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ABSTRACT

In many countries, the operation of legal, political and regulatory institutions is subverted by the wealthy and the politically powerful for their own benefit. This subversion takes the form of corruption, intimidation, and other forms of influence. We present a model of such institutional subversion – focusing specifically on courts – and of the effects of inequality in economic and political resources on the magnitude of subversion. We then use the model to analyze the consequences of institutional subversion for the law and order environment in the country, as well as for capital accumulation and growth. We illustrate the model with historical evidence from Gilded Age United States and the transition economies of the 1990s. We also present some cross-country evidence consistent with the basic prediction of the model.

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I. Introduction

Recent evidence from a cross-section of countries suggests that economic inequality is related to a variety of adverse social and economic outcomes. Alesina and Rodrik (1994) and Persson and Tabellini (1994) show that inequality reduces economic growth, especially in democracies. Barro (1996) concurs but argues that this is only true in poor countries. Waldmann (1992) identifies adverse consequences of inequality for infant mortality. Fajnzylber, Lederman, and Lloayza (2002) show that countries with higher inequality suffer from more violent crime. These results are generally robust to controls for the absolute level of poverty.

In this paper, we propose a new mechanism by which inequality shapes economic and social outcomes: subversion of institutions.[1] Since Montesquieu (1748) and Smith (1776), economists agree that good economic institutions must secure private property against expropriation – by both the neighbors and the state. Such security encourages individuals to invest in physical capital, and so fosters economic growth. Countries with good institutions grow and prosper, countries without them – stagnate. Indeed, recent evidence (Barro 1991, DeLong and Shleifer 1993, and Knack and Keefer 1995) strongly corroborates the proposition that institutions effectively securing property rights are conducive to economic growth.

We argue that inequality is detrimental to the security of property rights, and therefore to growth, because it enables the rich to subvert the political, regulatory, and legal institutions of

[1] There is a large theoretical literature on inequality and growth, including Aghion and Williamson (1998), Alesina and Rodrik (1994), Banerjee and Newman (1991, 1993), Benabou (1996a, 1996b, 2002), Murphy, Shleifer, and Vishny (1989), Perotti (1993), Persson and Tabellini (1994), Piketty (1997), and Rajan and Zingales (2002).

society for their own benefit. If one person is sufficiently richer than another, and courts are corruptible, then the legal system will favor the rich, not the just. Likewise, if political and regulatory institutions can be moved by wealth or influence, they will favor the established, not the efficient. This in turn leads the initially well situated to pursue socially harmful acts, recognizing that the legal, political, and regulatory systems will not hold them accountable.

Inequality can encourage institutional subversion in two distinct ways. First, the have-nots can redistribute from the haves through violence, the political process, or other means. Such Robin Hood redistribution jeopardizes property rights, and deters investment by the rich. This mechanism is emphasized by Perotti (1993), Alesina and Rodrik (1994), and Persson and Tabellini (1994). Second, the haves can redistribute from the have-nots by subverting legal, political and regulatory institutions to work in their favor. They can do so through political contributions, bribes, or just deployments of legal and political resources to get their way. This King John redistribution renders the property rights of those less well positioned – including small entrepreneurs -- insecure, and holds back their investment. Interestingly, the writers of the Enlightenment, including Smith, were much more concerned with King John redistribution by monopolies and guilds than with Robin Hood redistribution. Here we describe a particular version of King John redistribution similar to the one that concerned Smith .

This focus on institutional subversion by the powerful is related to the literature on lobbying (e.g., Grossman and Helpman 2001), and has appeared in a number of recent studies. Acemoglu and Robinson (2000, 2002) and Glaeser and Shleifer (2002c) examine how political incumbents design inefficient institutions to keep themselves in power. Glaeser and Shleifer (2002a, 2002b) consider the consequences of the subversion of institutions by the powerful for the design of efficient legal systems and regulatory schemes. Sonin (2002) examines the effect

of the subversion of institutions by Russian oligarchs in the 1990s on the country's transition. Do (2002) examines the consequences of inequality for the evolution of institutions.

We specifically focus on the effects of unequal distribution of economic and political resources on the workings of the legal system. In many countries, litigants bribe judges and legislators. They threaten and coerce judges and prosecutors. They spend significant resources on attorneys to slow the workings of justice. In any plausible model of courts, the economic and political resources of the litigants matter for the outcome of the case. Likewise, in a reasonable model of regulation, such resources determine whether regulation serves public welfare or secures rents for the regulated firm, as argued forcefully by Stigler (1971).

Inequality crucially shapes institutional subversion. In the legal context, the rights and wrongs of the case still matter even when the litigants are unequally matched. But if there is some scope for private action to influence outcomes, then relative resources also matter. When the two litigants are relatively equally matched, the outcome depends on the merits of the case. But when legal armaments are unequal, the stronger litigant has an advantage in court.

When courts are subverted, there is less reason not to harm in the first place. If the politically strong expect to prevail in any court case brought against them, they would not respect the property rights of others. This breakdown in the security of property follows inequality when institutions are weak to begin with. The breakdown in property rights in turn deters investment, at least by the potential victims, with adverse consequences for economic growth.

Below we present a model of a corrupt legal system illustrating these ideas. The model also predicts that, in societies with weak institutions, small elite groups do all of the investing, while a much larger group has no possessions and no political power. A strong middle class develops only when institutions protect it from the powerful. The causality between inequality

and injustice runs in both directions. Initial inequality leads to subversion of institutions, but weak institutions themselves allow only those able to protect themselves to become rich.

We illustrate the model with two case studies. First, we look at the American Gilded age between 1865 and 1900. Industrialization created large inequalities of wealth, which undermined the existing legal system. The inadequacies of the law in turn brought a public demand for reform that was realized in the Progressive Era. Second, we look at the transition economies of Eastern Europe. In several countries, privatization created a significant amount of new private wealth. The existing legal and political institutions were not strong enough to stand up to the inequality in the economic and political power of different actors. The new wealth was able to subvert both justice and other institutions. The rise of Vladimir Putin in Russia can be seen as a popular response to the institutional breakdown. Finally, we present some cross-country evidence supporting the prediction that the negative impact of inequality on growth is more pronounced in countries with weaker rule of law.

II. The Model

Our model of inequality and the breakdown of judicial systems proceeds in three stages. In the first stage, individuals choose whether or not to invest in a project, which if successful, yields a return of D. This investment has a cost $\theta D < D$ (there is no discounting). In the absence of impediments, such as insecure property rights, everyone invests. The assumption that the investment project is of a fixed size is not innocuous. It implies that even the rich do not invest more than D. After presenting our basic results, we consider relaxing this assumption.

In the second stage, each individual is randomly paired with another, and each member of this pair then decides whether or not to expropriate the other's investment. There is no

possibility of expropriating someone who had not invested. Expropriation can take the form of routine theft, or of destruction of investment, entailing a loss of the entire project (i.e. D) to the victim. The offender gains $\delta D < D$ from his act.

The interpretation of the model relies heavily on what kinds of harm and expropriation we have in mind. In some instances, it can be a direct taking of property. More realistically, one can think of cheating in a transaction, using illegitimate – or illegal – practices to damage a business partner or a competitor, or even using friendly government officials to deny a potential competitor a license or to shut him down. One of the parties in a transaction can actually be a government official holding up an investor rather than a private individual. Although we use the words theft, expropriation, and crime to describe these actions, we are only focused on civil disagreements, so all the litigation we describe is between private parties.

