Increasing the Value of Property Rights by Limiting Transferability

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Abstract: We examine non-price allocation mechanisms when the incentive constraints faced by a democratic government may render credible commitment to the ideal (i.e., "first-best") outcomes infeasible. Our model identifies a potential tradeoff between the misallocation of goods and the misalignment of incentives: Although restricting the transferability of property rights will worsen misallocation, it may generate offsetting benefits by improving the alignment of incentives over collective decisions. In this light, the holders of some types of property rights may collectively favor restrictions on transferability, even though – individually – they would stand to gain from the ability to sell their rights. We apply the model to several examples, including the rights to hunt wild game (often allocated using lotteries) and the rights to build and occupy housing in the presence of rent control.

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> [O]f the private land, part should be near the border, and the other near the city, so that, each citizen having two lots, they may all of them have land in both places; there is justice and fairness in such a division, and it tends to inspire unanimity among the people in their border wars. Where there is not this arrangement some of them are too ready to come to blows with their neighbors, while others are so cautious that they quite lose the sense of honor.
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> -Aristotle, Politics, Part X of Book Seven, translated by Benjamin Jowett

I. Introduction

Economists laud the benefits of market exchange. Exchange allows goods and services to move from lower-valued to higher-valued uses, making trading parties better off. The prospect of exchange improves owners' incentives to engage in costly care, inspires entrepreneurs to find quicker, more attractive, or less resource-intensive ways to produce or distribute goods, and encourages inventors to develop new and more desirable products. Moreover, much of the incredible increase in material well-being that has occurred over the last few centuries can be attributed to the expansion of market-based exchange, from personal to impersonal, and from small and local to large and international (e.g., North 1991).

Yet certain market exchanges – exchanges that would find both willing buyers and willing sellers – are forbidden by law. In some cases, moral, ethical, or civic concerns may lead to bans on market exchange; for example, a human kidney may be donated but not sold to the highest bidder. The list of goods and services for which trade is banned, or has been banned in the past, is long; see, for example, Roth (2007, Table 1).[1]

In this paper, we depart from the previous literature on non-tradable rights by examining non-price allocation mechanisms when the incentive constraints faced by a democratic government render credible commitment to the ideal (i.e., "first-best") outcomes infeasible. Our

[1] Roth refers to markets in such goods (the adoption of children; horse meat for human consumption; prostitution) as "repugnant", and focuses on developing non-market means of improving allocative efficiency when such constraints are faced.

model identifies potential tradeoffs between the misallocation of goods and the misalignment of incentives. This means that restrictions on the transferability of property rights – restrictions that necessarily cause misallocation – may generate offsetting benefits by improving the alignment of incentives over collective decisions. In this light, the holders of some types of property rights may collectively favor restrictions on transferability, even though – individually – they would stand to gain from the ability to sell their rights. We apply the model to several examples, including the allocation of rights to hunt wild game and the rights to build and occupy housing in the presence of rent control.

Our findings complement papers on a diverse set of political economy topics, building on a literature that includes classic work by Aristotle, Condorcet, and Arrow.[2] Perhaps the most similar analysis of the tradeoffs between misallocation and misalignment is Warren's (2012) study of the way political decisions with respect to fighting wars will depend on whether the military uses conscription or a volunteer system.[3] Closely related work on hunting includes Lueck's (1989, 2000) explanation of the variation in mechanisms used to assign property rights to wildlife and Boyce's (1994) work on the reasons for non-transferable, lottery-assigned hunting rights.[4] Rucker, Thurman, and Sumner (1995) present a theoretical and empirical analysis of restrictions on the market-based trade of tobacco quotas, explaining the persistence of those

[2] In addition to Arrow's Impossibility Theorem, see his work on the choice between market and nonmarket allocation (e.g., Arrow 1969). Our approach to analyzing the effects of property rights draws heavily on Barzel (1989). For related work on the advantages and disadvantages of alternative mechanisms for making collective decisions, see the classic work by Hayek (1945), Buchanan and Tullock (1962), Olson (1965), Riker (1982), and Ostrom (1990).

[3] In future versions of our paper, we will expand our discussion of conscription.

[4] Boyce develops a theoretical model and uses it to demonstrate that a non-transferability requirement, coupled with an entry fee, reduces the participation of "speculators" in a lottery, thereby increasing the rents that primary user groups receive. Ohler, Chouinard, and Yoder (2014) develop a model related to Boyce's, then apply it in an analysis of the way the Four Rivers Lottery is used to allocate rafting permits. For related work on the variety of mechanisms to establish property rights to natural resources, see Anderson and Hill (1975), Ellickson (1989), and Anderson (1995). Weitzman (2016) compares "voting on prices versus voting on quantities" as mechanisms to set policies intended to reduce climate change.

restrictions as due, in part, to the deadweight losses being small relative to the rents at stake.[5] Our paper presents a framework that links and expands upon key ideas from these various branches of the literature.

