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INCOMPLETE PROPERTY RIGHTS, REDISTRIBUTION, AND EFFICIENCY

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Abstract

In a world where the private protection of property is costly, government redistribution can lead to an increase in aggregate output. I find that while redistribution increases aggregate output, it may make some members of the society worse off. The State may *directly* enhance economic rights through investments in security and the protection of property or it may *indirectly* do so through the redistribution of income. Indeed, under certain conditions, redistribution becomes desirable in situations where the State has exhausted its ability to enhance efficiency through the direct enforcement of property rights. In this case, redistribution can make all members of a society better off. Specifically, this occurs when the cost of predation is sufficiently low *and* the technology of private protection of property rights is sufficiently weak. The adverse effects of redistribution may be the consequence but not the cause of State failure. The real cause is a corrupt and inept State.

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1. Introduction

The first welfare theorem states that, under certain conditions, any competitive allocation is Pareto efficient. The second welfare theorem states that any Pareto efficient allocation can be supported as a competitive equilibrium through lump-sum taxes and transfers. Instructors in Public and Welfare economics courses typically emphasize the trade-off between efficiency (increasing the size of the pie) and equity (distributing the pie). Indeed, the old Public Economics tradition evidenced in textbooks by Richard Musgrave emphasize that redistribution has an adverse effect on efficiency. But it is now known that when the first welfare theorem ceases to hold, as in the case of public good goods, there may be a case for redistribution which enhances efficiency. For example, government redistribution from altruistic rich people to the poor could make the rich better off, given that charity is a public good to the rich. Also, redistribution enhances efficiency in a world where agents are risk-averse and income is determined by luck. Government redistribution is then a form of social insurance.[1]

There is yet another scenario where the first welfare theorem fails such that redistribution could lead to an increase in the economy's output. This is when property rights are incomplete. The degree of property rights protection plays a crucial role in the functioning of markets. When economic agents cannot enjoy the fruits of their labor, this has adverse effects on their incentives to invest, work, save, etc. Hence, one should not expect the first welfare theorem to hold when property rights are incomplete.[2] When incomplete property rights result in the failure of the first welfare theorem, there may be

[1] These arguments and others are nicely reviewed in Boadway and Keen (2000) and Chapter 3 of Mueller (2003).
[2] This point was forcefully made by Usher (1987) in his analysis of the efficiency effects of theft. However, he does not examine redistribution as a second-best solution to the problem.

room for efficiency-enhancing government redistribution. This result is not new. The novelty of the paper lies in specifying the conditions under which this efficiency-enhancing redistribution also improves the welfare of those who finance it (i.e., the rich) and how this is affected by the protection of property rights.

I find that while redistribution increases aggregate output, it may make some members of the society worse off. The State may *directly* enhance economic rights through investments in security and the protection of property or it may *indirectly* do so through the redistribution of income. Indeed, under certain conditions, some moderate form of redistribution becomes desirable in situations where the State has exhausted its ability to enhance efficiency through the direct enforcement of property rights. In this case, redistribution can make all members of a society better off. This occurs when the cost of predation is sufficiently low and the technology of private protection of property rights is sufficiently weak. I argue that the adverse effects of redistribution may be the consequence but not the cause of State failure.

The paper is organized as follows. The next section discusses how the present paper is related to previous literature. Section 3 presents a simple model of incomplete property rights where agents can choose to be predators or producers. I show how redistribution can enhance efficiency in this environment. Section 4 discusses the results of the paper. Section 5 concludes the paper.

2. Relationship to previous literature

Justino (2005) finds empirical support for the efficiency-enhancing effect of redistribution. Using data for fourteen major Indian states between 1973 and 2000, she found that redistributive policies have been significantly more effective in reducing civil unrest in India than more direct mechanisms like using the police or military. It also had positive effects on growth.

Redistribution in my model could be seen as a form of bribery from the rich (i.e., high-ability agents) to the poor (low-ability agents) which enables the rich to "buy their peace" (Grossman, 1994, 1995). This is also similar to Acemoglu and Robinson (2000) where the rich elite accept redistributive taxation in order to prevent a revolution. Indeed, the effect of inequality on economic growth has led to a growing literature in economics. Alesina and Rodrik (1994) show, in a model without privately-enforced predation, that income inequality has an adverse effect on growth. They argue that in more unequal societies, economic growth is lower because the demand for fiscal redistribution financed by distortionary taxation is higher. The inverse relationship between inequality and growth is tested empirically in Alesina and Perotti (1996). In that paper, they argue that income inequality fuels social discontent and increases socio-political instability. The uncertainty in the politico-economic environment reduces investment which reduces growth.[3]

The model is similar to Palda (1999) but it differs from it in the following respects: First, I assume a continuous distribution of abilities while Palda (1999) assumes

[3] See Kanbur (2000) for a survey of the inequality-growth debate.

a discrete distribution.[4] Second, the welfare of a producer is decreasing in the total number of predators. In Palda (1999), a producer's welfare is independent of the number of predators. Finally but more importantly, I obtain results (like my proposition 2) which are not obtained by Palda (1999). That is, Palda (1999) focuses on how redistribution might enhance efficiency but in cases where redistribution enhances efficiency, Palda (1999) does not consider if redistribution improves the welfare of the rich.