If one individual harms the other, there is a possibility of legal retaliation. At some cost, C, the victim can go to court and seek damages equal to the loss of property. In court, a judge decides whether the claim is justified, and if so awards "D" to the victim. If the judge rules for the defendant, there is no transfer of cash. We assume that this award amount is fixed (i.e. there is no possibility for double or triple damages).

Our objective is to determine the overall amount of harm in the society, and to trace its negative impact on investment. We proceed recursively. First, we examine the outcome of the trial conditional upon theft having occurred and the victim suing. We then examine the decision to sue. Next, we consider the decision to expropriate, and finally the impact of equilibrium expropriation on investment.

The Outcome of the Trial

The trial stage of this model also has a temporal structure. First, both the plaintiff and the defendant simultaneously and separately offer bribes to the judge. These bribes are secret gifts, and no contract can be written based on them. We denote the plaintiff's bribe by B_P and the defendant's by B_D. We assume agents face no credit constraints.[2]

Bribes are not contractually binding, but a judge who accepts one makes it possible for the briber to punish him. Punishment takes the form of revealing the bribe and causing the judge either embarrassment or true legal problems. Only an actual briber can punish the judge. Punishment is costless to impose if the briber has lost the case. If the briber has won, his victory is voided when the bribe is revealed. Thus, no briber who wins the case ever punishes the judge.

We only consider equilibria where bribers who are unsuccessful in the case actually punish the judge rather than go away. Since punishment is free, this focus can be justified either by reputational concerns, or by utility of vengeance. The punishment from the plaintiff is Z_P and from the defendant Z_D. Z_P and Z_D are exogenous parameters representing the political power of the two litigants. A low value of Z suggets that an impotent individual who accuses the judge of taking a bribe will not get far. A high value of Z suggests that the politically powerful have a wide variety of means of punishing judges who do not stay bought. In the population as a whole, there is a continuous distribution G(Z) of political power, and we assume that D exceeds the maximum value of Z. The political power of each actor is perfectly observable.

[2] An earlier draft show that the presence of credit constraints creates a second possible type of inequality, where unequal access to credit markets can also increase theft and corruption.

The judge obtains utility of V from "doing the right thing." This can be thought of as the reputational loss from having his decision reversed on appeal, or as a pure utility gain from following the law (Posner 1995). The value of V differs among judges and is described by a density function f(V) and a cumulative distribution F(V). We assume that V> 0. The value of V becomes known as soon as the lawsuit is filed, but not before (i.e., the plaintiff does not know the identity of the judge before filing the case).

The Decision of the Judge

After the judge has taken a bribe, his decision depends only on V and the two Z parameters. The level of the bribe influences the outcome only insofar as it induces the judge to take the bribe in the first place, and thereby puts him in a compromising position where he can be punished. The judge always accepts the bribe of the person whom he plans to favor, but situations where the judge takes two bribes are not an equilibrium, since the losing litigant is always better off not having bribed at all.[3] Thus, the only equilibria are ones in which the judge takes exactly one bribe and rules in favor of the litigant whose bribe he has accepted.

What will be the equilibrium bribes? If $V > Z_D$, then even if the judge takes the defendant's bribe, he will favor the plaintiff. In that case, the plaintiff offers a bribe of zero and still wins. If $V < Z_D$, then it is useful to know that:

Lemma 1: No one's bribe ever strictly exceeds his ability to punish, i.e. $Z_D \geq B_D$ and $Z_P \geq B_P$.

[3] Generically, there are no mixed strategy equilibria where the judge takes both bribes and randomizes since the judge (almost everywhere) strictly favors one of the litigants.

This lemma guides us to the equilibrium. When $Z_D > B_D$ and $Z_P > B_P$, the judge only takes the bribe of the defendant and rules for the defendant when $B_D > V + B_P$. In equilibrium, either the defendant sets $B_D = V + Z_P$ and wins (when $Z_D > V + Z_P$) or the plaintiff sets $B_P = Max(0, Z_P - V)$ and wins (when $Z_D < V + Z_P$). The equilibrium losing bids are infinitesimally less than Z_P and Z_D respectively (i.e. Z_P and Z_D). These bids are consistent with equilibrium, because if the winners bid anything less, they lose, and anything more is wasteful. If the losers bid anything more, their bids are accepted, but this does not change the outcome and the loser gains nothing from a lower bid. Formally:

Proposition 1: If $V > Z_D - Z_P$, then $B_P = Max(0, Z_D - V)$, $B_D = Z_D$, the plaintiff wins the case, and only the plaintiff's bribe is taken. If $V < Z_D - Z_P$, then $B_P = Z_P$, $B_D = V + Z_P$, the defendant wins, and only the defendant's bribe is taken.

Proposition 1 establishes that the critical determinant of the legal outcome is whether V is greater or less than the difference in the abilities to punish the judge.

The Decision to Use the Courts

The cost of using a court is C. This cost covers the filing fee, legal representation, and delays associated with civil litigation.[4]

[4] Djankov et al. (2002b) present evidence that legal procedures are heavily formalized in most countries, and that the time and financial costs of pursuing even the simplest disputes are extremely high.

If the potential plaintiff knew the value of V, he would file the case whenever $V > Z_D - Z_P$ and not otherwise. However, the plaintiff must base his decision to sue on the expected value of V. In this case, the expected payoff from the lawsuit is:

$$\int_{V=Max(0,Z_D-Z_P)}^{Z_D} (D - Z_D + V) f(V) dV + \int_{V>Z_D} D f(V) dV \ . \qquad (1)$$

The following proposition follows:

Proposition 2: If $D - Z_P > C$, then for any plaintiff with a fixed level $Z_P < Z_{Max} - V_{Max}$, there exists a value of $Z_D > Z_P$ denoted by $Z_D^*(Z_P)$ at which the plaintiff is indifferent between suing and not suing. For values of Z_D below $Z_D^*(Z_P)$, the plaintiff always prefers to sue. For values of Z_D above $Z_D^*(Z_P)$, the plaintiff does not sue. The value of Z_D^* rises with Z_P, falls with C, and rises with D. If we write $V = \nu + \varepsilon$, where ν is constant across judges, then $Z_D^*(Z_P)$ rises with the level of ν.

This proposition makes several points. First, the willingness to use courts rises with the honesty of the judges (ν) and falls with litigation costs. Also, courts are more likely to be used when damages are large. More importantly for our argument, courts are always used when the victim is more powerful than the offender. Only when the offender is much more powerful than the victim does the former walk away from the crime.

This proposition helps us to understand the circumstances in which courts are used. In countries where judges are particularly venal, we expect courts to be rarely used. When courts

are corrupt, moreover, inequality becomes very important. Two roughly equally powerful individuals would use courts, but significant inequality between them keeps them away from courts (at least when the plaintiff is weaker than the defendant). High costs of using the legal system also deter the potential litigants.

The Decision to Harm

When deciding whether or not to commit an offense initially, the potential offender assumes that the victim will respond optimally. We imagine that two individuals are matched and both simultaneously decide on whether to harm the other. There is no connection between the two decisions to harm, so we think of them as separate choices. We assume that, while V is not known, each party knows his own characteristics and those of his match when deciding whether or not to harm. At this point, we think of the power of the potential offender as Z_A and the power of the victim as Z_B. The offender ends up being the defendant in court and the victim ends up being the plaintiff. Conceivably, we could end up having two offenders and two victims in a pair: a truly Hobbesian outcome.