II. A Model of the Misalignment Problem

Our model's purpose is to examine how incentive problems influence the way that restrictions on transferability affect the value of property rights. To keep the assumptions as simple as possible yet still allow a useful analysis of the relevant phenomena – notably non-markets allocations and restrictions on voluntary exchange – we develop our analysis within a supply and demand framework. Within this framework, we can compare first-best outcomes to second-best (or worse) outcomes by applying a simple "behind a veil" perspective – that is, asking what individuals would choose if they could decide among options before learning whether they would be high or low on the demand curve, whether they would be winners of losers of a lottery, etc.

A Starting Point: Simple Cost and Benefit Assumptions

We assume that a large population (of size n) has a uniform distribution of willingness-to-pay for a unit of a government-allocated good, such as permission to kill wild game or permission to build or occupy a unit of housing. Each consumer will consume either zero units or one unit of the good. More formally, define:

w willingness to pay, distributed uniformly ($0 \leq w \leq 1$) among n individuals

For simplicity, assume that the good has a cost of α per unit (with $\alpha \geq 0$), with the total cost αQ shared equally among the n individuals in the population.

[5] By contrast, the deadweight losses from the misallocation of housing resulting rent control policies are likely very large (e.g., Epstein 1988; Glaeser and Luttmer 2003). In future versions of our paper, we will expand our discussion of the literature on rent control.

Each individual seeks to maximize his or her expected net benefits. Notably, individual i will pay a price up w_i (the individual's reservation price) in order to consume a unit of the good. Similarly, individual i will vote to change a policy if and only if the policy change would increase individual i's expected net benefits.

Inherent Misalignment: Majority Rule Fails to Support the First-Best

The first best outcome – the outcome that maximizes total surplus and is, therefore, unanimously favored behind the veil – is easy to identify in the generic manner (i.e., where marginal costs equal marginal benefits). The outcome is exactly what would be obtained by several mechanisms, including: setting price where marginal benefits equals marginal costs, i.e., setting $P = \alpha$; auctioning the efficient quantity, i.e., $Q = n/\alpha$; allocating the efficient quantity through a lottery then allowing trade.[6]

It is straightforward to show why simple democracy – which we model as majority rule decisions – will not generally support the first-best policy. To illustrate, consider voting on a simple price (restricted to non-negative values), with the revenues divided equally among the population. For non-extreme costs (i.e., for $0<\alpha<1$), the first-best policy of setting price equal to marginal cost (denoted $P_f = \alpha$) will not maximize any individual's net benefits. To see why, note that if consumer i has $w_i<\alpha$, the consumer would not purchase the good if $P = \alpha$, and thus would favor the monopoly price of $P_m = .5(1-\alpha)$, which leads to an inefficiently small Q. Whereas if consumer j has $w_j>\alpha$, the consumer would purchase the good if $P = \alpha$, and thus would favor setting a below-cost price of $P_b = .5\alpha$, which leads to an inefficiently large Q.

[6] These are, of course, very standard, with the lottery's efficiency following directly from the First Fundamental Theorem of Welfare Economics.

To show this more formally in a manner that sets up an easily extendable framework, consider that the policy's net benefits to individual i, as a function of auctioning Q units, can be expressed as the sum of consumer surplus (if any), shared revenue, and shared costs:

$$V_i = (w_i - P^*)\delta_i + (Q/n)P^* - (Q/n)\alpha$$

where

P^* denotes the equilibrium price

δ_i equals 1 if $(w_i - P^*) > 0$ and equals 0 otherwise

Supply and demand implies: $P^* = 1 - (Q/n)$. This yields:

$$V_i = (1 - P^*)(w_i - P^*)\delta_i + (1-P^*)(P^*-\alpha)$$

To find the individual's preferred P and Q, note that

$$\partial EV_i/\partial P^* = (2P^* - w_i - 1)\delta_i - (2P^* - \alpha - 1)$$

which yields (as noted above) the following preferred prices:

$P_m = .5(1 + \alpha)$; $Q_m = .5(1 - \alpha)n$ if $w_i < \alpha$

$P_b = .5\alpha$; $Q_b = (1 - .5\alpha)n$ if $w_i > \alpha$

Taking this a step further, we can identify a Condorcet winner among the policies – that is, we can identify a policy that will defeat all other options in pairwise voting. If $\alpha<.5$, then a majority of voters will prefer P_b to P_m (and to all other options). If $\alpha>.5$, then a majority of voters will prefer P_m to P_b (and to all other options). With $\alpha=.5$, the median voter (who has $w=.5$) will be indifferent between P_b and P_m, preferring either of those to all other options. In sum, simple majority rule does not support first-best options for price and quantity. Note that although the preceding discussion considered voting on price, the results hold for voting on a quantity to be auctioned at a market-clearing price: The outcome will be identical to choosing price because, either way, voters are choosing a point on the demand curve.