Bos and Kolmar (2003) develop a theory of redistribution stemming from differences in individual productivity. To see this, consider a world with two people, A and B, in a state of anarchy. There is an initial allocation of land between A and B but A is more productive in the use of the land than B. Then it is in the interest of both parties for B to transfer part of his land to A in period 1, B produces some output in period 2, and redistributes an agreed-upon output to A in period 3. Of course, in a one-shot game, A has no incentive to honor the agreement to transfer some output to B. Therefore, to enforce this agreement, Bos and Kolmar (2003) analyze an infinitely-repeated version of this game yielding a folk-theorem type notion of co-operation.[5] They define this self-enforcing rule as a constitution and therefore the State emerges from a Hobbesian "state of nature". In their model, redistribution of output is a compensating mechanism that enables the society to Pareto-improve the initial allocation of land. My model differs from Bos and Kolmar (2003) in the following respects: (1) I consider a one-shot game

[4] Also, Palda (1999) does not analytically prove the effect of redistribution on efficiency, although he uses a specific functional form for the distribution of individual abilities. Palda (1999, p. 138) notes that "[E]ven though equation (24) appears to allow for some ambiguity as set-up, income distribution will always increase national income by enticing marginal takers to become makers… I have confirmed this in simulation of the above for a wide variety of parameter values."

[5] Noh (2002) develops a model with two players. One player is a producer and the other player is a predator. The producer can make a transfer to the predator to deter the predator from attacking him. Noh (2002) *assumes* that the predator does not attack the prey after he has received the transfer. Unlike, Bos and Kolmar (2003), he considers a two-period game, so there is no reason why the predator cannot attack after receiving the transfer.

involving predators, producers, and a government, (2) in my model, an agent can be either a producer or predator but not both. Two other key differences are that Bos and Kolmar (2003) cannot determine the effect of the number of predators on the welfare of producers and there is no predation in equilibrium. However, as argued by Barzel (2000), predation cannot be entirely eliminated. However, my model is similar to Bos and Kolmar (2003) because redistribution arises as result of differences in productivities among agents. However, my results (e.g., proposition 2) differ from Bos and Kolmar (2003).

Another model which is close to mine is Grossman (2002). Unlike my model, his model has no predation in equilibrium when the state intervenes.[6] Also, Grossman (2002) considers a model with *identical* agents, so there is not a unique set of producers and predators. Since my model has different agents, I am able to identify a unique set of producers and predators. In my model and Grossman (2002), State intervention may be beneficial. But this is driven by different forces. In Grossman (2002) the State uses tax revenue collected from producers for investment in the protection of private property (i.e., output), which in turn increases output and therefore tax revenue. In my model, the State does not invest in the protection of private property. The State deters predation by distributing its tax revenue to predators. Grossman (2002) can be seen as a model in which the State's role is to *directly* enhance economic rights, while the State *indirectly* does so in my model. Redistribution may be preferable when the benefits of the

[6] As Barzel (2002) notes, it is impossible to eliminate predation or theft in a society.

enforcement of legal rights have been exhausted. By taxing the output of predators before predators are able to lay hands on it, the State makes predation less attractive. [7]

The paper is also related to the literature on rent seeking as appropriative activity (e.g., Skaperdas, 1992; Allen, 2002; Konrad, 2002; Gradstein, 2007). For example, Gradstein (2007) considers a model where a ruling rich elite is contemplating mass political participation (i.e., democracy). In his model, democratization and the attendant protection of property rights by the State reduces rent seeking, and boosts investment and growth. [8] This beneficial effect of democratization must be balanced against the cost to the rich, since democratization will result in a shift of policy from the preferred policy of the rich. This cost is higher, the higher is the degree of inequality between the rich and the poor. Hence, democratization and State protection of property rights will occur, if and only if the inequality between the rich and poor is sufficiently small. In other words, the rich elite will agree to democratize (i.e., redistribute income to the poor), if the costs (benefits) are sufficiently small (large).[9] This is similar to the thrust of the argument behind my main result in the sense that the rich will agree to redistribute income to the poor, if their ability to protect their own property is sufficiently weak in which case the benefits of redistribution to the rich are sufficiently high.

