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THE REGULATION OF REPUGNANT
GOODS AND THE LIMITS OF THE
ALCHIAN- ALLEN EFFECT

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The Regulation of Repugnant Goods and the Limits of the Alchian-Allen Effect

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Abstract: We argue in this article that constant-quality models like the one used to derive the Alchian-Allen effect are of very limited use in the analysis of the regulation of repugnant goods (morally contested goods ranging from human organs to sex work, pornography, and surrogate motherhood). The Alchian-Allen effect has often been applied in the literature on the regulation of repugnant goods, for instance to suggest that a common unit cost imposed on alcoholic drinks will lead the consumer to substitute less potent alcoholic drinks for more potent alcoholic drinks. Various authors have suggested that this effect is so broadly relevant that we should speak of an iron law of prohibition: “the harder the enforcement, the harder the drugs”. We demonstrate that the Alchian-Allen effect has a narrow domain of validity, does not always suggest that regulation has adverse effects, and its predicted effects depend strongly on the goods selected for analysis. Moreover, real-world regulations do not impose a common unit cost. Therefore, the Alchian-Allen effect is not helpful to analyze the regulation of repugnant goods. We further highlight the relevance of Barzel’s work on the incompleteness of regulation, and the importance of quality adjustments in response to regulation.

JEL codes: A13, D01, H21, L51.

Keywords: Regulation, Unit Cost, Alchian-Allen Effect, Repugnant Goods

Recent discussions on the morality of markets have centered on so-called “repugnant goods”, ranging from human organs to sex work, pornography and surrogate motherhood (Roth 2007; Healy and Krawiec 2017). Although sometimes repugnance is primarily understood as goods involving the human body or intimacy, others have applied the concept more broadly to all goods which are morally contested (Leuker, Samartzidis, and Hertwig 2021). In a recent work, repugnance has been defined as “a socially constructed disapproval of market transactions expressed in moral terms by third parties” (Dekker and Gradoz 2023, p. 903). This definition covers a broader set of moral externalities to which third parties might object. This means that repugnance now typically includes the category of goods previously analyzed as “sin” or “demerit” goods. There is an extensive literature on the question whether to levy sin taxes on these goods, and their optimal level (e.g., Antonelli et al. 2022). One key argument against sin taxes is the “Alchian-Allen effect” which

“suggests that an increase in the prices of two goods by the same amount leads to a decrease in the relative price of the more expensive good, and hence to a relative increase in the compensated demand for that good” (Minagawa and Upmann 2015, p. 1893). When the price of a good is related to its potency, as it is the case for most drugs, this effect suggests that a common unit cost (such as a per unit excise tax) will lead the consumer to purchase (relatively) more potent goods.

It is a small step, therefore, to use the Alchian-Allen effect as a counterargument to regulate or criminalize repugnant goods. Some have done this under the banner of the “iron law of prohibition”, summarized in the phrase, “the harder the enforcement, the harder the drugs” (Cowan 1986). By applying the Alchian-Allen effect to repugnant goods, several contributions argued that regulation may have the opposite effect than the one sought by third parties, in the sense that the basket of goods purchased by the consumer is considered more repugnant by third parties (Thornton 1998; 2007; Austin and Ressler 2012; Lawson and Nesbit 2013; Nesbit 2018). If this effect could actually be applied to the regulation of repugnant goods, the Alchian-Allen effect would indeed be a compelling objection. We argue in this article that the Alchian-Allen effect does not translate from the restricted domain of a common unit cost to the broader domain of the regulation of repugnant goods, especially the prohibition of transactions.

