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EXCESSIVE RENTS AND NON-COMPLIANCE WITH PRICE CEILINGS

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Abstract
Standard microeconomic theory warns us that price controls create incentives for non compliance. In this paper we analyze the suppliers' compliance with price ceilings decisions in a competitive sector, focusing on rent controls. We conclude that, first, forcing a non-complying landlord to simply return all payments in excess of the maximum allowed amount constitutes an implicit, nevertheless effective, real penalty. Second, instead of bringing the price back to its free market level, black market results to some implicitly defined ceiling, above the legal one. Third, as the gap between the ceiling and the free market price increases, the efficiency of fixed fines relative to that of proportional fines is reduced.

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Introduction

Price ceilings as well as price floors have mainly been introduced as a means to protect the "weak side" in a market transaction. Agricultural products' price floors, for instance, are set in order to protect agricultural income, usually considered vulnerable under free market conditions. Similarly, rent and gasoline price controls have been introduced in order to protect consumers' purchasing power, since these goods are considered to represent a major part of a household's budget.[2]

Standard microeconomic theory warns us that price controls create incentives for non compliance. Farmers often wish to sell more than their quota and when they find it impossible sell their excess supply through black market channels at lower prices. Similarly, apartment owners often demand higher rent from new tenants, either because the latter may be unaware of the previous rent, or, more frequently, based on the presumption that the prospective tenants may fear that the apartment will be rented to someone else, more willing to accept the landlord's demands.[3]

In this paper we analyze the suppliers' compliance with price ceilings decisions in a competitive sector. Although our analysis applies as well to most cases involving a price ceiling, we focus on rent controls.[4] While much has been written on price ceilings,[5] the question of compliance has been neglected. Our work borrows from Grenier (1982) where, in reply to Ashenfelter and Smith (1979), it is shown that forcing a firm caught paying wages lower than the legal minimum to reimburse the difference to its workers may effectively deter such behaviour. Our model shows that the analysis in Grenier (1982) can also be applied to price ceilings, clarifying, at the same time, an important point on the elasticity involved. Moreover, it further completes the analysis by introducing a more sophisticated penalty scheme.

The model

Let p^* and $\overline{p}$, with $p^* \geq \overline{p}$, denote the free market and controlled rent, respectively, and $S(q, p, X)$ represent individual producer's surplus, where X is a vector of cost parameters. Let $q(p)$ be the quantity of space an individual landlord is willing to rent out at any market price

2. Examples of ceilings can also be found on basic foodstuff prices during periods of great adversity (war, severe production shortages, *etc.*)
3. See Basu and Emerson (2000, 2003) for the asymmetric treatment between old and new tenants
4. The literature on rent controls, both theoretical and empirical, is enormous. For instance, Thies (1993) examines search costs and efficiency; Glaeser and Luttmer (2003) evaluate empirically the cost of apartment misallocation in New York. Little, however, has been done on compliance issues.
5. See, among others, Lee (1978), Chen and Rosenthal (1996), and Knittel and Stango (2003).

(supply function), and let $q(p^*) \equiv q^*$, $q(\overline{p}) \equiv \overline{q}$, be the supplied quantity at the free market price and the ceiling, respectively. An effective ceiling implies $S(\overline{q}, \overline{p}, X) \le S(q^*, p^*, X)$, which creates an incentive to disobey the law, thus, making compliance impossible without detection and punishment. We assume that detection occurs with probability $\lambda \le 1$. For a landlord caught receiving higher than the allowed rent, penalty takes two forms: a fixed amount *F,* and an amount proportional, by a factor μ, to the amount extracted unlawfully. The expected surplus of a non complying landlord is, therefore:

$$\mathrm{E}\left[S(p^*, \lambda, \mu, F, X)\right] = S(p^*, X) - \lambda\left[\mu \cdot (p^* - \overline{p}) \cdot q(p^*) + F\right], \tag{1}$$

where $\mu, F \ge 0$. When $\mu = 1$ and $F = 0$, the penalty consists of simply returning the amount of rent gained unlawfully.

Apartments are offered by a fixed, but sufficiently large, number *n* of competing developers, each having an upwardly sloping supply curve. The latter is equivalent to assuming that apartment space has alternative uses and that land can be built and/or transformed into apartments within the period under consideration. While existing developers can perform such works within the considered time length, outside developers need a lot more time to enter the market.