[7] Grossman (1995) also considers a model with government tax-financed income redistribution. Like Bos and Kolmar (2003), there is no predation in equilibrium.
Grossman (1994) considers a similar model but redistribution occurs through a reform of property (i.e., land) ownership.
[8] Unlike my model, rent-seeking is productive in his model. In particular, productive investment and rent-seeking investment are complements in an agent's net capital endowment. Therefore, the return to rent-seeking investment is higher for agents with higher investments in productive capital.
[9] See also Acemoglu and Robinson (2005).

3. A model of redistribution and incomplete property rights

Consider an economy in which risk-neutral agents of unit measure can choose to be producers or predators (i.e., steal from producers). Agents have an ability or productivity parameter, r, distributed continuously on $[\underline{r},\bar{r}]$ with density f(r) > 0, distribution function F(r), and $\underline{r} \geq 0$. An agent with productivity, r, can produce an output equal to r.

Let n be the measure (number) of predators. The predation technology is such that a proportion, αn, of each producer's output is stolen by predators, where $0 < \alpha n < 1$. Notice that this proportion is increasing in the total measure, n, of predators. So if Y is total output by producers, then αnY is stolen by predators. Let c > 0 be the cost of predation. This cost includes the cost of weapons, expected penalty for breaking the law, the guilt of wrong doing, etc. If α = 0, then property rights are complete. In this paper, we consider incomplete property rights (i.e., α > 0). I assume that $0 < \alpha \leq 1$.

The total output stolen is shared equally among all predators. So the payoff to a predator is αnY/n – c and the payoff to a producer is (1 – αn)r. A person with ability, r, will be a predator if

$$\frac{\alpha nY}{n} - c \geq (1-\alpha n)r \qquad (1)$$

Let $\hat{r}$ be the ability of the marginal predator who is indifferent between predation or production. In this case, the expression in (1) holds with equality. Solving (1) gives

$$\hat{r} = \frac{1}{(1-\alpha n)}(\alpha Y - c) \qquad (2)$$

It is easy to show that an agent with ability $r \leq \hat{r}$ will be a predator and an agent with ability $r > \hat{r}$ will be a producer. Hence sufficiently high-ability agents are producers and sufficiently low-ability agents are predators.

The process of finding an equilibrium works as follows: Suppose all agents before they decide on their profession form expectations about the measure of predators, n. If we find a value of n such that the expected n is equal to the actual n, then we have an equilibrium. Technically, an equilibrium involves finding a fixed point.

Given that agents with $r > \hat{r}$ are producers and $r \leq \hat{r}$ are predators, it follows that

$n = \int_{\underline{r}}^{\hat{r}} f(r)dr = F(\hat{r})$ and aggregate output is $Y = \int_{\hat{r}}^{\bar{r}} rf(r)dr$.

Putting these expressions into equation (2) gives

$$\hat{r} = \frac{1}{1-\alpha F(\hat{r})}\left(\alpha \int_{\hat{r}}^{\bar{r}} rf(r)dr - c\right) \equiv g(\hat{r}) \qquad (3)$$

For simplicity, suppose r is uniformly distributed on [0, 1], so that $\underline{r} = 0, \bar{r} = 1$ and f(r) = 1. Then we have $n = F(\hat{r}) = \hat{r}$ and $Y = \int_{\hat{r}}^{1} rdr = 0.5(1-\hat{r}^2)$. Then the solution (i.e., a fixed point)[10] to equation (3) is

$$\hat{r} = (1/\alpha) \pm \sqrt{(1/\alpha)^2 + 2c/\alpha - 1} \qquad (4)$$

Given $0 < \alpha \leq 1$ and noting that we require $\hat{r} < 1$, the only relevant root is

$$\hat{r} = (1/\alpha) - \sqrt{(1/\alpha)^2 + 2c/\alpha - 1} \equiv \hat{r}(0) \qquad (4a)$$

[10] At least one fixed point exists because $g(\hat{r})$ is continuous and $\hat{r}$ belongs to the compact and convex set $[\underline{r}, \bar{r}]$.

The equilibrium measure of predators is unique. It is easy to show that for $\hat{r} > 0$, we require $c < 0.5\alpha \equiv \bar{c}$.[11] If $c \geq \bar{c}$, then there will be no predators in equilibrium and therefore we are in a first-best world where the first welfare theorem holds. Redistribution cannot be Pareto-improving.

Given (4a), we obtain

$$\frac{\partial \hat{r}}{\partial c} = -\frac{1}{\alpha\sqrt{(1/\alpha)^2 + 2c/\alpha - 1}} < 0 \qquad (5)$$

This gives the following lemma:

Lemma 1: *An increase in the cost of predation results in a fall in the number of predators and therefore increases aggregate output.*

For use in subsequent discussions, we note that

$$\frac{\partial}{\partial \alpha}\left(\frac{\partial \hat{r}}{\partial c}\right) = \frac{c - \alpha}{(1 + 2c\alpha - \alpha^2)^{1.5}} < 0, \qquad (5a)$$

given $c < 0.5\alpha$.