Tradable Rights Allocated by Lottery: The Same Inherent Misalignment

If, instead, voters choose a quantity to be allocated by lottery (i.e., units randomly assigned to members of the population), the voting results will be comparable to the auction outcome with respect to the choice of quantity (and hence the resulting price), although the distributive consequences will necessarily be different. To see why, note that with the lottery each individual's expected net benefits will be consumer surplus (if any) plus the expected value of winning the lottery, minus the per capita cost of Q:

$$EV_i = (w_i - P^*)\delta_i + (Q/n)P^* - (Q/n)\alpha$$

Thus, voters will behave identically to what we found when examining voting over price or a quantity to be auctioned. Of course, the random nature of the lottery has distributional effects: Rather than distributing shares of auction revenue (or sales revenue) equally among all n individuals, the lottery outcome means that lottery winners, in effect, share equally in an amount equal to the auction revenue.

Avoiding the Problem: Set Policy While Behind the Veil

A useful way to examine potential solutions to the problem – though perhaps better described as ways to avoid the problem – would be to commit to policy while still behind a veil of ignorance. If, for example, voters could set the price knowing costs (α) and the distribution of w (uniform between 0 and 1) before they knew who had what values of w, they would unanimously favor the first-best price ($P_f = \alpha$). Similarly, if the power to set prices could be delegated (without cost) to a benevolent social planner, behind-the-veil voters would unanimously favor doing so. The practical complication, of course, is how to commit to a policy, or delegate power, while still behind the veil.

Summarizing the Key Results

> *Implication 1: Voting to Set Prices Generates Undesirable Outcomes.* After the veil has been lifted, no one will support the first-best policy. Individuals with low reservation prices will prefer a high price (equivalent to the monopoly price) if revenue is equally divided among the population, while individuals with high reservation prices will prefer a low price (i.e., below marginal cost); individuals in the middle range would prefer going either way – to the high price or to the low price – instead of staying at the efficient price. Similarly, if allocating tradable rights randomly (e.g., by a lottery), no one will support the first-best quantity.

III. Alignment When the Market Includes Nonresidents

We will now consider what happens when voters can set policies with respect to allowing or blocking sales to nonresidents. Our starting point will be the case when nonresidents who purchase the good remain nonresidents (e.g., buyers of nonresident hunting licenses). After that, we will extend the analysis to consider the case when nonresidents who purchase the good gain the right to vote – the notable case being that when nonresidents purchase housing, they become residents and, thus, gain voting rights.

For this purpose, we make the same assumption about the distribution of willingness to pay, but allow demand to have two components. To keep the notation simple, let n denote (as before) the size of the resident population, and let e denote the nonresident population; that is, e indicates the number people who live "elsewhere" and have values of willingness to pay distributed uniformly ($0 \leq w \leq 1$).

When Nonresidents Remain Nonresidents

As a preliminary point, note that with our assumptions about costs (i.e., the total cost, $C = \alpha Q$, divided among the n members of the resident population), the analysis is very simple as long as resale from residents to nonresidents cannot occur. In the absence of resale, all residents will favor charging nonresidents the monopoly price: $P_e = .5(1 + \alpha)$. The problem of setting the

resident price remains identical to that described in Section I: Voters will low values of w will favor charging residents the monopoly price: $P_r = .5(1 + \alpha)$, while voters with high values of w will favor charging residents the below-cost price: $P_r = .5\alpha$. (Of course, the first-best price from an efficiency perspective would be unchanged: $P_f = \alpha$.)

What if resale can occur? In this case, each resident will (as in Section I) favor either the monopoly price, $P_m = .5(1 + \alpha)$ as before, or a lower price that would generate consumer surplus for the individual, now $P_b = .5\alpha(n+e)/n$.[7] For all residents, the addition of nonresidents to the demand curve increases the relative attractiveness of the monopoly price, because additional consumers raise the per-resident share of profits (at any given price) by a factor of (n+e)/n, while the consumer surplus for residents at P_b will fall, because P_b increases. This, in turn, increases the number of voters who favor P_m to P_b.