First, the Alchian-Allen effect is a specific price-theoretic result which only holds under a set of strict conditions hardly ever met outside of microeconomics textbooks, and even there we must assume that producers do not engage in quality adjustments. Second, under these conditions, the effect is a result about the evolution of the ratio of the compensated demand for the more expensive good and the compensated demand for the less expensive good, and not about the evolution of the total consumption of the two goods. Income effects suggest that in nearly all instances overall consumption of the two goods, say two different types of alcoholic drinks, has gone down, although the relative consumption of the more expensive alcoholic drink is higher. Third, the effectiveness of the Alchian-Allen objection to the regulation of repugnant goods hinges crucially on the identification

of the relevant alternatives, an issue hardly discussed in the literature. Overall, the Alchian-Allen effect is a partial equilibrium result which is frequently not applicable to the analysis of the regulation of repugnant goods. To support this idea, we notably rely in this article on the work of Yoram Barzel, and more specifically on his analysis of the taxation of sin goods (Barzel 1976), which highlights the incompleteness of any form of regulation. His analysis is critical of “constant-quality models,” like that of Alchian and Allen, and proposes an alternative which recognizes the multiple margins of adjustment. Once quality adjustments are introduced there is no longer an *a priori* expected direction for the substitution. Instead, the likely effects depend on the institutional details of the regulation and the type of alternatives which are developed in response.

This article is structured as follows. In the first section, we revisit the Alchian-Allen effect and the conditions under which it holds. In the second section we illustrate the problematic analogy to the analysis of repugnance regulation with an example drawn from pornography regulation. In the third section, we engage in a critical discussion with several contributions that have applied the Alchian-Allen effect to repugnance regulation, notably as the underlying mechanism explaining the iron law of prohibition. The fourth section presents Barzel’s analysis of the taxation of sin goods and his critique of constant-quality models.

1 The Alchian-Allen Effect

The Alchian-Allen effect is named after the economists Armen Albert Alchian (1914-2013) and William Richard Allen (1924-2021) who have described this effect in their book *University Economics* (1964). According to its general definition, the Alchian-Allen effect “suggests that an increase in the prices of two goods by the same amount leads to a decrease in the relative price of the more expensive good, and hence to a relative increase in the compensated demand for that good” (Minagawa and Upmann 2015, p. 1893). Minagawa and Upmann (2015) present the following model. They assume three goods, labeled 1, 2 and 3. The quantity of good i purchased by the consumer is denoted x_i . p_i is the price of good i . It is assumed that $p_1 > p_2$ and a well-behaving utility function

$U(x_1, x_2, x_3)$. The price of goods 1 and 2 is then increased by a common unit cost t , so that the price actually paid by the consumer for good 1 is $p_1 + t$ and $p_2 + t$ for good 2. The expenditure minimization problem of the consumer corresponds to the minimization of $(p_1 + t)x_1 + (p_2 + t)x_2 + p_3x_3$, according to x_1, x_2 and x_3 , under the constraint that $U(x_1, x_2, x_3) \geq v$ (with v a given level of utility). This model excludes corner solutions, as most models which have investigated the Alchian-Allen effect (Cowen and Tabarrok 1995, p. 253). Therefore, all the goods proposed on the market are purchased by the consumer in equilibrium. The compensated demand function for good i is denoted $x_i(p_1, p_2, p_3, t, v)$. According to Borchering and Silberberg (1978), the Alchian-Allen effect could be reformulated as $\frac{\partial x_1(\cdot)}{\partial t x_2(\cdot)} > 0$. This definition is nowadays commonly used (e.g., Bauman 2004). We have:

$$\frac{\partial x_1(\cdot)}{\partial t x_2(\cdot)} = \frac{\frac{\partial x_1(\cdot)}{\partial t} x_2(\cdot) - \frac{\partial x_2(\cdot)}{\partial t} x_1(\cdot)}{x_2(\cdot)^2}$$