If the offender knows that the victim will not go to court, he chooses to harm. Thus, if Z_A is greater than $Z_D^*(Z_B)$, the offender acts with impunity. We are not allowing non-legal forms of redress, but inequality is probably even more important in deterring weak victims from punishing strong offenders outside of courts.

The next result follows immediately:

Lemma 2: If $D - Z_P > C$, an offense does not occur unless Z_A is greater than Z_B.

Proof: If $Z_P > Z_D$, then the plaintiff always wins the case, and so always sues. For this reason, the potential offender always loses from the offense.

It follows from Lemma 2 that when two people interact, only the politically stronger of the two attacks the other. Naturally, this result hinges on the fact that damages are always observable and there are not hidden offenses. Indeed, this framework is unhelpful for thinking about street crime with limited detection.

When C is high, both individuals may choose not to use the courts, and anarchy ensues. At the extreme, if C > D, no one ever uses the courts and all property is violated.

We focus on the case where $D - Z_P > C$, so harm is done when $Z_A > Z_D^*(Z_B)$. Harm may also be done even if the victim sues. The offender's costs from the suit are:

$$\int_{V=0}^{Z_A - Z_B} (Z_B + V) f(V) dV + \int_{V > Z_A - Z_B} D f(V) dV \qquad (2)$$

If the offender knows that $Z_D^*(Z_B) > Z_A$, then he only harms if δD exceeds (2). This leads to our third proposition:

Proposition 3: If the victim sues for damages, then an offense occurs if and only if Z_A is greater than $Z_A^{**}(Z_B) > Z_B$, where Z_A^{**} is falling with δ and D and rising with Z_B. If $V = \nu + \varepsilon$, where ν is constant across judges, then $Z_A^{**}(Z_B)$ rises with the level of ν. When D is sufficiently large relative to Z_P, Z_D, and C, then $Z_D^*(Z_B) > Z_A^{**}(Z_B)$ and $Z_A^{**}(Z_B) \approx Z_B + F^{-1}(1-\delta)$.

This proposition tells us that offenses may occur even against victims who will sue, but occur more rarely when they are more wasteful and when victims are more powerful. Honest judges protect property. Somewhat more interestingly, expropriation rises with the scale, D, of investment. The reason is that the benefit of an offense scales with D but only part of the cost scales with D. The costs that represent bribe payments are independent of D, which makes expropriation more attractive as the scale of enterprise rises (Glaeser and Shleifer 2002b).

When D is particularly large, two forces come into play. First, $Z_D^*(Z_B) > Z_A^{**}(Z_B)$, which means that some harms are litigated. The marginal violator expects to be taken to court. When D is sufficiently large, $Z_D^*(Z_B)$ determines whether there is an offense in a match. Second, when D is large, $Z_A^{**}(Z_B) \approx Z_B + F^{-1}(1-\delta)$. This means that only relative, not absolute, power determines whether an offense takes place. There is a constant power gap between a potential victim and the marginal violator who exploits him. This gap is a function of the level of waste and of the honesty of the judge.

The combination of propositions tells us that socially damaging actions are more likely when the two parties are unequal in their resources, or more precisely, when the aggressor has much more political power than the victim. Also, whichever proposition applies, the level of harm is determined by the honesty of the judge. In cases where D is low and Proposition 2 applies, which is more likely when litigation costs are high, then these costs become a critical determinant of the security of property.

The Overall Level of Harm

To assess the overall level of harm, we assume that, in every period, two random members of society are matched and one has an opportunity to harm the other. Our interest is in the impact of social inequality on the level of such expropriation.

For the following proposition, we assume that all the possible distributions of Z have densities that are single-peaked and symmetric. We use the following definition:

Definition: The density function $\tilde{g}(z)$ is a single-troughed, symmetric mean preserving spread of the density function g(z) if $g(z) - \tilde{g}(z)$ is single-peaked around the median of z and symmetric.

Proposition 4: If D is sufficiently large, then the level of harm rises as the variance of Z is increased through a single-troughed, symmetric, mean-preserving spread.

Proposition 4 gets at the heart of the paper. It states that an increase in the inequality of power or resources raises the overall level of expropriation. In the model, this works through subversion of justice. Unequal resources enable some individuals to expropriate others with impunity. Unsurprisingly, expropriation follows.

In the next proposition, we consider the distribution of matches and its dependence on the social organization of the society. We model the possibility that, in some societies, people interact with others more closely matched to them in political power, and examine the impact of such closeness on expropriation. Specifically, we assume that $Z = \lambda\alpha + (1-\lambda)\mu$, where α is a random variable that is common to any match, and μ is an idiosyncratic term. The parameter λ captures the degree of social connectivity. For this structure, we can establish:

Proposition 5: If D is sufficiently large, then an increase in λ reduces the amount of expropriation in the society.

When two random individuals in a society have more comparable political power, it is less likely that the inequality of resources leads to a breakdown in justice. Traditional environments that depend on interactions among similarly situated individuals are less likely to face problems of expropriation than the highly volatile modernizing environments where the weak interact with the strong. Alternatively, an influx of powerful outsiders can lead to a breakdown in property rights.

The Level of Investment

To complete the model, we return to the investment decision. For any individual with political resources Z, the expected return from investment minus the expected losses from harm plus the expected gains from using the courts equal:

$$G(Z_A^{**}(Z))D - \theta D + \int_{Z_A = Z_A^{**}(Z)}^{Z_D^*(Z)} \left(\int_{V > Z_A - Z} Df(V)dV - \int_{V = Z_A - Z}^{Z_A} (Z_A - V) f(V)dV - C \right) g(Z_A)dZ_A \qquad (3)$$

The first two terms $G(Z_A^{**}(Z))D - \theta D$ reflect the expected returns if the investment is made times the probability that the investment is not expropriated $G(Z_A^{**}(Z))$ minus the cost of investment θD. The third term,

$\int_{Z_A=Z_A^{**}(Z)}^{Z_D^*(Z)} \left(\int_{V>Z_A-Z} Df(V)dV - \int_{V=Z_A-Z}^{Z_A} (Z_A - V)f(V)dV - C \right) g(Z_A)dZ_A$, reflects the expected benefits of using the courts minus the expected bribes minus court fees. Investment occurs if and only if expression (3) is positive.

We now assume that V is deterministic and equals ν. This assumption is not absolutely necessary, but it simplifies the algebra considerably. Since risk is eliminated, victims use the court system if and only if they know they are going to win, i.e. if and only if $Z > Z_A - \nu$. In this case, investors are expropriated if and only if they encounter a potential offender whose level of Z is more than ν higher than their own, and in fact, the court system is never used. The threat of litigation is just a deterrent to potential offenders. The expected return from investment is equal $G(Z + \upsilon)D - \theta D$, and we can prove the following proposition:

Proposition 6: If $\theta > G(\underline{\underline{Z}} + \upsilon)$, where $\underline{\underline{Z}}$ denotes the minimum value of Z, there exists a value of Z, denoted Z_I, at which individuals are indifferent between investing and not investing. For values of Z above Z_I, investing is preferred to not investing, whereas for values of Z below Z_I, not investing is preferred to investing. Moreover,

(a) The value of Z_I is increasing with θ.