Assuming risk neutrality, a landlord will cheat and risk to get caught if $\mathrm{E}\left[S(p^*, \lambda, \mu, F, X)\right] \ge S(\overline{p}, X)$, which, from (1), implies:

$$S(p^*, X) - \lambda\left[\mu \cdot (p^* - \overline{p}) \cdot q(p^*) + F\right] > S(\overline{p}, X). \tag{2}$$

Using Taylor series to expand the RHS of (2) around p^* we get

$$S(\overline{p}, X) \simeq S(p^*, X) + \frac{\partial S(p^*)}{\partial p}(\overline{p} - p^*) + \frac{1}{2}\frac{\partial^2 S(p^*)}{\partial p^2}(\overline{p} - p^*)^2. \tag{3}$$

Substitution of $S(\overline{p}, X)$ from (3) back to (2) yields, after some further manipulation:

$$-\frac{\partial S(p^*)}{\partial p}(\overline{p} - p^*) - \lambda\left[\mu \cdot (p^* - \overline{p}) \cdot q(p^*) + F\right] > \frac{1}{2}\frac{\partial^2 S(p^*)}{\partial p^2}(\overline{p} - p^*)^2.$$

Taking into account that $\partial S(p^*)/\partial p = q(p^*) \equiv q^*$, and $\partial^2 S(\bullet)/\partial p^2 = \partial q(\bullet)/\partial p$, the expression above can be further simplified to

$$q^* \cdot (p^* - \overline{p}) \cdot (1 - \lambda\mu) - \lambda F > \frac{1}{2}\frac{\partial q(p^*)}{\partial p}(\overline{p} - p^*)^2.$$

Defining $Q^* \equiv nq^*$ as the quantity supplied at the free market price, substituting Q^*/n for q^*, bringing it to the RHS, and dividing both sides by $\left(p^* - \overline{p}\right)$, we obtain

$$1-\lambda\left[\mu - \frac{n}{Q^* \cdot \left(p^* - \overline{p}\right)} F\right] > \frac{1}{2} \cdot \frac{1}{n} \frac{\partial Q^*}{\partial p} \frac{\left(\overline{p} - p^*\right)}{Q^*/n}.$$

Multiplying and dividing the RHS by p^* and performing some simple manipulations on the LHS, we obtain that non-compliance will occur when

$$1-\lambda+\lambda\frac{(1-\mu)\cdot\left(p^*-\overline{p}\right)\cdot q\left(p^*\right)-F}{\left(p^*-\overline{p}\right)\cdot q\left(p^*\right)} > \frac{1}{2}\varepsilon\frac{\left(p^*-\overline{p}\right)}{p^*}, \tag{4}$$

where ε is the market elasticity of supply. Expression (4) relates the non-compliance condition of an individual landlord to a) the probability of escaping detection $1-\lambda$, b) the penalty structure, c) the gap between the price ceiling and the free market price, and d) the market supply elasticity ε.

Setting (4) as equality yields the μ and F combinations such that the landlord is indifferent between complying and not complying with the law:[6]

$$\mu = \frac{1-\frac{1}{2}\varepsilon\left(\frac{p^*-\overline{p}}{p^*}\right)}{\lambda} - \frac{1}{\left(p^*-\overline{p}\right)\cdot q^*} F \tag{5}$$

Figure 1 illustrates two such indifference lines, $\left[\hat{\mu}, \hat{F}\right]$ and $\left[\hat{\mu}', \hat{F}'\right]$, separating the compliance and no-compliance regions in the $\left(F, \mu\right)$ space.

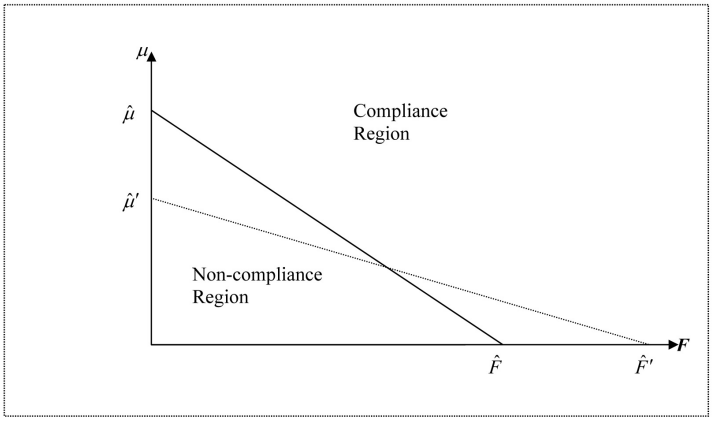

Fig. 1

6. We are grateful to the referee of this journal for pointing this out.

The position of an indifference line depends on factors a) – d) above. It can be easily verified that, as λ —the probability of detection— increases, the indifference line moves downwards, thus squeezing the non-compliance region. Similarly, the indifference line moves downwards with an increase in supply elasticity, compliance will, therefore, be more likely observed in markets where market supply is elastic.[7]