To see how the potential for resale can affect the political economy of the resident price P_r, consider the case in which α is below .5 by an infinitesimal amount. In this case, the absence of nonresidents in the market (i.e., e = 0) would cause the median voter to favor P_b over P_m by an infinitesimal amount. This implies that the effect of increasing e to a positive number would depend on the potential for resale: In the absence of resale, the median voter's choice (i.e., setting $P_r = P_b$ being preferred to setting $P_r = P_m$) would be unaffected by the increase in e. Yet in the presence of resale, an increase in e would swing the median voter into the position of preferring to set $P_r = P_m$.

In this light, something that blocks resale (whether the nature of the product, a norm, or a legal prohibition) may benefit some residents and harm others – and this occurs though a change

[7] We are implicitly assuming that the large number of residents (n) is sufficient to preclude collusion in resale, thus leading to one market price. If it is possible to choose between (i) selling at the monopoly price, $P_m = .5(1 + \alpha)$, to residents and nonresidents, and selling at a residents-only price with no resale, then the relevant residents-only solution for the below-cost price is $P_b = .5\alpha$, as in Section I.

in the alignment over pricing. If the ability to engage in resale would lead to the monopoly price for residents (by swinging the median voter's choice from P_b to P_m), then blocking resale would benefit residents with sufficiently high values of w (by leading to differential pricing for residents). Similarly, if a prohibition on resale leads to differential pricing, that prohibition will harm consumers with sufficiently low values of w, because they would prefer to charge residents the monopoly price.

Summarizing the Key Results

> *Implication 2: With Nonresident Buyers, Misalignment Among Voters Remains, and Outcomes May Depend on the Potential for Resale.* In the absence of resale, the addition of nonresidents (who do not vote locally) to the market leads to monopoly pricing for the nonresidents, leaving unchanged the misalignment problem with respect to setting the resident price. In the presence of resale (thus requiring a single price for residents and nonresidents alike), monopoly pricing becomes relatively more attractive for all voters, yet the fundamental nature of the misalignment problem remains. Moreover, a prohibition on (or other obstacle to) resale may swing the pricing decision toward a lower price for residents, thus benefiting some residents (those with a high reservation prices) and harming others (those with low reservation prices).

When Nonresident Buyers Become Resident Voters

We now consider how voter alignment problems change when the act of buying the good has, in essence, the effect of converting nonresident buyers into resident voters. The motivation for examining this scenario is, as we noted earlier, the market for housing. In Section IV, will explain in more detail how our approach to policy-driven prices and quantities applies to housing policies.

Deadweight Losses from Commitment Problems

When nonresident buyers gain the right to vote, the fundamental nature of the pricing problem faced by the original residents changes from what we have previously analyzed. To illustrate, consider again the scenario in which most of the original residents would support monopoly pricing for residents even in the absence of nonresidents (i.e., even if e=0). In this

case, increasing e will increase the monopoly profits shared by the residents; thus, if nonresident buyers cannot vote, the greater the value of e, the greater the number of residents who favor monopoly pricing, and the more strongly they prefer it. Yet, if nonresidents willing to pay the monopoly price become voters, that will increase the fraction of the electorate that favors a reduction in the price – and this will hold true whether or not the new voters share in the profits.[8] For a sufficiently large e, allowing sales to nonresidents would bring a sufficient large influx of new voters that a majority of the new electorate would oppose monopoly pricing.

The important point to recognize here is that commitment problems, not just the effects of monopoly pricing and below-cost pricing summarized in Implication 1, can contribute to deadweight losses. Consider again the case in which most of the original residents would support monopoly pricing for residents even in the absence of nonresidents, yet selling at the monopoly price to nonresidents would (though the addition of voters) end majority-rule support for monopoly pricing, leading to below-cost pricing. In this case, the original residents may, foreseeing the outcomes, prefer to block sales to nonresidents.

This illustrates the value of commitment devices. More precisely, finding a way to commit to future policy may enable an otherwise infeasible Pareto-improving alignment of voters. Continuing with the scenario from the previous paragraph, if the original residents have the option to block sales to nonresidents, but can commit to future policy, they would unanimously favor a law – perhaps a constitutional provision – that set the monopoly price. Such a provision would benefit all of original residents, because it would increase their profit shares (by creating unanimous support for selling to nonresidents) and have no effect on their consumer surplus (because the price would be the monopoly price either way). It would also

[8] If it were not just those willing to pay the monopoly price who gained voting rights and profit-sharing rights, but rather the entire set of nonresidents who gained those rights, the effect would merely be a scaling up of the population, equivalent to an increase in n.

benefit the nonresidents, because in the absence of the provision, being blocked from purchasing the good would leave them with no consumer surplus. A corollary to this point is that nonresidents would stand to gain from their own disenfranchisement, because that would have the same effect as a constitutional provision that guaranteed the monopoly price.