(b) The value of Z_I is decreasing with ν.

(c) If the variance of Z is increased through a mean-preserving spread, then the value of Z_I rises if and only if $\theta > .5$.

(d) If $Z = \lambda\alpha + (1-\lambda)\mu$, where α is a random variable that is common to the match, and μ is an idiosyncratic term, then proportion of the population that invests is increasing with λ.

The condition $\theta > G(\underline{\underline{Z}} + v)$ is necessary to assure that investment is not attractive to the least powerful member of society.

According to part (a), investment declines when its price increases. According to part (b), investment increases as judges become more honest.

The result on increasing the variance of power requires that the returns from investment are not too high, i.e. $\theta > .5$. If θ is less than .5, undertaking a project is understood to be highly risky, and the marginal investor succeeds (without being expropriated) if and only if he is lucky enough to meet a very weak individual. An increase in inequality increases the probability of encountering somebody very weak and therefore raises the likelihood of investment.

The final comparative static tells us that connectivity among individuals is also important. When individuals interact with different people, then likelihood expropriation tends to increase, and therefore investment declines.

The essence of Proposition 6 is that in weak legal systems, politically impotent individuals are unlikely to invest. Under our assumption that each person can only invest a fixed amount, how many invest determines the overall levels of investment. But this assumption may not always hold: in many cases, individuals with power can expand their own levels of investment if insecure property rights deter others from investing.

A Digression

We briefly illustrate the consequences of relaxing the assumption that investment per individual is fixed. To this end, we simplify the model even further, and assume that there are only two levels of Z: $\overline{Z}$ and $\underline{Z}$. Investors with the high level of Z are never harmed. The

people will low levels of Z are harmed if they encounter a high Z type and if $\nu < \overline{Z} - \underline{Z}$. Denote the proportion of individuals with $Z = \overline{Z}$ by π. Consider a transition from a situation where $\nu > \overline{Z} - \underline{Z}$ to one where $\nu < \overline{Z} - \underline{Z}$ due to either a change in the level of corruption of the judiciary or an increase in the level of inequality. If $\theta > \pi$ and this transition occurs, the low Z types stop investing.

However, this may not reduce aggregate investment if the high Z types then undertake the foregone projects. Suppose that individuals can undertake surplus projects that have not been undertaken by others, but at a cost for the marginal project of $\theta(N)$, where N reflects the total number of extra projects that any one person undertakes. If increases in inequality or judicial corruption push the weaker citizens out of investment, then there are two scenarios to consider. First, the high Z types may undertake all of the surplus projects. In this case, there is no reduction in investment, and the welfare losses from weak property rights just come from the fact that high rather than low cost individuals are undertaking projects. Second, only some of the projects may be undertaken. In this case, ignoring integer constraints, the high Z types invest until the point where $\theta(N)$ equals one. The social losses in this case combine the loss from underinvestment with the loss from extra costs.

To formalize this point, assume that after their first project individuals are able to invest a continuous amount. If the number of extra projects is denoted by I, assume that the cost of this extra investment is $\theta I + \Theta I^2 / 2$. Assume also that $\theta + \Theta(1-\pi)/\pi > 1$, so that there are some surplus projects, and that each high Z type invests in exactly $(1-\theta)/\Theta$ surplus projects. In that case, the per capita social loss resulting from moving from a situation where property rights are secure and everyone invests, to a regime where property rights are insecure and only the powerful invest, equals:

$$D\left((1-\theta)(1-\pi)-\frac{\pi(1-\theta)^2}{2\Theta}\right) \tag{4}$$

This equation makes it clear that the social loss from an increase in inequality or a breakdown in rule of law depends on π, the proportion of people who are left able to invest, and on Θ, the extent to which having the wrong people invest raises costs. There are two natural interpretations of Θ. First, it might just represent the decreasing returns to any one individual managing more investments. Second, it might represent the losses from failure to utilize person-specific knowledge or talents in investment. When Θ is low, there are few costs from having all investment undertaken by a few people. When Θ is high, then such an outcome leads to substantial welfare losses.

This distinction may explain why breakdowns in the protection of property rights may be more important in some phases of development than in others. During industrialization, especially for follower countries that are able to copy the technology of leader countries, scale economies may mean that Θ is low and there are few losses from concentrating investment in the hands of a few oligarchs. In other phases of development, when local innovation, local knowledge, small business formation, and entrepreneurial initiative are important, Θ is much higher and it may be more costly to a society to experience a breakdown in property rights.

Going back to the original model with fixed investment per capita, Proposition 6 also sheds light on the evolution of income distribution. Since Z_1 is the minimum value of Z at which people invest, $1-G(Z_1)$ is the proportion of the population that is investing and growing richer over time. When Z_1 is low, a broad spectrum of the society is investing and over time gradually

enriching themselves. However, when Z_I is high, then only the very powerful are investing and only they are growing rich over time.

This logic provides us with another link between inequality and injustice. A weak judicial system, which is described by a high value of C or a low value of ν, leads not only to low levels of investment (or misallocated investment) across society as a whole, but also to a very unequal income distribution. Only the most powerful members of a society—those able to protect their investment— actually invest. Conversely, a low value of C and a high value of ν enable a wide swath of society to actually invest and be sure that they can keep their profits. This argument suggests that the development of a large middle class relies on the existence of strong judicial institutions.

Another way of putting this is that, in nations with weak judicial institutions, the equilibrium correlation between political power and wealth has to be high. Only the politically powerful, those with high values of Z, are able to protect their investments. In countries with stronger institutions, the connection between political power and wealth is weaker, as individuals with a wide range of political resources can become wealthy.

These results may help explain why England developed a large middle class before other European countries. The stronger legal protection afforded by the common law meant that an English merchant could invest with less fear of expropriation than a French one. As a result, an English middle class could develop when the French middle class could not. In nations with still weaker institutions, such as Tsarist Russia, the middle class was even smaller than in France. If the demand from the middle class facilitates investment in fixed cost technologies (as argued by Murphy, Shleifer and Vishny 1989), then strong legal institutions not only support investment directly, but also have an indirect benefit by changing the distribution of income.

As a final aside, we have so far treated Z as an exogenous parameter. In reality, Z is a valuable asset and individuals would take actions to expand their level of political power. Investment in Z may take the form of bribing politicians on a regular basis, investing in media outlets or acquiring connections. One way of doing this is to combine and form alliances and for firms to merge. The incentive to invest in Z is stronger in weak legal regimes than in strong ones. We should thus expect to see combinations arising in periods and in places where legal institutions are failing.

III. The U.S. During the Gilded Age

Glaeser and Shleifer (2002b) argue that many American institutions failed to keep up with the needs of the Gilded Age. In 1841, DeToqueville surveys the United States and finds a country that is marked both by its equality and by the strength of its legal institutions. He comments that "Men are [in America] seen on a greater equality in point of fortune and intellect, or, in other words, more equal in their strength, than in any other country of the world, or in any age of which history has preserved the remembrance."

In DeToqueville's view, equality of wealth is accompanied by relatively strong institutions. He writes "in the United States, I never heard anyone accused of spending his wealth buying votes." Indeed (by comparison with the later age), it is utterly surprising how little space DeToqueville devotes to the subversion of institutions. While he worries about excessive democratic tendencies (which he sees as being checked by strong courts), he is not concerned with the rich overwhelming the political and legal systems.