3.1 Redistribution and efficiency

Now I want to examine the effect of government redistribution on the incentive to be a producer or predator. In particular, the government implements a linear tax-transfer scheme of the type pioneered by Romer (1975) and Meltzer and Richard (1981). To do so, I consider the following sequence of actions:

[11] Given the restriction $c < 0.5\alpha$, various parameter values reveal that the equilibrium is stable where the absolute value of the slope of $g(\hat{r})$ is less than 1 at $\hat{r}(0)$. For a related point in this class of models, see, for example, note 14 and figure 2 in Alesina and Angeletos (2005).

(a) The government announces a tax rate, t, on the output of each producer, where $0 < t < 1$.

(b) The government also announces that it will redistribute aggregate tax revenue equally among *all* agents, regardless of their choice of career.

(c) Based on the government's transfer/tax policy, agents decide whether to be producers or predators.

(d) The government collects tax revenue and implements its transfer policy as announced in (a) and (b).[12]

Notice that although the tax revenue is shared equally among all agents, it is still a *net transfer* to predators since predators produce no output.[13] Notice also that producers with a lower ability benefit at the expense of producers with a higher ability. Alternatively, one may assume that redistribution takes the form of an in-kind transfer where the government uses the tax revenue to provide a public good that benefits everyone.

A key assumption is that the government collects taxes from producers *before* predators get the chance to steal the output of producers. Since we are interested in how redistribution affects the incentives of predators, this timing of actions makes sense. This timing could also reflect the fact that the State has more power than individual predators. Until the State gets its share of output through taxes, individual predators have no power. In this case, the State has a first-mover advantage. For example, the State has this first-

[12] This is still a linear tax-transfer scheme in the tradition of Meltzer and Richard (1981) given that predators in our model have a *legal* income of zero.

[13] One might assume that the government redistributes the tax revenue to only predators. However, this is not likely to make sense since the government would not like to give the impression that it deals exclusively with bad people (predators). In view of this, the assumption that the government shares the tax revenue equally among all agents is much more plausible.

mover advantage when it deducts income taxes directly and automatically from a person's payroll. Hence, predators can only steal from a person's disposable income not his gross income.[14]

Let R(t) be the transfer per person. An agent of ability, r, will be a predator if

$$\frac{\alpha n(1-t)Y}{n} - c + R(t) \geq (1-\alpha n)(1-t)r + R(t) \qquad (6)$$

where $R(t) = t\int_{\hat{r}(t)}^{1} rf(r)dr$ and $\hat{r}(t)$ is the ability of the marginal predator.[15]

The expression in (6) simplifies to

$$\alpha Y - \frac{c}{1-t} \geq (1-\alpha n)r \qquad (7)$$

Comparing the expressions in (1) and (7), it is easy to see that redistribution is analytically equivalent to an increase in the cost of predation from c to c/(1-t). Therefore, using lemma 1, it follows that the ability of the marginal predator, $\hat{r}$, falls resulting in an increase in the measure of producers and aggregate output. Although redistribution does not appear to directly affect incentives because the term R cancels out in (6), it nevertheless affects incentives indirectly because taxation, in this model, is necessitated only by the desire to redistribute income.

I summarize the above analysis in the following proposition:

[14] It can be shown that if property rights are incomplete, government redistribution from producers to predators will reduce aggregate output, if predators steal output from producers *before* government collects taxes and redistributes income. The formal proof is available on request.

[15] Note that since the total measure of all agents is 1, aggregate transfer is the same as per capita transfer.

Proposition 1: *If property rights are incomplete and the government collects taxes before predators steal output, then redistribution from producers to predators enhances efficiency (i.e., increases aggregate output).*[16]

3.2 The effect of redistribution on the welfare of producers

While I have shown that redistribution increases aggregate output, I have not shown that it makes pre-redistribution producers better off, given that they are now subject to both predation and taxation.

Note that with redistribution, the marginal predator has ability, $\hat{r}(t) = (1/\alpha) - \sqrt{(1/\alpha)^2 + 2c/(1-t)\alpha - 1}$. When there is no redistribution, the marginal predator has ability, $\hat{r}(0)$, given by equation (4a). Note that that $\partial\hat{r}(t)/\partial t < 0$. Therefore, $\hat{r}(0) > \hat{r}(t)$ for $t \in (0,1)$. Therefore, given proposition 1 and the separating nature of the equilibrium where any producer has a strictly higher ability than any predator, all agents with ability $r > \hat{r}(0) > \hat{r}(t)$ will *continue* to be producers in the presence of government redistribution. That is, all pre-redistribution producers will *continue* to be producers after redistribution. But will they be better off? When there is no government redistribution, $t = 0$. I want to show that, under certain conditions, any producer with ability $r > \hat{r}(0) > 0$ is better off for some $t > 0$.