Summarizing the Key Results

> *Implication 3: A rational group of original residents will consider the endogeneity of the electorate when setting policy.* Even in the presence of constant marginal and average cost (implying that scaling up the size of the population would leave individuals unaffected), attracting a group of new voters willing to pay the monopoly price may undo the electorate's support for monopoly pricing. In this light, a commitment device – such as a constitutional provision requiring monopoly pricing or the exclusion of newcomers from voting – may benefit all involved parties.

Incorporating an Upward-Sloping Marginal Cost Curve

So far we have assumed that costs are described by $C = \alpha Q$. By assuming constant marginal and average costs, we developed a simple and useful way to examine questions of alignment over pricing decisions. For the case of in-migration, however, it is valuable to modify that assumption in order to allow for marginal costs to increase with quantity. Because extending our model to allow for an upward-sloping marginal cost curve is straightforward and generates intuitive results, we will explain the main implications here, relegating the algebra to Appendix A.

With an upward-sloping marginal cost curve, expanding the population of potential consumers now matters – even if the added population has the same characteristics as the original population. The logic of basic monopoly and competitive market models show that, conditional on the addition of new consumers leaving the collective decision unchanged (in the sense that a majority remains in favor of monopoly pricing or a majority remains in favor of below-cost pricing), prices will increase as a result of allowing sales to new (i.e., originally

nonresident) consumers. Thus, the old consumers stand to lose consumer surplus when the demand curve shifts out as a result of allowing sales to nonresidents.

The more interesting result is a twist on Implication 3's findings with respect to an endogenous electorate. With the potential for nonresident buyers to become resident voters, the original residents will consider not only the factors described in the previous paragraph (based on the collective decision not changing), but whether the collective decision will change. In this light, the alignment over whether to allow sales to nonresidents depends on the parameter values, rendering an interesting ambiguity with respect to our model's predictions about the real world. More specifically, if the potential number of new consumers is small (i.e., e is small) yet sufficient to swing the collective decision from monopoly pricing to below-cost pricing, the original residents with high values of w will (seeking additional consumer surplus) favor sales to nonresidents, while the original residents with low values of w will (seeking to avoid a reduction in profit shares) oppose sales to nonresidents. The alignment may be in the opposite direction, however, if the new consumers will not undo majority support for monopoly pricing: The original residents with sufficiently high values of w will (seeking to avoid a reduction consumer surplus) oppose sales to nonresidents, while the original residents with low values of w will (seeking larger profit shares) support sales to nonresidents. Finally, note that a commitment device can work in the same manner described in Implication 3: A credible legal commitment to monopoly pricing (or the exclusion of newcomers from voting) may benefit all involved parties.

Summarizing the Key Results

> *Implication 4: Even with very simple assumptions about benefits, costs, and voting, identifying the way voters will align over pricing policies can be complicated.* When sales to nonresidents will change the composition of the electorate, the way that a voter's reservation price (w) influences support for / opposition to allowing such sales may go in either direction: It may be that support comes from voters with a high w (seeking to swing the voting outcome in the direction of lower prices), with opposition from voters

with a low w (seeking to keep prices high), or it may be that opposition comes from voters with a high w (seeking to avoid an increase in the monopoly price), with support coming from voters with a low w (seeking higher monopoly profits).

IV. Nonmarket Allocation and Voter Alignment: Aristotle, Hunting, and Housing

We now consider how the basic principles developed in our model can illuminate some potentially puzzling policy decisions. The emphasis will be on whether institutions can be designed so that policy decisions are based on an alignment of incentives that matches to a "behind the veil" weighing of costs and benefits. In practice, of course, making decisions behind the veil will not be feasible, but a willingness to forego some efficiency in allocation may enable better alignment. [The discussion here is still very much in progress and will, in future drafts, be linked more formally to the theoretical model.]

Aristotle's Recommendation

To begin, recall the quotation with which we began this paper. Aristotle's proposal cannot yield a first-best outcome, because it necessarily precludes gains from specialization, but it may yield a second-best solution in light of a misallocation versus misalignment tradeoff: If the gains from specialization that must be forgone to have homogeneity with respect to land holdings are less than the expected costs of misalignment over the use of the military, then a rule that requires homogeneous land holdings (and thus necessarily blocks exchange) may be the best feasible policy.[9]

Our model can easily be extended to capture the basic logic of this tradeoff. The main modification is to have the value of the potentially traded good (land in Aristotle's example) reflect the collectively set quantity of a complementary public good (defense in Aristotle's example). If the public can commit to an efficient level of public good provision, there is no