In the next 50 years, the United States changed. Inequality rose significantly in the 19th century, as industrialization and the increasing size of the American market made a number of

Americans extremely rich. While there is some debate on wage inequality, Lindert and Williamson (1985) and Lindert (2000) document growing wealth inequality during this time, including a striking rise in the number of enormous fortunes.

The growth of individual fortunes paralleled, indeed derived from, the growth of large companies and trusts. In 1832, the McLane report finds only 106 manufacturing firms with assets greater than $100,000 in the United States. In contrast, Chandler (1977) finds 278 firms with more than $20 million in assets in 1917. Much of this change came about because of scale economies inherent in the shift to a mass industrial economy. Some of this expansion in scale, however, was a response to the opportunities created by weak institutions.

Wealth inequality fueled the subversion of institutions. While DeToqueville sees magistrates as upright guardians of democracy, the muckrakers 50 years later describe a judicial system subverted by wealth. The great protagonists of the Gilded Age subverted institutions as part of normal business practice (Josephson 1934). The famous Erie Railroad battle between Commodore Vanderbilt and Jay Gould culminated in massive bribery of both the judges and the New York State legislature. The financial operations of Jay Gould and Jim Fisk were abetted by their alliance with William Marcy Tweed who supplied friendly judges on demand (Callow 1966). Corporate battles against unionization were fought with the weapons of state police.

One obvious example of the wealthy subverting the government is the massive transfers of land to the railroad and traction companies. Both inter-city and intra-city transportation firms were heavily subsidized through massive grants of public lands. Growth of public transport industry was stimulated by long leases of public space (e.g., 999 years) for nominal fees (e.g., one dollar). Massive bribes to public officials lubricated this generosity (Glaeser 2001). The

story of the American transport industry in the Gilded Age is one of powerful firms bribing politicians and judges to receive large quantities of previously public land.

One reason for the growth in the scale of business during this period was the accumulation of political power. The Republican leader of the Senate, Nelson Aldrich, organized the creation of trusts. The profitability of trusts came not just from monopoly pricing (subversion of markets), but also from their ability to manipulate the Senate and the courts. Government policies, such as the high and pervasive tariffs, responded to the influence of powerful firms, and the trusts came about in part to enhance this influence.

Did the breakdown of judicial institutions during the Gilded Age hurt growth and investment? After all, the Gilded Age is often seen as a time of remarkable growth of the American economy. This reputation for expansion should not obscure the fact that economic growth during 1860-1910 was much slower than that afterwards. The weaknesses of the system did not cause a collapse, but the institutional failures may have unduly limited the expansion. Indeed, as our discussion following Proposition 6 suggests, the major investments of the new industrial economy could have been efficiently undertaken by relatively few large firms, but – at the same time – the lack of law and order may have stymied smaller scale entrepreneurship.

The institutional failures of the Gilded Age elicited a major political response. First the Progressives and then the New Dealers changed the institutions to counter the power of big firms. Rising taxation and regulation, including the regulation of interstate commerce, the anti-trust laws, the securities laws, and other forms of state intervention – were central elements of reform. Anti-trust policy aimed as much at eliminating the political power of trusts as at cutting their monopoly rents. Hofstadter (1955, p. 227) writes that trust busting was based on "a fear founded in political realities – the fear that the great business combinations, being the only

centers of wealth and power, would be able to lord it over all other interests and thus put an end to traditional democracy."

Without endorsing the wisdom of all the reforms, we can agree that the subversion of institutions was countered peacefully and effectively. The fundamental strength of American democracy ultimately meant that when the public sought to restrain the power of the mighty, Theodore Roosevelt, Woodrow Wilson and F.D.R. had the tools to do so. A vigorous array of government policies compressed the distribution of income between 1900 and 1960. Other policies protected the legal rights of the weak. The excesses of the Gilded Age were eventually corrected and inequality declined, as did corruption.

IV. Transition Economies

The transition of economies of Eastern Europe and the former Soviet Union from socialism to capitalism started around 1991, following the fall of the Berlin wall and the end of communism in the U.S.S.R. At that time, many economists cautioned against the backlash by the losers from economic transition. Those left behind by the privatization and restructuring of former state enterprises, the argument went, will use their political muscle to stop and possibly reverse future reforms, and indeed might return to government socialist or communist parties (Kornai 1990). Those involved in reform and privatization programs took this argument to heart, and attempted to design policies that would minimize the risk of such a backslide (Boycko, Shleifer and Vishny 1995). These concerns were intimately related to fears that Robin Hood redistribution undermines investment and growth.

Despite the widespread fear, a populist backlash never materialized. Several countries – including Poland -- elected socialist and pseudo-communist politicians in the aftermath of radical

reforms, but these politicians typically continued the reforms with less radical market rhetoric. Reforms in many countries did indeed stall, or even failed to get started, but the problem was not a popular backlash, but rather the capture of political and legal institutions by the winners of initial changes. In some countries, particularly those in Central Asia, the winners from the political transition gained control over state assets personally, and transformed their countries into crony capitalist dictatorships. In other countries, of which the most conspicuous is Russia, the economic transformation itself created a cadre of winners who succeeded in subverting the institutions of the state to further their political and economic influence.

This reality of transition was first recognized by Joel Hellman (1998), who referred to it as "winner take all" reforms. His insight has since been extended in both theoretical and empirical work relating to Russian and other countries in the Former Soviet Union (Sonin 2002, Hellman, Jones, and Kaufmann 2000). Because it fits very naturally with our analysis, we focus on Russia in the following discussion.

Russia's mass privatization program, conducted between 1992 and 1994, created nearly 40 million individual shareholders in the more than 14,000 medium and large-scale enterprises that were auctioned off. Through secondary trading, however, ownership in many of these firms – particularly the valuable ones – quickly concentrated in the hands of relatively few industrial groups, which often included commercial banks as part of their organizations. Persons controlling these groups, known as oligarchs, moved to consolidate their economic and political control. Using their banks, they acquired additional firms, including those in the energy sector. They used their influence over Parliament and courts to dilute minority shareholders with legal impunity, and thereby to consolidate their control over business groups. They used political contributions, and the government's lack of funds, to convince the government to pursue a

"shares-for-loans" program, which transferred to the oligarchs the control over several of the country's most valuable enterprises. They used their resources to acquire newspapers and television stations, the crucial instruments of political influence. Last but not least, they used their economic and political power to stop further reforms of law and order, including corporate governance, commercial and central banking, and securities markets. Ultimately, several of the oligarchs simply joined the government. Subversion of political and legal institutions brought crony capitalism to Yeltsin's Russia.

Russia of the 1990s exhibits many elements of the injustice of inequality we have noted. These include the breakdown of legal institutions, the subversion of political institutions – including the Parliament, the government, and the Presidency, the formation of industrial groups driven by political (and ultimately economic) considerations rather than traditional efficiency, as well as the consequent discrimination in economic policy against smaller firms. Recent critiques of Russia's transition have identified the institutional discrimination against smaller, entrepreneurial firms – as the culprit of the country's economic difficulties (McKinsey and Co. 1999). In line with this analysis, Russia has some of the highest levels of regulation of smaller firms in the world (Djankov et al. 2002a), as one would indeed fear from our model. Perhaps not surprisingly, economic growth in the 1990s was slow, especially that of small business.