For any tax rate, t, the payoff to a producer with ability $r > \hat{r}(0)$ is

$$U(r, t, \alpha) = (1 - \hat{r}(t)\alpha)(1 - t)r + R(t), \qquad (8)$$

[16] Notice that proposition 1 will not hold if property rights were complete (i.e., $\alpha = 0$), because regardless of redistribution all agents will be producers, if $t < 1$.

where $R(t) = t\int_{\hat{r}(t)}^{1} rf(r)dr = 0.5t[1-(\hat{r}(t))^2]$, $\hat{r}(t) = (1/\alpha) - \sqrt{(1/\alpha)^2 + 2c'/\alpha - 1}$ and

$c' \equiv c/(1-t)$.

Taking the derivative of equation (8) with respect to t gives

$$\frac{\partial U}{\partial t} = r\left\{-(1-\alpha\hat{r}(t)) - (1-t)\frac{\partial \hat{r}(t)}{\partial t}\right\} + 0.5\left\{1-(\hat{r}(t))^2 - 2t\hat{r}(t)\frac{\partial \hat{r}(t)}{\partial t}\right\} \qquad (9)$$

The sign of the derivative in (9) is not easy to determine analytically. To simplify the analysis, I investigate the sign of this derivative as $\alpha \rightarrow 1$. To do this, note the following preliminary results:

$$\lim_{\alpha\to 1}\hat{r}(t) = 1 - \sqrt{\frac{2c}{1-t}} \quad \text{and} \quad \lim_{\alpha\to 1}\frac{\partial \hat{r}(t)}{\partial t} = -\frac{1}{1-t}\sqrt{\frac{c}{2(1-t)}}$$

Putting these expressions into (9), we can show after some lengthy but straightforward algebra, that

$$\Delta \equiv \lim_{\alpha\to 1}\frac{\partial U}{\partial t} = \frac{c(2-r-t+rt-\theta)}{\theta(1-t)^2} \qquad (10)$$

where $\theta \equiv \sqrt{\frac{2c}{1-t}}$. Given $r \in (0,1]$ and $t \in (0,1)$, it follows that $2 - r - t > 0$. Also, $\theta = 0$ if $c = 0$. Therefore, if $c = 0$, then $2 - r - t + rt - \theta > 0$. Also, if $c = 0.5(1\text{-}t)(2 - r - t + rt)^2 \equiv \tilde{c} > 0$, then $2 - r - t + rt - \theta = 0$. Notice that $(2 - r - t + rt - \theta)$ is monotonically decreasing in c. It follows that $\Delta > 0$ if $c \in (0, \tilde{c})$.

Given $\alpha \rightarrow 1$, we require $c < 0.5(1-t) \equiv \hat{c}$ to obtain $\hat{r}(t) > 0$. Since $\hat{c} < \tilde{c}$, it follows that the feasible set of values of c for which there is *predation in equilibrium* and $\Delta > 0$ for all agents with ability $r > \hat{r}(0)$ is $c \in (0, \hat{c})$.[17]

The intuition behind the result in the preceding paragraph is straightforward. If $\alpha \rightarrow 1$, then a producer can protect a very low proportion of his property. Therefore, the benefits of redistribution in terms of reducing the number of predators (i.e., lowering n) is very high if α is very high. But for this benefit to be that high, it must be the case that the producers must be protected from predators who incur sufficiently low costs in their activity (i.e., $c < \hat{c}$). Otherwise, if the costs of predation were sufficiently high such that predation is sufficiently low, then the benefits of redistribution will not be high enough to justify the cost (i.e., taxation) on high-ability producers, even if they had a very low ability to protect their property. This makes them worse off. Therefore, it the combination of a low ability to protect one's property *and* low costs of predation which ensures that the rich are better off with redistribution.

Noting that α captures the extent to which a producer or the State can protect property rights, where a lower α corresponds to a higher level of protection, gives the following proposition:

[17]If $c \geq \hat{c}$, there is no predation (i.e., $\hat{r}(t) = 0$). The state sets $t > 0$ high enough to eliminate predation. I ignore this case because it is not particularly interesting.