We write $\frac{\partial x_i(\cdot)}{\partial t} = \frac{\partial x_i(\cdot)}{\partial p_1} + \frac{\partial x_i(\cdot)}{\partial p_2}$. If we replace and rearrange the previous equation, we obtain:

$$\frac{\partial x_1(\cdot)}{\partial t x_2(\cdot)} = \left(\frac{x_1(\cdot)}{x_2(\cdot)} \right) \left[\frac{\partial x_1(\cdot)}{\partial p_1} \frac{p_1}{x_1(\cdot)p_1} + \frac{\partial x_1(\cdot)}{\partial p_2} \frac{p_2}{x_1(\cdot)p_2} - \frac{\partial x_2(\cdot)}{\partial p_1} \frac{p_1}{x_2(\cdot)p_1} - \frac{\partial x_2(\cdot)}{\partial p_2} \frac{p_2}{x_2(\cdot)p_2} \right]$$

If we denote ε_{ij} the compensated elasticity of demand for good i according to the price of good j , we can rewrite the previous equation as:

$$\frac{\partial x_1(\cdot)}{\partial t x_2(\cdot)} = \left(\frac{x_1(\cdot)}{x_2(\cdot)} \right) \left[\frac{\varepsilon_{11}}{p_1} + \frac{\varepsilon_{12}}{p_2} - \frac{\varepsilon_{21}}{p_1} - \frac{\varepsilon_{22}}{p_2} \right]$$

As the compensated demand function is homogenous of degree 0 (Mas-Colell, Whinston, and Green 1995, p. 61), we have $\varepsilon_{11} + \varepsilon_{12} + \varepsilon_{13} = 0$, $\varepsilon_{21} + \varepsilon_{22} + \varepsilon_{23} = 0$ and $\varepsilon_{31} + \varepsilon_{32} + \varepsilon_{33} = 0$ (*ibid.*, p. 27).

If we rearrange these equalities to remove ε_{12} and ε_{22} in the previous equation, we obtain:

$$\frac{\partial x_1(\cdot)}{\partial t x_2(\cdot)} = \left(\frac{x_1(\cdot)}{x_2(\cdot)} \right) \left[(\varepsilon_{11} - \varepsilon_{21}) \left(\frac{1}{p_1} - \frac{1}{p_2} \right) + (\varepsilon_{23} - \varepsilon_{13}) \frac{1}{p_2} \right]$$

This result has initially been highlighted by Borchering and Silberberg (1978, p. 135). Minagawa and Upmann point out that this result “implies that if the two goods are not perfect complements (i.e., $\varepsilon_{11} < \varepsilon_{21}$) and good 1 is not a much stronger substitute for the third good than is good 2 (i.e., $\varepsilon_{23} - \varepsilon_{13} > -\alpha$ for some small positive α), then the Alchian-Allen result, that the partial derivative $\frac{\partial x_1(\cdot)}{\partial t x_2(\cdot)}$ is positive [holds]” (2015, p. 1897). In other words, under these conditions the compensated demand for the first good increases relative to the compensated demand for the second good, after the introduction of a common unit cost t .

In the literature on the Alchian-Allen effect, price differences between goods are often associated with quality differences. In this situation, the Alchian-Allen effect could be reformulated as: if a common unit cost is applied to a low-quality good and a high-quality good, then the compensated demand for the high-quality good will increase relative to the compensated demand for the low-quality good. This is the situation initially considered by Alchian and Allen, through the example of the exchanges of grapes between California and New York. If we assume a common unit transportation cost applied to *good* grapes (first good) and *bad* grapes (second good), and if we assume that good grapes are more expensive than bad grapes, then, according to Alchian and Allen, the $x_1(\cdot)/x_2(\cdot)$ ratio will *ceteris paribus* be lower in California, which is producing grapes, than in New York, which does not (and which should therefore bear the cost of transporting the grapes).

But this simple relationship between price and quality has been challenged by some: “the [Alchian-Allen] proposition is difficult to specify due to a wide variety of interpretations given to the concept of quality” (Kaempfer and Brastow 1985, p. 341). As a matter of fact, while price differences are clear and objective, quality differences are more difficult to establish. Price is only an imperfect proxy of quality, because price differences between goods could be explained by other factors than quality differences (market power, information asymmetries...), and quality differences do not imply that we will observe price differences (Courty 2011). Therefore, the empirical application of the Alchian-Allen effect according to the quality interpretation is not always straightforward. An additional problem is

that we cannot simply assume that the quality differences remain constant. It is likely that a change in transportation costs or a per unit tax will motivate producers to adjust the quality of the goods (Umbeck 1980).