Setting $F = 0$ we obtain $\hat{\mu}$ such that any $\mu > \hat{\mu}$ will result in compliance without the need of a fixed fine; obviously, $\left(\partial\hat{\mu}/\partial\varepsilon\right) < 0$. Interestingly, when $\varepsilon > 0$, $\hat{\mu}$ can be ≤ 1. When $\mu = 1$, simply obliging a cheating landlord to return all the unlawfully earned rent may be sufficient to deter non compliance. We call this the "Grenier paradox": the landlord refuses a lottery yielding $\left(p^* - \overline{p}\right) \cdot q^*$ with positive probability $\left(1 - \lambda\right)$, and 0 with probability λ.[8] This paradox can be explained by the fact that $q\left(\overline{p}\right) < q^*$, therefore, $\varphi \equiv S\left(q\left(\overline{p}\right); \overline{p}\right) - S\left(q\left(p^*\right); \overline{p}\right) \geq 0$: a landlord caught cheating ends up supplying more than the profit maximizing quantity at $\overline{p}$, paying, in consequence, an implicit penalty, φ. The magnitude of φ depends on the elasticity of supply: the more elastic the supply is, the higher the $q^* - q\left(\overline{p}\right)$ difference, and the more drastic the impact of the implicit penalty. Obviously, when supply elasticity is very high, $\hat{\mu} < 1$, therefore, even remitting less than the unlawfully earned rent may be sufficient to deter non-compliance. On the other hand, when $\varepsilon = 0$, $q\left(\overline{p}\right) = q\left(p^*\right)$, therefore, $\varphi = 0$: compliance can only be obtained through the use of additional penalties, whether fixed or proportional.[9]

One might expect that the larger the difference $p^* - \overline{p}$, the greater the temptation to sell at market price. Setting $F = 0$ in equations (4) or (5), we see that, contrary to this expectation, return to free market price is less likely when the ceiling differs markedly from that price. To see why, let $\mu = 1$, so that only the implicit penalty is imposed to a landlord caught cheating. Then, as the $p^* - \overline{p}$ difference increases, the more reluctant a landlord becomes about selling the units

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7. This result will be analyzed below.
8. Grenier (1982) points out this paradox in regard to compliance with minimum wage laws (price floors). In that case the crucial factor is labor demand (rather than supply) elasticity.
9. It is well known that in the long run supply is more elastic than in the short run (on rent supply elasticities, see Turner and Malpezzi (2003). This implies that compliance problems are more severe in the short run.

in the neighborhood of q^* at price equal $\overline{p}$, hence, the value of φ increases. In general, as the ceiling becomes tighter, $\hat{\mu}$ moves down to a point such as $\hat{\mu}'$ (see Figure 1), implying that the effectiveness of proportional penalties increases with the distance between the ceiling and the free market price. One should not conclude, though, from this discussion that setting a sufficiently low ceiling guarantees compliance. Simply, when the ceiling is too low relative to the free market price, charging a price equal to the latter may be too dangerous for landlords as it increases the proportional penalty. Landlords may still cheat, but not up to the market clearing price.

Adding the fixed fine into the picture, we see that the effect of the difference $p^*-\overline{p}$ on compliance is ambiguous. On the one hand, tightening the ceiling reduces $\hat{\mu}$, but, on the other, it also reduces the slope of the indifference line in absolute terms, thus, reducing the efficiency of fixed fines. Let $\hat{F} \equiv \left(\frac{p^*-\overline{p}}{\lambda}\right)\left(1-\frac{\varepsilon}{2}\cdot\frac{p^*-\overline{p}}{p^*}\right)$ be the minimum fixed fine that induces compliance when $\mu = 0$. The sign of $\partial\hat{F}/\partial\left(p^*-\overline{p}\right)$ can be either positive or negative. Assume $\partial\hat{F}/\partial\left(p^*-\overline{p}\right)>0$, and let the difference $p^*-\overline{p}$ increase. This situation is depicted on Figure 1 as a move from the solid $\left[\hat{\mu},\hat{F}\right]$ line to the doted $\left[\hat{\mu}',\hat{F}'\right]$ one. What we see here is that penalty structures relying heavily on the fixed fine, such as point A in the neighborhood of $\left(\hat{F},0\right)$, stop inducing compliance when the difference between free market price and the ceiling becomes more important. On the other hand, when $\partial\hat{F}/\partial\left(p^*-\overline{p}\right)<0$, the efficiency of fixed fines increases as the ceiling becomes tighter. Even then, however, the slope of the indifference line is reduced in absolute terms, making the use of μ more effective. Thus, when the difference between free market and the ceiling price is small, fixed fines are more effective, while proportional fines work better in inducing compliance with tighter ceilings.

Conclusions

We have examined a model of non-compliance in the presence of effective price ceilings, using controlled rents as an example. Our first conclusion is that the Grenier paradox applies not only to price floors but also to situations of price ceilings: forcing a non-complying landlord to simply return all payments in excess of the maximum allowed amount constitutes an implicit, nevertheless effective, real penalty. Whether this penalty is able to induce compliance depends directly on the elasticity of supply. Second, we have shown that black market may not lead back to the free market price when the probability of detection is positive, but rather to some other ceiling,

which can be implicitly defined by setting (4) as equality. Third, as the gap between the ceiling and the free market price increases, the efficiency of fixed fines relative to that of proportional fines is reduced.

The results presented in this paper constitute a first step towards a more thorough analysis of price ceilings. High in our research agenda figure a) the introduction of profit maximization in order to determine endogenously the deviation of market price from the ceiling, and b) the examination of incentives to cheat in the presence of monopoly power. The latter may be of special interest since most European competition authorities fine monopoly behavior proportionally to the revenues illegally earned.

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