Proposition 2: *If all agents who were producers in the absence of redistribution have a sufficiently low ability to protect their property and if the individual cost of predation is sufficiently low, then all pre-redistribution producers will be better off with redistribution.*[18]

Of course, I do not allow producers or the State to reduce α by investing resources in the protection of property rights. The implicit assumption is that there is some threshold level of α, say $\underline{\alpha} > 0$, below which the protection of property is impossible. Below $\underline{\alpha}$, the cost of protecting private property is prohibitive or there are sharp diminishing returns to investment in the protection of private property. Proposition 2 then implies that redistribution enhances the welfare of pre-redistribution producers, if $\underline{\alpha}$ is sufficiently high and the cost of individual predation is sufficiently low (i.e., $c < \hat{c}$).

To elaborate further, recall that in this model, redistribution enhances efficiency by increasing the cost of predation from c to c/(1-t). Noting that the derivative in (5) is negative, the sign of the derivative in equation (5a) implies that benefits of redistribution are higher, the higher is α. Therefore, redistribution reduces the measure of predators by a bigger amount the weaker is the protection of property rights. Weaker property rights protection increases the measure of predators (i.e., $\partial \hat{r} / \partial \alpha > 0$). With a higher measure of predators, it is easier to reduce this measure by a bigger amount via redistribution. However, this higher marginal benefit must be balanced against the cost of redistribution

[18]Grossman (2002) obtains a somewhat similar result in a model with *identical* agents. But as noted earlier, there is no predation in equilibrium in his model when the government intervenes. In contrast, the result in this paper holds even if the state cannot fully deter predation or if doing so is prohibitively costly. Finally, as noted in section 2, Grossman (2002) obtains his result through the direct enforcement of property rights while I do so indirectly through redistribution.

to the rich, since they have to finance it by paying taxes. This is what drives the result in proposition 2.[19]

Notice that $\partial\Delta/\partial r < 0$. Therefore, even if redistribution improves the welfare of producers, lower-ability producers benefit more than higher-ability producers. This is because higher-ability producers pay more in taxes than lower-ability producers. So the benefits of redistribution to higher-ability producers is smaller than for lower-ability producers.[20] Hence if higher-ability producers are better off with redistribution, then lower-ability producers are also necessarily better off.

Predators who did not switch careers are also better off with redistribution. These are the predators with ability $r < \hat{r}(t)$. To see this, note that the payoff for a predator may be written as

$$V(t) = \alpha(1-t)Y(t) - c + R(t) = Y(t)[\alpha(1-t) + t] - c. \qquad (11)$$

Since Y(t) is increasing in t (i.e., proposition 1) and $\alpha \leq 1$, it follows that V(t) is increasing in t.[21]

The predators who became producers (i.e., those who switched careers) after redistribution have ability $r \in [\hat{r}(t), \hat{r}(0)]$. It is easy to see that this group is also better off. Before redistribution they were predators and obtained the *same* payoff (i.e.,

[19]It is tempting to argue that proposition 2 implies that we should observe more redistribution in countries with weaker protection of property rights. But this will be stretching the results of this paper because the model does not endogenize the choice of property rights protection. Also, weak property rights protection may be the consequence of a corrupt state, which will not engage on Pareto-improving redistribution as considered in this paper.

[20] This difference is not present in Grossman (2002) since all agents in his model are identical.

[21] The result that predators are better off regardless of the value of α is not a general result. From the standpoint of predators, redistribution is beneficial if the government is more efficient at legal/public-sector predation (i.e., taxation) relative to illegal/private-sector predation. Hence, the size of α will, in general, matter. For our purposes, it is sufficient that we can construct a model in which predators and producers are both better off with redistribution.

$V(0) = \alpha Y(0) - c$) as the predators who did not switch careers (i.e., those with ability $r < \hat{r}(t)$). As shown above, $V(t) > V(0)$ for $t > 0$. Since each agent is atomistic, any producer can switch to predation without affecting the redistribution equilibrium and thereby obtain a payoff of $V(t)$. So given that agents of ability $r \in [\hat{r}(t), \hat{r}(0)]$ choose to be producers, it follows that their payoff is higher than $V(t)$. And since $t > 0$ gives $V(t) > V(0)$, it follows that this group of agents is also better off with redistribution.

Hence, if the conditions in proposition 2 hold then everyone is better off with redistribution. Given that redistribution leads to an increase in aggregate output, it is easy to appreciate why, under certain conditions, everyone can be made better off.