Despite these limitations, various empirical studies have (partially) confirmed the Alchian-Allen effect. Hummels and Skiba (2004) have established the effect for the paradigmatic case of international trade of commodities (such as grapes), noting that the effect only occurs in the case of a common unit transportation cost, rather than an *ad valorem* transportation cost. Bertonazzi et al. (1993) have confirmed the effect for the choice of seats in college football games, demonstrating that those who travel further buy relatively better seats. They believe that their findings suggest that the theorem has far wider applications to many instances where complementary goods are bought by some customers. They predict, for instance, that couples who hire a babysitter for date-night will also go to relatively more expensive restaurants. Cowen and Tabarrok (1995) have questioned this extension, and even the football seats results, because it cannot be assumed that those traveling further to visit a football game have similar incomes as locals. Eid et al. (2013) demonstrated the effect for Australian thoroughbred horses, differentiating between importing areas which also breed horses and those that do not. They find that the effect is stronger for areas who also breed their own racehorses. Lavoie (2005) studied the Alchian-Allen effect for Canadian wheat exports. She draws attention to “markets valuing quality” as a factor influencing the strength of the effect.

There are also several studies which have empirically analyzed the Alchian-Allen effect in the context of regulation, specifically for excise taxes. Excise taxes are taxes imposed on the volume instead of on the sales price. Traditionally, excise taxes are applied to goods like fossil fuels, gambling, alcohol, marijuana or tobacco (Boyes and Faith 1993). This is why they are sometimes labeled “sin taxes”. An excellent overview of existing empirical studies can be found in Nesbit (2018). Sobel and Garrett (1997) demonstrate that the Alchian-Allen effect holds for cigarettes, but their results were nuanced with more recent data by Espinosa and Evans (2013). Likewise, Christian Rojas and Tianji Shi (2011)

suggest that the effect holds for the beer market. The studies suggest that a “common unit cost” can be applied to different contexts ranging from transportation costs and other transaction costs as well as excise taxes (Minagawa and Upmann 2015, p. 1893).

2 Applying the Alchian-Allen Effect to the Regulation of Repugnant Goods

In this section we analyze the Alchian-Allen effect when applied to repugnant goods, in the narrow case in which the regulation of repugnant goods mirrors as close as possible the case of excise taxes. In the following sections we will argue that it is highly unlikely that actual regulation of repugnant goods meets these conditions. Moreover, as in microeconomics textbooks and in most economic studies dedicated to the Alchian-Allen effect, the issue of goods categorization is overlooked. It is within this framework that the Alchian-Allen effect was initially conceived. We will return at the end of the section to the limitations of this approach, which is particularly problematic when applying the Alchian-Allen effect to the regulation of repugnant goods.

To demonstrate how the Alchian-Allen effect could be applied to the regulation of repugnant goods, we consider the example of pornography. In this example x_1 corresponds to the quantity of “extreme” pornography purchased by a consumer, x_2 the quantity of “normal” pornography purchased and x_3 the hours devoted to participating in a support group to overcome pornography addiction. The pornography market in this example consists of two goods (1 and 2). We have chosen a specific third good here, but x_3 can also be interpreted as a *composite commodity* representing the goods that are not associated with the pornography market (Hummels and Skiba 2004, p. 1388).

In this hypothetical example extreme pornography is a niche good, and therefore we assume $p_1 > p_2$. For a consumer who is purchasing both types of pornography (and the third good), extreme and normal pornography are not perfect complements. Moreover, extreme pornography is not a much stronger substitute for the third good than normal pornography. We assume that a regulator imposes a common unit cost t on the consumption of pornography (for instance an excise tax or an identity

verification for each connection to a pornographic website).¹ Therefore, extreme and normal pornography are associated with a common unit cost t , which is not imposed on the third good. In this situation, we can apply the result presented in the previous section, that the introduction of the common unit cost t increases the compensated demand for extreme pornography relative to the compensated demand for normal pornography.