[9] Fleck and Hanssen (2017) provide a detailed analysis of this point, explaining how an understanding of the tradeoff can account for differences between Athenian and Spartan institutions.

reason to block exchange of the tradable good. But if commitment is not possible, allowing exchange will, for the reasons described in our model's Implication 1, generate inefficient majority-rule outcomes: Public good production will be too high or too low. In this case all property owners – including those who would sell at the market price – may favor a prohibition on exchange. Thus, a policy that restricts trade may increase the value of property rights and, thereby, yield an outcome that Pareto dominates a policy that allows exchange.[10]

Rights to Hunt Wild Game

For several reasons, the rights to hunt and fish for wild game provide a particularly interesting opportunity to apply our model. First, the potential for undesirable outcomes, especially in the presence of open access, is obvious, and this provides strong incentives to assign property rights or otherwise improve incentives for wildlife management (e.g., Ellickson 1989; Lueck 1989; Ostrom 1990; Anderson 1995). Second, some real world outcomes are clearly wasteful – consider the costly but often ineffective efforts to stop the poaching of elephants, rhinos, and tigers. Third, there is wide variation in the institutional foundations used to support more successful outcomes.

Consider the way hunting is managed in the United States. Although the results are far from perfect, public support for state-level management under the public trust doctrine has generally been quite solid.[11] What is most striking, however, in the context of our model is that all states have similar features and use a mix of allocation mechanisms.[12] In all states, nonresidents pay more than residents, as we would expect from Implication 2 if resident hunters

[10] We will add a more formal theoretical analysis.
[11] See Watson (2012) on the law and economics of the public trust doctrine.
[12] Our empirical analysis is in progress. So far, we have collected data on hunting laws in 49 of the 50 states (Alaska, an outlier in many ways, is the exception). The data were collected from state game commission web pages (e.g., http://fwp.mt.gov/hunting/regulations/ for Montana).

are the dominant political coalition.[13] Furthermore all states employ lotteries for some but not all species.

Given that we observe the use of differential prices and the use of lotteries, it seems reasonable to infer that resident non-hunters would, if they could capture the revenue, stand to gain from charging higher prices to hunters. And, of course, if hunters could capture the revenue, they would also stand to gain from moving toward a wealth-maximizing allocation of rights to hunt the most prized species. What would explain such a widespread and durable combination of allocation mechanisms? Boyce (1994) shows how a lottery without resale can increase the rents to hunters without allowing non-hunters to participate in the lottery as speculators. We provide an additional, complementary insight: In the context of our model, and in particular in view of Aristotle's reasoning, lotteries for hunting rights can be understood as mechanisms to provide behind-the-veil incentives for specific kinds of decisions. For hunters who expect to enter, say, a bull elk lottery and a bighorn sheep lottery every year, decisions with respect to the inter-temporal allocation of resources that improve hunting quality are very well aligned: Everyone owns a probabilistic right to hunt this year, a probabilistic right to hunt next year, and so on. Thus, until the winners are announced, lottery participants have Aristotle-style homogeneity in hunting rights, analogous to being behind the veil. There is, of course, still a deadweight loss from the misallocation of hunting rights generated by a lottery without

[13] Our model employs a simple majority-rule mechanism as a tractable way to characterize democratic decision-making, but in reality, hunting policy in the United States is set through representative government – often with the representatives delegating powers to agencies. That said, voters' preferences should still influence policy in a manner similar to what we model. Moreover, in the presence of logrolling in legislatures, voters with much at stake need not be a majority in order to swing policy decisions in their favor (e.g., Riker 1982; Fleck 2008).

tradability, but the alignment generated by the lottery without tradability will be an offsetting benefit.[14]

By contrast, we would expect that an American style system, in which residents enter lotteries for non-tradable rights to hunt the most prized species, would be highly inefficient for allocating rights to hunt in Africa. The simple reason is that the nonresident demand will generally far exceed resident demand – in other words, the number of locals willing to pay many thousands of dollars to hunt a lion or a cape buffalo will be much smaller than the number of foreigners willing to do so. Thus, if the local population has the ability to set policy and enforce property rights, we would expect the rights to be sold principally to foreigners – though within the context of our model, it would not matter whether the rights were sold directly to foreigners or allocated (say by lottery) to local residents who could sell the rights. What would matter in practice, however, is something outside the scope of our model: Whether selling rights directly to foreigners or allocating tradable rights to residents, the outcome – especially with respect to poaching – will depend on degree to which those who receive the residual claims can monitor and enforce their property rights.[15]