To analytically determine the sign of the derivative in (9), when producers have a sufficiently high ability to protect their property rights, one could take the limit of this derivative as $\alpha \to 0$. Unfortunately, this is not possible since $\lim_{\alpha \to 0} \hat{r}(t)$ does not exist. However, it is easy to see that if $\alpha = 0$, the inequality in (1) will not hold. Hence, there will be no predators. Then given $\alpha = 0$, redistribution makes a producer of ability r worse off if $r > t\int_{\underline{r}}^{\bar{r}} rf(r)dr + (1-t)r \Rightarrow r > \tilde{r}$, where $\tilde{r}$ is the expected or mean ability. Hence, anyone with above-average ability is worse off with redistribution.[22] Based on this result, I conjecture that when α is sufficiently small, this effect will continue to dominate such that redistribution will make some high-ability producers worse off. By choosing a range of numerical values of c, r, α, and plotting U(t) against $t \in [0, 1)$, I am able to find examples where U(t) is monotonically decreasing in t, if α is sufficiently low. For example, for $c = 0.00001$, I find that $\partial U/\partial t < 0$ for $r = 0.8 > \hat{r}(0)$, if $\alpha \leq 0.78$. I do not wish

[22] This is a very well-known result given that property rights are complete. See, for example, Harms and Zink (2003).

to claim too much for this result given that it was based on numerical stimulations. But suffice it to say that redistribution could make some producers worse off if their ability to protect their property rights is sufficiently high.

4. Discussion

A key concept in the analysis is the protection of property rights. To be sure, a distinction ought to be made between *legal* (property) rights and *economic* (property) rights. Barzel (2002, p. 15) defines economic rights as "an individual's ability, in expected terms, to directly consume the services of an asset, or consume indirectly through exchange". According to Barzel (2002, p.157) legal rights "… are the claims over assets delineated by the state as the property of particular individuals or institutions." A person could have complete *legal* rights over his property (e.g., a piece of land) in the sense that the State recognizes that it is his. But he may not have full economic rights over that land. In other words, the person or the State cannot *fully* monitor or deter those who encroach on his land and thereby reap some economic gains from it. As Barzel (2002, p. 16) observes "economic rights can exist in the absence of legal rights". Therefore, economic rights can exist in a Hobbesian "state of nature" and are akin to Hobbes' "natural rights". Of course, as Barzel (2002) correctly argues legal rights enhance economic rights. However, there are limits to the ability of the State in enforcing legal property rights. Barzel (2002, p. 158) makes this point poignantly when he notes that

"For an asset that needs protection, then, there is ambiguity about its economic owner. Assets that are not perfectly delineated lie, in part, in the public domain. By providing protection and legal delineation for an asset, a protection specialist reduces the portion that lies in the public domain and enhances the economic ownership over it. Even when protection is provided, however, ownership will not be made perfect, because airtight protection would be prohibitively costly. The assets protected by the specialist, then, will not be entirely immune to theft."

The preceding discussion makes the point that institutionalizing property rights is expensive and legal rights are incomplete if they cannot be fully enforced. If we had full legal and economic property rights (i.e., $\alpha = 0$), redistribution would not be necessary to enhance efficiency in a model like ours. In a world of incomplete economic property rights, redistribution may reduce the rate at which predators (e.g., the have-nots) encroach on the economic property rights of the rich. The enforcement of legal rights will typically be incomplete insofar as this enforcement is *costly*. Herein lies the logic behind the potential beneficial effects of redistribution in proposition 2.[23]

Institutions emerge to minimize transactions costs which are the resources used to establish and maintain property (i.e., economic) rights (Coase, 1937; Demsetz, 1967; North, 1990).[24] Proposition 2 is insightful in light of the preceding discussions because it shows that in a world where the private protection of property is costly, redistribution through the tax system may emerge as an institution to enhance the welfare of high-ability agents (i.e., producers). By taxing the output of producers, the State makes the remaining output less attractive to predators. But even so, private agents could also have achieved the same goal by destroying part of their own output or by producing below r

[23] Barzel (2002) does not argue that the limits to property rights protection might make redistribution desirable.

[24] Gradstein (2004) explores a bi-directional causality between property rights and economic performance. In his model, better enforcement property rights leads to higher economic growth and higher growth enhances the enforcement of property rights. This two-way causation results in two steady equilibria: one with full protection of property rights and a high income level, and another with minimal protection of property rights and a low income level.

(i.e., below their output in the presence of full property rights) and thereby make their property less attractive to predators.[25] However, a disadvantage of this behavior by private agents relative to State intervention is that it leads to deadweight losses, since output is destroyed or sub-optimally provided from a social point of view. Of course, this is based on the assumption that redistribution by the State results in a smaller deadweight loss. Indeed, in our model, it leads to zero deadweight losses (i.e., proposition 1).[26] So ultimately the desirability of redistribution by the State depends on the relative efficiency of private agents in protecting their property. This brings us back to the message behind proposition 2.

One may argue that a disadvantage of redistribution is that it is prone to wasteful rent-seeking activities and therefore it is better for the State to focus its energies on the protection and enforcement of property rights. But if we can trust the State to honestly and impartially protect property rights (via taxation), why can't we trust the same State to redistribute income without significant rent-seeking? One cannot have it both ways. If the protection of property rights (i.e., the courts, police etc) is not subject to too much rent-seeking, then there should be no reason why redistribution will. A State that cannot redistribute income without too much rent-seeking can also not enforce the protection of property rights without too much rent seeking stemming from inefficient and corrupt courts, judges, police, etc.