In some respects, the political response to the end of the Yeltsin era is similar to that in the U.S. circa 1900. Yeltsin's successor, Vladimir Putin, was elected largely on a law and order platform. He immediately moved to pursue legal reform and to increase the police powers of the state. He greatly undermined, if not destroyed, the political influence of the oligarchs, in some instances confiscating their assets and forcing them to emigrate. In the first two to three years of Putin regime, Russia has grown rapidly, although some of this growth is surely attributable to

high oil prices. It remains to be seen whether the reduction in institutional subversion through centralization of political power actually manifests itself in long-term economic growth. Whatever the ultimate outcome, Russia in the 1990s offers a most remarkable illustration of how vast inequality of economic and political resources, in the context of initial institutional weakness, can lead to a substantial breakdown of law and order.

V. Cross-Country Evidence

As our last piece of evidence, we present the cross-country relationship between inequality and growth. A large literature, including Alesina and Rodrik (1994), Persson and Tabellini (1994), and Barro (1996), examines the inequality-growth nexus. In our model, the adverse effect of inequality on growth is especially pronounced in countries with weak legal regimes. Countries with strong rule of law should not see (as strong) a negative relationship between inequality and growth. Below we test this prediction. Empirical work in this area, including that presented below, is compromised by the endogeneity of the variables and by reverse causation. For this reason, we see this evidence as only suggestive.

We use the Gini coefficient calculated by Deininger and Squire (1996) as a measure of income inequality. We use a "rule of law" index, which is an assessment of the law and order tradition of the country from the International Country Risk Guide, as a measure of the quality of legal institutions . Specifically, we code countries as having strong legal systems if they have a value for the Rule of Law Index that is greater than the mean value for the sample. We then interact this Rule of Law dummy with the Gini Coefficient, and run a regression of the growth rate in per capita GDP on the Gini, the dummy for rule of law and the interaction. The result is:

(4) GDP Growth= 4.7 - .09*Gini - 3.7*Rule of Law Dummy + .11*Interaction
(1.3) (.03) (1.8) (.04)

Standard Errors in Parentheses, Number of Observations=87, R-Squared=.21.

This result is consistent with the model. Inequality is bad for growth, but only in countries with poor rule of law. For the countries with good rule of law, inequality has no effect on economic growth. Thus the negative effects of inequality may well work through the law and order channel that our model points to. In countries like the U.S., which have strong legal institutions, inequality is not likely to be a problem. In countries where institutions are not as strong, inequality may lead to institutional breakdown, reduction and misallocation of investment, and consequently lower growth.

VI. Conclusion.

This paper describes a possibly important adverse effect of inequality on economic and social progress: the subversion of legal, regulatory, and political institutions by the powerful. We argued that this risk indeed became a reality in the U.S. during the Gilded Age and in Russia in the 1990s, as well as many other places. The U.S. was remarkably successful in confronting the problems of institutional subversion, the verdict on Russia remains open.

It is tempting to conclude from this analysis that, especially in countries with weak political institutions, inequality is a source of institutional breakdown and should be countered at all costs through redistribution. Some of our discussion is not that distant from Marxist analyses of imperialism, colonialism, and globalization, which see institutional capture by the powerful – whether local oligarchs or foreign capital – as the crucial reason for underdevelopment (Baran 1957). Although we share with the radical writers a concern about the inequality of political

power, we do not find in these writings much to agree with. More importantly, the solutions we envisage – institutional reform rather than redistribution -- are very different.

In the last two decades, economists have begun to recognize more clearly the possibilities, and the promise, of institutional reform. Successful changes in institutions, from the introduction of trial by jury in 12th century England, to Meiji restoration, to Progressive reforms in the U.S., to transplantation of Western institutions to developing countries, radically changed both economic and social performance. At the more microeconomic level, several countries in Latin America, Eastern Europe, and East Asia pursued successful institutional reforms of banking and corporate governance in the last 20 years (Glaeser, Johnson, and Shleifer 2001, La Porta et al. 2000). Many of these reforms have gone a long way toward reducing the scope of institutional subversion.

In many countries, the political response to institutional subversion by the rich was not institutional reform, but rather a turn to massive Robin Hood redistribution, often in the context of a social revolution. Such revolutions replaced the old oligarchies of the rich with the new socialist or institutionalist oligarchies. In some cases, the massive redistribution that followed dramatically slowed economic and social progress. In other cases, the principal effect has been a change in elites, with continued capture of institutions by those in power. Dornbusch and Edwards (1991) present a depressing account of macroeconomic populism in Latin America, motivated largely by redistribution, and setting back the development of the region by decades.

We do not believe that the best solution to King John redistribution is Robin Hood redistribution. Rather, we point to instances where countries experienced peaceful institutional reforms that addressed the problem of subversion. There are useful lessons in these experiences.

Appendix: Proofs of Propositions

Lemma 1: The judge always takes any bribe greater than Z, and as the only point of the bribe is to put the judge into a compromising position, no one ever offers a bribe strictly greater than Z, since the litigant could always get the judge to accept a slightly smaller bribe that is still greater than Z. If $V > Z_D - Z_P$, then $B_P = Max(0, Z_D - V)$, $B_D = Z_D$, the plaintiff wins the case, and only the plaintiff's bribe is taken. If $V < Z_D - Z_P$, then $B_P = Z_P$, $B_D = V + Z_P$, the defendant wins, and only the defendant's bribe is taken.

Proposition 1: First, we prove that the strategies in the claim describe an equilibrium, and then we show that they are unique. First, consider the case where $V > Z_D - Z_P$. The plaintiff gains nothing from offering more (after all, he wins the case). If the plaintiff offers less, he loses, and the value of the case is higher than the bribe (by assumption). The defendant has no benefit from reducing his bribe: he is losing the case anyway and does not care about offering less since the bribe is not paid anyway. The defendant does not pay more because he is constrained (by lemma 1), i.e. if he paid more the judge would take his bribe and still rule against him.

To prove that the first equilibrium is unique, consider any other pair of bribes. First, the plaintiff cannot get less than $D + V - Z_D$, since he can always offer $Z_D - V$ and win the case. Thus, he never offers more than $Z_D - V$. Suppose the plaintiff offers less than $Z_D - V$. In that case, the plaintiff could offer $B_P + V + \varepsilon$, which is a winning bribe, and the plaintiff would lose, and he would therefore be worse off than if he offered $Z_D - V$. Thus, in all equilibria, the plaintiff offers $Z_D - V$. The defendant is not going to offer more than Z_D by lemma 1. If the defendant

offered less, then the plaintiff would likewise reduce his bribe, but that can't be an equilibrium because we have already shown that the plaintiff's bribe equals $Z_D - V$.

To prove that the actions in the case where $V < Z_D - Z_P$ are an equilibrium, we note that the defendant never offers more than this amount since he wins the case anyway, and never offers less, because he would then lose the case and be strictly worse off. The plaintiff cannot offer more (by lemma 1) and gains nothing from offering less.