NIMBY Regulations and the Deadweight Loss of Rent Control

Recent political and scholarly concern about an "affordable housing crisis" in certain parts of the United States has focused attention on NIMBY ("not in my backyard") regulations. Basic supply and demand is sufficient to explain why homeowners who plan to sell the homes in the future would favor restrictions on building: Shifting the supply curve rightward drives down the value of the asset they plan to sell. Moreover, to the extent that there are associated external costs (e.g., new construction brings with it a population increase, which in turn causes crowding)

[14] Recall that although allowing lottery winners to sell their rights would improve allocation, it would generate misalignment along the lines described in Implication 1.
[15] This point follows the logic set out in Barzel (1989).

for which the original residents cannot secure compensation, the NIMBY incentives will be amplified. A more interesting question, however, is why some cities, most prominently San Francisco and Los Angeles, in which high rents have taken center stage in the political arena would nevertheless allow little construction of market-priced rental housing – and this is despite having many renters and relatively low population densities for cities with such high rents.

Our focus will be on the incentives of renters who live in rent-controlled apartments or other housing for which they pay below-market prices. Once again, basic supply and demand with external costs (and a price control applied to some units) can explain why such tenants would oppose the construction of new market-priced housing: Shifting out the supply curve will not (at the margin, at least) reduce the below-market rent they pay, yet they will bear some of the external costs. Thus, tenants paying below-market prices will oppose new construction, for essentially the same reasons homeowners will.

Yet there is more to the issue. With the government-allocated good being stylized building permits for apartment units, we can consider the logic of Implications 2, 3, and 4. To focus on the addition of new housing, assume the starting point is an efficient allocation of units among the original residents (i.e., the supply and demand outcome). Then suppose a rent control ordinance is imposed, with the original residents having a non-tradable right to remain in their apartments paying the price that had cleared the market.

If the original tenants can set a price for new building permits (as a one-time fee to be shared among equally among the original tenants), the price will be set to maximize their net gains from selling those permits. Thus, the price reflects their market power – and recall that tenants who pay below-market prices are, in essence, sellers of building permits but not, at the margin, affected by the lower prices brought about by increasing the number of permits. Note

that if external costs exist, the permit price will reflect those costs, but the key point is that, regardless of whether there are external costs, the price will be inefficiently too high.

This may help to explain high "impact fees" for new construction, but, as we will now discuss, the model's implications are not dependent on the original residents being able to collect impact fees or otherwise sell building permits. Henceforth, we will assume that permits have a price of zero, with voters setting the quantity to be given away.

As in Implications 3 and 4, the endogeneity of the electorate has effects on incentives. One obvious point is that, if future voters can remove rent control, and if newcomers would have an incentive to do so, the original tenants will have the incentive to oppose construction of market-priced housing if the increased demand form newcomers is sufficiently large that the newcomers will form a majority. And, with an upward-sloping demand curve, newcomers will indeed favor the removal of rent control, because tenants with a willingness to pay less than the market price will, if rent control is removed, vacate their apartments, thus reducing the market price. This, in turn, will lead the original tenants to oppose new construction (even in the absence of externalities) if there is a sufficiently large demand for new construction. Put another way, tenants paying below-market rates have more reason to oppose new market-priced housing under conditions that imply the deadweight loss resulting from that opposition will be particularly large. Thus, once again, voting can be an undesirable way to set policy. In this light, opposition to "gentrification" may make sense.[16]

Now consider the role of prohibitions on resale. That is, why not allow tenants who hold rent-controlled leases to sell those rights, such as through subletting? As our theoretical analysis emphasizes, the endogeneity of the electorate may create incentives to block trade. In the

[16] For example, in San Francisco, the in-migration of high tech workers – whom the city considered subjecting to special tax surcharge – will change the electorate.

context of rent control, if the original tenants (holders of rent-controlled contracts) who sublet at market rates moved to another jurisdiction (hence voting elsewhere), while the new tenants became voters, the process of subletting could (as "resale" in our model can) swing support in favor of building new housing. Recall that the new tenants would have a reason to favor a greater quantity of building permits – indeed, they would favor a quantity in excess of the efficient quantity. In this light, even if rent control cannot ever be undone, tenants holding rent-controlled leases – even those tenants who individually would stand to gain from subletting – may be in favor of collectively enforcing a prohibition on subletting. Put another way, the property rights to reside in rent-controlled apartments may be more valuable if those rights cannot be sold. Of course, this additional value does not reflect a net gain, because it comes at a cost, including the forgone consumer surplus among would-be newcomers who, instead, remain nonresidents.[17]

Finally, note that we have provided more reason to expect rent control policies to create deadweight losses. In the standard textbook analysis, the causes of deadweight losses include the inefficiently small quantity of rental housing and the inefficient allocation of that reduced quantity. Yet, as we argue, the occupants of rent-controlled apartments have incentives to oppose efficiency-enhancing policies, including the construction of new market-priced housing. This will add to the magnitudes of the deadweight losses described in textbooks.