The preceding argument suggests that the adverse effect of redistribution through the political process is the consequence but not the cause of State failure. The real cause

[25] Allen (2002) explores this behavior and gives several interesting examples.
[26] But this is just an artifact of the model stemming from the fact that producers inelastically supply labor. In a model with endogenous labor supply or leisure, government redistribution will typically lead to deadweight losses.

is a corrupt and inept State. An inept and corrupt State will grossly misuse tax revenue whether it purportedly claims to use it for redistribution or for the protection of property rights. One may argue that a corrupt State does more harm when it is in the business of redistribution than when it is in the business of protecting property rights. There seems to be no basis for this argument. Also, one could argue that selective or discriminatory protection of property rights by a corrupt State has redistributive effects. The real challenge is to find ways of making the State to deliver in a manner which complements the efforts of private individuals.[27]

The most compelling argument against redistribution relative to property rights protection is that redistribution, even by an honest State, could have an adverse effect on efficiency since it distorts incentives, causes the recipients of transfers to be lazy, and distorts the effort decisions of high-ability people. In these cases where there is a tradeoff between equity and efficiency, one ought to be *very careful*. To be sure, this trade off cannot be eliminated.[28] However, in situations where some *moderate* amount of redistribution can enhance efficiency and has the support of those whose labor finances the redistributive program, the case against redistribution is much weaker.[29] It makes sense for a society to *initially* develop via the protection of property rights and well functioning markets. However, the market might produce extreme inequality and as Barzel (2000) points out there are limits to the ability of the State to protect property rights. It then becomes necessary for the State to engage in some moderate redistribution

[27] This subject is beyond the scope of this paper.
[28] See Boadway and Keen (2000).
[29] As mentioned earlier, Justino (2005) presents empirical support for the efficiency-enhancing effect of redistribution.

in order to reduce inequality and more importantly enhance efficiency and the welfare of both the rich and poor.

Indeed, it can be argued that the existence of patriotic individuals committed to the public good, and the collective will of a people are necessary for development. Here again some redistribution can play a role. It is difficult to imagine a significant proportion of people in a society having a strong commitment to the public good when there are extreme socio-economic inequalities. Again, moderate redistribution and the consequent sense of belonging that an individual feels are important for producing individuals who are patriotic and committed to the public good.

On the preceding point, Alesina and Angeletos (2005) argue that political support for redistribution may stem from differences in social perceptions regarding the fairness of market outcomes, and the underlying sources of income inequality. Societies that believe that success is largely driven by one's effort are less likely to support redistribution while those who believe that luck, corruption, and connections account for success are more likely to support redistribution. In the latter group, the cost of predation is likely to be small given that part of this cost is due to guilt or the moral cost of wrong doing. In such societies people can *deconstruct* their guilt or justify predation on the grounds that they are doing the right thing by stealing from the rich in order to reduce economic inequality which was generated by corruption, luck, or connections. In order to deter predation, the low cost of predation (i.e., $c < \hat{c}$) could result in a situation where societies which believe that success is due to luck may engage in more redistribution as

in Alesina and Angeletos (2005).[30] And this form of redistribution may well be Pareto-improving.

5. Conclusion

Using a very simple model, I show that redistribution can enhance efficiency in a world of incomplete property rights. The analysis shows that the assumption of complete property rights is crucial to the first welfare theorem and it also implies that, all other things being equal, redistribution cannot enhance efficiency in such a world.

The analysis also shows that while redistribution increases aggregate output, it may make some members of the society worse off. If the agents who bear the brunt of redistributive programs are unable to sufficiently protect their property, then they will be better off and are willing to allow the State to tax them and transfer the proceeds to predators. But it is not only a weak ability to protect one's property that matters. What is also required is a sufficiently low cost of predation. These two factors make redistribution desirable.

Pareto-improving redistribution is very much desirable because it has the support of those whose labor finances the redistributive program. A politically-astute redistributive program must be designed to win the support of these people. Otherwise, the State must bear in mind that it ought to tread cautiously.

[30]However, redistribution in Alesina and Angeletos (2005) is not undertaken to deter predation. In their model, property rights are complete. Notice that in Alesina and Angeletos (2005), societies which care about fairness demand a positive level of redistribution in order to correct the perverse effect of luck on income inequality. Alesina and Angeletos (2005) assume that this demand for fairness is expressed through voting. My argument is that in certain societies this demand may be expressed through the threat of predation, revolution, or social unrest as in Alesina and Perotti (1996) and Acemoglu and Robinson (2000).

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