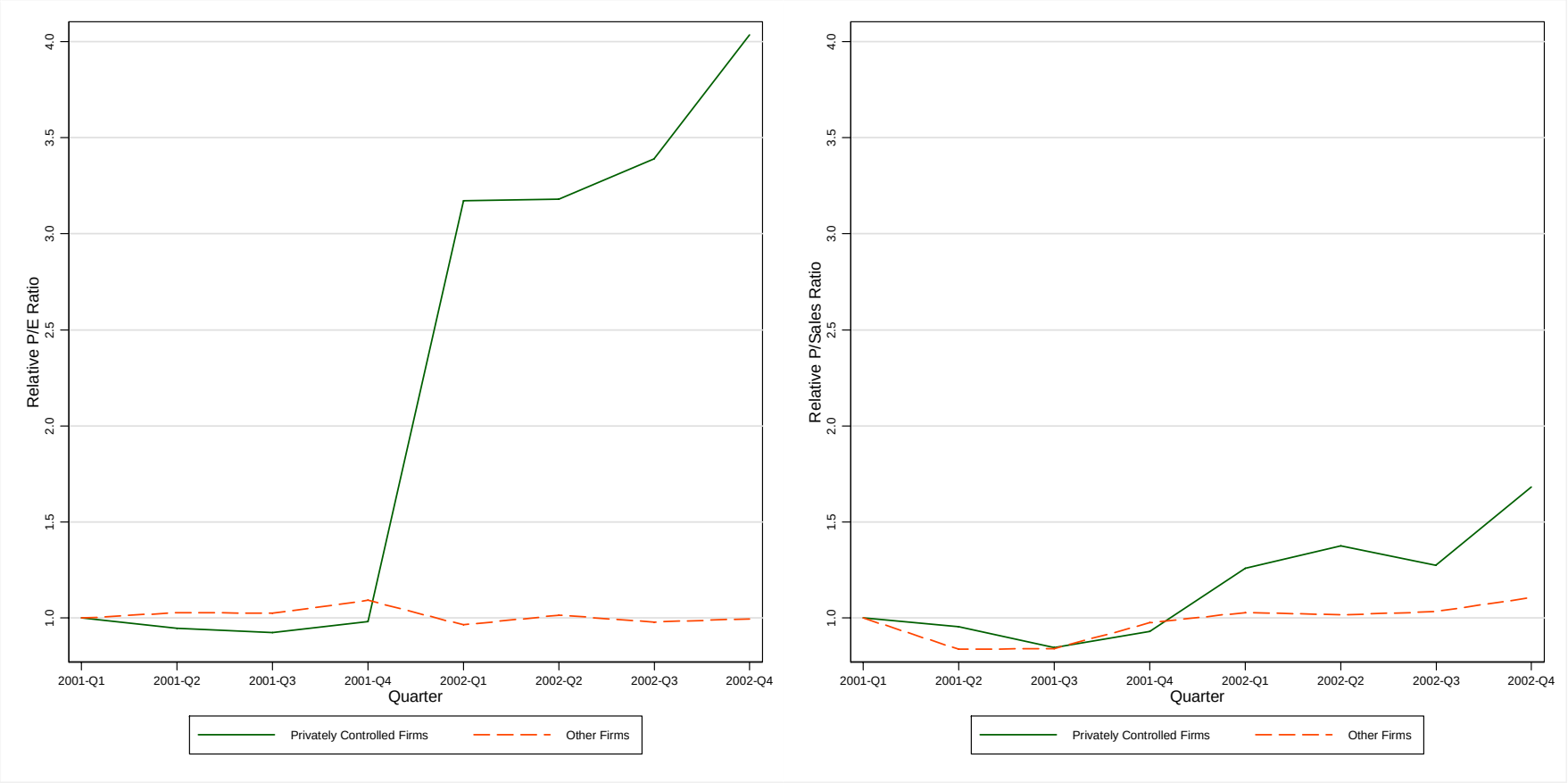

Figure 2. Relative PE and Price/Sales Ratios during the 2001-2002 Period

Privately controlled firms are firms with a non-government majority shareholder as of Dec 31, 2001. Other firms have government majority owner or no majority owner. PE Ratio for each quarter is computed as average stock price over the quarter divided by prior year's earnings, and similarly for price/sales ratios. PE sample includes firms which have earnings > 0.01 lev and non-missing PE for all eight quarters of 2001-2002. (10 privately controlled firms and 7 other firms). Sample for the price/sales graph includes firms with non-missing Price/Sales for all 8 quarters of 2001-2002 (16 privately controlled firms and 12 other firms). The graphs show the average PE (price/sales) ratio for each group, normalized to 1.0 in the first quarter of 2001.