[17] A corollary to this point is that tenants who seek to maintain a coalition against the construction of market-priced housing will have an incentive to expand the number of tenants paying below-market prices. If it is infeasible to expand the number of rent-controlled units, one alternative is "affordable housing" mandates, such as a requirement that a certain fraction of new construction be set aside for below-market rates. Naturally, some non-market mechanism (e.g., a lottery or queuing) must be employed to allocate the "affordable" units.

Aristotle Once Again

As a thought experiment, consider what Aristotle might suggest to mitigate the problem of rent control creating incentives for tenants to oppose the construction of new housing (while tenants paying market rates might favor excessive construction of new housing). If tenants in rent-controlled apartments periodically had to enter a lottery in which they might retain or might lose their right to a rent-controlled unit (while other tenants might gain the right to occupy those units), the incentives of tenants would be better aligned. This would be analogous to ancient Greeks owning land in two parts of their city-state, as well as analogous to hunters entering lotteries every year.

Similarly, the incentive effects of military conscription (versus a volunteer system) will depend on timing. If the draft lottery occurs prior to the decision of whether to fight a war, the decision of whether to fight will be made out from behind the veil: Borrowing Aristotle's wording, those not drafted may be "too ready to come to blows with their neighbors" while those who are conscripted may be "so cautious that they quite lose the sense of honor." By contrast, if the decision to fight precedes the draft, the incentives with respect to the collective decision will be relatively well aligned.[18]

V. Conclusion

This paper provides new insight into the potential tradeoff between the misallocation of goods and the misalignment of incentives. Although the basic idea of the tradeoff has long been recognized, dating back at least to Aristotle, it has received relatively little attention in the economics literature. As our model demonstrates, in some circumstances, imposing restrictions on the transferability of property rights may, while worsening misallocation, generate offsetting

[18] We will add citations to the literature.

benefits by improving the alignment of incentives over collective decisions. Consequently, the holders of some types of property rights may collectively favor restrictions on transferability, even though – individually – they would stand to gain from the ability to sell their rights. In sum, we argue that the value of maintaining alignment over collective decisions provides a plausible rationale for the variety of allocation mechanisms that include prohibitions on exchange.

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Appendix A: Allowing for an Upward-Sloping Marginal Cost Curve

To demonstrate the effects of modifying the cost function to allow marginal cost to increase with Q, let the cost function be:

$$C = \alpha Q + \beta Q^2 \qquad \alpha \geq 0; \beta \geq 0$$

which yields:

$$MC = \alpha + 2\beta Q$$

and the cost to resident i:

$$c_i = \alpha + \beta Q$$

With costs thus defined, the identification of the first-best pricing and of monopoly-pricing (without differential pricing based on residency) is very simple: Find where P = MC for the first-best, and find where MR = MC for the monopoly:

$$P_f = 1 - (1-\alpha)/[2\beta(n+e)+1]$$

$$P_m = 1 - (1-\alpha)/[2\beta(n+e)+2]$$

Maintaining for the moment our earlier assumption that nonresidents do not vote (and assuming no resale), the important change is that the profit-maximizing nonresident price (P_e) now depends on whether the resident price (P_r) is set to maximize gains to residents as a whole, to residents with values of w sufficiently low that they do not purchase the good, or to residents with values of w sufficiently high that they will purchase the good.

To find the combination of prices that maximizes the net returns to the residents (i.e., what they would want behind the veil), the task is to find the combination at which the resident price, nonresident marginal revenue, and marginal cost are all equal, where:

$$P_r = 1 - Q_n/n$$

$$MR_e = 1 - 2Q_e/e$$

$$MC = \alpha + 2\beta(Q_n + Q_e)$$

Using the subscript v to denote what residents would want behind the veil, this yields the following pair of prices:

$$P_{r,v} = 1 - [(1-\alpha)/(2\beta n+\beta e+1)]$$

$$P_{e,v} = 1 - .5[(1-\alpha)/(2\beta n+\beta e+1)]$$

Of course, for the reasons we have emphasized, even though the resident voters would favor this outcome behind the veil (i.e., knowing they would be resident voters, but not knowing their values of w), they will not support it after the veil has been lifted. Note, for example, that if voter i has $w_i = P_{r,v}$, that voter would prefer (relative to $P_{r,v}$) both a set of higher prices (thus increasing profits shared among residents) and a set of lower prices (thus increasing consumer surplus more than enough to offset the marginal loss in shared profits).[19]

[19] Add details here.