To prove uniqueness, we note that the defendant can always win by offering $Z_P + V$, so he cannot get less than $-Z_P - V$. If the defendant offered more than $Z_P + V$, he would earn strictly less than this, so it would not be an equilibrium. If the defendant offers less than this, the plaintiff would offer $B_D - V + \varepsilon$ and win the case, and thus the defendant would be better by offering $Z_P + V$. The plaintiff cannot offer more than Z_P by lemma 1, and cannot offer less since that would induce the defendant to offer less than $Z_P + V$.

Proposition 2:

The benefits of suing are $\int_{V=Max(0,Z_D-Z_P)}^{Z_D}(D - Z_D + V)f(V)dV + \int_{V>Z_D} Df(V)dV$. At $Z_D = Z_P$, the plaintiff always wins the case, and pays less than $D - Z_P$ which is greater than C, so suing is optimal. If $Z_D > V_{Max} + Z_P$, then the defendant always wins, and the case generates negative returns. The derivative of this with respect to Z_D equals: $-f(Z_D - Z_P)(D - Z_P) - \int_{V=Z_D-Z_P}^{Z_D} f(V)dV$ (if

$Z_D > Z_P$) which is strictly negative, and which we denote as Δ. Hence there exists a value of Z_D^* at which

$$C = \int_{V=Z_D^*-Z_P}^{Z_D^*} (D - Z_D^* + V) f(V) dV + \int_{V>Z_D^*} D f(V) dV, \qquad \text{(A1)}$$

and it is always optimal to sue if Z_D is less than Z_D^* and always optimal not to sue otherwise.

Differentiating this equation gives us that $\frac{\partial Z_D^*}{\partial C} = \frac{1}{\Delta} < 0$, and $\frac{\partial Z_D^*}{\partial C} = \frac{F(Z_D^* - Z_P)}{-\Delta} > 0$, and $\frac{\partial Z_D^*}{\partial Z_P} = \frac{f(Z_D^* - Z_P)(D - Z_D^* + Z_P)}{-\Delta} > 0$. When $V = \nu + \varepsilon$, (A1) can be rewritten:

$$C = \int_{\varepsilon=Z_C^*-Z_P-\nu}^{Z_D^*-\nu} (D - Z_D^* + \nu + \varepsilon) \phi(\varepsilon) d\varepsilon + \int_{\varepsilon>Z_D^*-\nu} D \phi(\varepsilon) d\varepsilon, \qquad \text{(A1')}$$

where $\phi(.)$ is the density function for ε. Differentiation then yields:

$$\frac{\partial Z_D^*}{\partial \nu} = \frac{(D - Z_P)\phi(Z_C^* - Z_P - \nu) + \int_{\varepsilon=Z_C^*-Z_P-\nu}^{Z_D^*-\nu} \phi(\varepsilon) d\varepsilon}{-\Delta}, \text{ which is positive.}$$

Proposition 3: When $Z_A = Z_B$, the offender loses the lawsuit and is worse off by committing the theft. When Z_A is sufficiently high, then the probability that he loses the lawsuit goes to zero and he always commits the theft. The costs of the lawsuit are

$(1-F(Z_A-Z_B))D+\int_{V=0}^{Z_A-Z_B}(Z_B+V)f(V)dV$, and the derivative of this with respect to Z_A equal $-f(Z_A-Z_B)(D-Z_A)$, which is strictly negative. By continuity, there exists a value of Z_A denoted $Z_A^{**}(Z_B)$ at which the offender is indifferent between stealing and not, so that for values of Z_A above that level, he always steals. $Z_A^{**}(Z_B)$ satisfies:

$$\delta D=(1-F(Z_A^{**}-Z_B))D+\int_{V=0}^{Z_A^{**}-Z_B}(Z_B+V)f(V)dV \qquad \text{(A2)}$$

Differentiating this equation gives us that $\frac{\partial Z_A^{**}}{\partial \delta}=\frac{D}{f(Z_A-Z_B)(D-Z_A)}<0$,

$\frac{\partial Z_A^{**}}{\partial D}=\frac{\int_{V=0}^{Z_A^{**}-Z_B}(Z_B+V)f(V)dV}{f(Z_A-Z_B)D(D-Z_A)}>0$,and $\frac{\partial Z_A^{**}}{\partial Z_B}=\frac{f(Z_A-Z_B)(D-Z_A)+\int_{V=0}^{Z_A^{**}-Z_B}f(V)dV}{f(Z_A-Z_B)(D-Z_A)}>0$

When $V=\nu+\varepsilon$, (A2) can be rewritten as:

$$\delta D=(1-\Phi(Z_A^{**}-Z_B-\nu))D+\int_{\varepsilon=0}^{Z_A^{**}-Z_B-\nu}(Z_B+\nu+\varepsilon)\phi(\varepsilon)d\varepsilon\,. \qquad \text{(A2')}$$

Differentiation then yields: $\frac{\partial Z_A^{**}}{\partial \nu}=\frac{\phi(Z_A-Z_B-\nu)(D-Z_A)+\int_{\varepsilon=0}^{Z_A-Z_B-\nu}\phi(\varepsilon)d\varepsilon}{\phi(Z_A-Z_B-\nu)(D-Z_A)}>0$

Rewriting (A2), we find: $F(Z_A^{**} - Z_B) = 1 - \delta + \frac{1}{D}\int_{V=0}^{Z_A^{**}-Z_B}(Z_B + V)f(V)dV$.

Returning to equation (A1), we can write: $F(Z_D^* - Z_B) = 1 - \frac{1}{D}\left(C + \int_{V=Z_D^*-Z_A}^{Z_D^*}(Z_D^* - V)f(V)dV\right)$,

which implies that when D is sufficiently large, then $Z_D^* > Z_A^{**}$. When D is sufficiently large, the third term becomes arbitrarily small and it follows that $Z_A^{**}(Z_B) \approx Z_B + F^{-1}(1-\delta)$.

Proposition 4: Following *Proposition 3*, when D is sufficiently large, theft occurs when out of the set of two Z's drawn in a pair, $Z_{Max} - Z_{Min} > F^{-1}(1-\delta)$, where Z_{Max} represents the greater value of Z in the pair and Z_{Min} represents the lower value of Z in the pair. We let k = $F^{-1}(1-\delta)$ and Z_{Med} denote the median value of Z. Note that the probability that $Z_{Max} - Z_{Min} > k$, equals the probability that $Z_1 - Z_2 > k$ plus the probability that $Z_1 - Z_2 < -k$. Given the symmetry of the problem this also equals twice the probability that $Z_2 - Z_1 > k$. Thus, the proof only requires us to show that the mean preserving spread increases the probability that $Z_1 - Z_2 > k > 0$.

The probability that $Z_1 - Z_2 > k$ can be written as

$\int_{Z_1=-\infty}^{+\infty}\int_{Z_2=Z_1+k}^{+\infty} g(Z_2)g(Z_1)dZ_2dZ_1 = \int_{Z_1=-\infty}^{+\infty}(1-G(Z_1+k))g(Z_1)dZ_1$, and our goal is to show that if $\tilde{g}(Z)$ is a symmetric single-troughed mean-preserving spread of g(Z), then we must show that

$\int_{-\infty}^{+\infty} G(Z+k)g(Z)dZ - \int_{-\infty}^{+\infty} \widetilde{G}(Z+k)\widetilde{g}(Z)dZ > 0$, or using the notation that $\widetilde{g}(Z)$ equals g(Z)+h(Z), $0 > \int_{-\infty}^{+\infty} \widetilde{G}(Z+k)h(Z)dZ + \int_{-\infty}^{+\infty} H(Z+k)(\widetilde{g}(Z)-h(Z))dZ$.

We now use two lemmas:

Lemma 2: Suppose $\Psi(Z)$ is increasing for $Z \le Z_{Med}$ and decreasing for $Z \ge Z_{Med}$. Then

$0 > \int_{-\infty}^{+\infty} \Psi(Z)h(Z)dZ$.

Proof: Since h(Z) represents a single-troughed mean-preserving spread, there exists a q>0 such that for all values of Z greater than $Z_{Med}+q$ or less than $Z_{Med}-q$, $h(Z) \ge 0$, and otherwise $h(Z) \le 0$. Furthermore, because h(Z) must integrate to zero, $\int_{-\infty}^{Z_{Med}=q} h(Z)dZ = -\int_{Z_{Med}=q}^{Z_{Med}} h(Z)dZ$ and

$-\int_{Z_{Med}}^{Z_{Med}+q} h(Z)dZ = \int_{Z_{Med}+q}^{\infty} h(Z)dZ$.

Using the fact that $\Psi(Z)$ is increasing for $Z \le Z_{Med}$, we obtain:

$$\int_{-\infty}^{Z_{Med}=q} \Psi(Z)h(Z)dZ \le \int_{-\infty}^{Z_{Med}=q} \Psi(Z_{Med}-q)h(Z)dZ = \Psi(Z_{Med}-q)\int_{Z_{Med}=q}^{Z_{Med}} -h(Z)dZ \le \int_{Z_{Med}=q}^{Z_{Med}} -\Psi(Z)h(Z)dZ$$

Similarly, since $\Psi(Z)$ is decreasing for $Z \ge Z_{Med}$,

$$-\int_{Z_{Med}}^{Z_{Med}+q} \Psi(Z)h(Z)dZ \ge -\int_{Z_{Med}}^{Z_{Med}+q} \Psi(Z_{Med}+q)h(Z)dZ = \Psi(Z_{Med}+q)\int_{Z_{Med}+q}^{\infty} h(Z)dZ \ge \int_{Z_{Med}+q}^{\infty} \Psi(Z)h(Z)dZ.$$

Hence the result.

Lemma 3: $\int_{-\infty}^{+\infty} H(Z+k)\tilde{g}(Z\ )dZ = -\int_{-\infty}^{+\infty} \tilde{G}(Z-k)h(Z)dZ$.

First, note that a simple change of variables argument implies that

$\int_{-\infty}^{+\infty} H(Z+k)\tilde{g}(Z\ )dZ = \int_{-\infty}^{+\infty} H(Z)\tilde{g}(Z-k)dZ$. Second integration by parts tells us that:

$\int_{-\infty}^{+\infty} H(Z)\tilde{g}(Z-k)dZ\ = -\int_{-\infty}^{+\infty} h(Z)\tilde{G}(Z-k)dZ + \tilde{G}(Z-k)H(Z)\Big|_{-\infty}^{+\infty}$, but the last term is zero (using the property that H(Z) equals zero at both extremes), and the lemma follows.

To prove the proposition first notice that from Lemma 3 we obtain

$$\int_{-\infty}^{+\infty} \tilde{G}(Z+k)h(Z\ )dZ + \int_{-\infty}^{+\infty} H(Z\ +k)(\tilde{g}(Z)-h(Z))dZ =$$

$$\int_{-\infty}^{+\infty} (\tilde{G}(Z+k)-\tilde{G}(Z-k))h(Z\ )dZ - \int_{-\infty}^{+\infty} H(Z\ +k)h(Z)dZ\ .$$

Since the density $\tilde{g}$ is single peaked, the function $\Psi(Z) = \tilde{G}(Z+k) - \tilde{G}(Z-k)$ satisfies the hypothesis of Lemma 2 and hence it suffices to show that

$$\int_{-\infty}^{+\infty} H(Z\ +k)h(Z)dZ \geq 0.$$

Using a change of variables and integration by parts exactly as in the proof of Lemma 3, one verifies that

$$\int_{-\infty}^{+\infty}(H(Z+k)+H(Z-k))h(Z)dZ=0. \qquad \text{(A3)}$$

Since h is single-troughed, the function $\Psi(Z)=H(Z-k)-H(Z+k)$ satisfies the hypothesis of Lemma 2 and hence

$$\int_{-\infty}^{+\infty}H(Z+k)h(Z)dZ \geq \int_{-\infty}^{+\infty}H(Z-k)h(Z)dZ\,. \qquad \text{(A4)}$$

(A3) and (A4) imply that

$$\int_{-\infty}^{+\infty}H(Z+k)h(Z)dZ \geq 0.$$

Proposition 5: If D is sufficiently large, then an increase in λ reduces the amount of theft in society. Theft occurs when $Z_{Max}-Z_{Min}>F^{-1}(1-\delta)$ or $(1-\lambda)(\mu_{Max}-\mu_{Min})>F^{-1}(1-\delta)$ or $(\mu_{Max}-\mu_{Min})>F^{-1}(1-\delta)/(1-\lambda)$. If the distribution of μ is characterized by a density function p(.) and a cumulative distribution function P(.) then following the logic of the last proof, we can write the amount of theft as $2\int_{\mu_1=-\infty}^{+\infty}(1-P(\mu_1+k))p(\mu_1)d\mu_1$, where k equals $F^{-1}(1-\delta)/(1-\lambda)$ and differentiating this with respect to k yields: $-2\int_{\mu_1=-\infty}^{+\infty}p(\mu_1+k)p(\mu_1)d\mu_1$, which is clearly negative.

As a consequence, anything that increases k reduces theft and anything that decreases k increases theft. As k is rising λ, this leads to a reduction in the level of theft.

Proposition 6: We denote the returns to investment by W(Z), which equals $(G(Z+v)-\theta)D$. As Z approaches the maximum value of Z, $G(Z+v)$ approaches one and investment yields strictly positive returns. When Z equals $\underline{\underline{Z}}$, then by assumption the value of W(Z) is negative. As G(.) is a continuous, monotonically increasing function, there must exist a value of Z, denoted Z_I, at which individuals are indifferent between investing and not investing, i.e. where $G(Z_I+v)=\theta$. For values of Z above Z_I, investing is preferred to not investing, whereas for values of Z below Z_I, not investing is preferred to investing. Moreover, differentiation immediately yields that $\frac{\partial Z_I}{\partial v}=-1$, and $\frac{\partial Z_I}{\partial \theta}=\frac{1}{g(Z_I+v)}$, which produces the first two comparative statics.

A mean preserving spread in G(.) causes $G(Z_I+V)D$ to fall (and Z_I to rise) if and only if Z_I+V lies above the median value of Z. The value of Z_I+V is defined so that $(G(Z_1+V)=\theta$, and therefore, Z_I+V lies above the median of Z if and only if $\theta > .5$.

If $Z=\lambda\alpha+(1-\lambda)\mu$, then $W(\mu)=(P(\mu+v/(1-\lambda))-\theta)D$, and for the marginal investor, denoted μ_I, $P(\mu_I+v/(1-\lambda))=\theta$, and differentiation produces $\frac{\partial \mu_I}{\partial \lambda}=-\frac{v}{(1-\lambda)^2}$, so the proportion of investors rises with λ.

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