Can we make any statement about the effectiveness of the measure imposed by the regulator? In our example, the application of the Alchian-Allen effect tells us that $\frac{\partial x_1(\cdot)}{\partial t x_2(\cdot)} > 0$. It is safe to say that an increase in the compensated demand for extreme pornography will be disliked by the regulator seeking to limit pornography consumption. However, the Alchian-Allen effect only specifies the evolution of $x_1(\cdot)$ relative to $x_2(\cdot)$ when t increases. Therefore, the increased compensated demand for extreme pornography *relative* to the compensated demand for normal pornography could have resulted from the fact that the compensated demand for normal pornography has proportionally decreased more than the decrease in the compensated demand for extreme pornography. In this situation the total consumption of pornography has declined, *and* the consumption of the two categories of pornography has decreased. This result would clearly be viewed as an improvement by the regulator. Bertonazzi et al. (1993) have suggested that imposing a common unit cost t on the two goods could also result in an increased *absolute* compensated demand for the more expensive good:

“By the first law of demand, the overall consumption of [pornography] will decline, but this, by itself, does not imply that the amounts consumed of both grades separately will decrease. If the substitution effect of the relative price decline between high and low grade dominates the own-price effect, the consumption of [extreme pornography] can increase (1993, p. 393)”²

¹ We assume, as most expositions of the effect do, that the burden of the tax falls entirely on the consumer.

² Their explanation was about whiskey not pornography.

In this situation, the regulator faces a trade-off. Imposing the common unit cost t on the pornography market reduces the overall compensated demand for pornography, but, at the same time, increases the compensated demand for extreme pornography. A regulator who categorically opposes pornography, without making distinctions between the different types of pornography, would find this situation satisfactory. However, a regulator who worries about sex-trafficking, exploitation or misogyny, phenomena often linked to extreme pornography, might consider this overall outcome worse than the original situation.

More broadly, we can already conclude that what matters in evaluating regulation of repugnant goods is not the Alchian-Allen effect itself. It is whether the basket of goods purchased by the consumer after the introduction of the common unit cost t is considered more repugnant than the one previously purchased. The issue is, however, almost never formulated in these terms in the literature. Instead, those skeptical of regulation mobilize the Alchian-Allen effect to suggest that regulation will have net negative effects, something which cannot be concluded without a consideration of the effect on the absolute levels of consumption. Bertonazzi et al. (1993) only present the nuanced analysis involving both the substitution effect and the absolute levels in a footnote, in which they refer to Silberberg (1990, p. 389) for a proof of the proposition. However, the proof of Silberberg is based on the difference between $x_1(\cdot)$ and $x_2(\cdot)$ (and not on the ratio between the two). Moreover, it relies on strong assumptions concerning elasticities.

This is not to deny that in the partial equilibrium analysis of two goods the effect of the absolute increase in the compensated demand for extreme pornography can occur. Gould and Segall (1969, p. 134) already demonstrated that the Alchian-Allen effect implies, in the two goods situation, that the compensated demand for the first good increases while the compensated demand for the second good decreases. As a matter of fact, if income is compensated, and if the consumer cannot purchase a third good, then $\frac{\partial x_1(\cdot)}{\partial t x_2(\cdot)} > 0$ implies that the compensated demand for the first good increases and the compensated demand for the second good decreases. But this two goods case seems to be of

very limited relevance. Not merely because it is hard to find markets with just two goods, but also because we are likely to see substitution effects away from the taxed goods to x_3 .

For the three goods situation Gould and Segall demonstrated that the absolute effect on the compensated demand for extreme pornography is indeterminate. When income effects are taken into account, this indeterminacy is aggravated (Borcherding and Silberberg 1978, p. 134). This is why most contributions on the Alchian-Allen effect focus on compensated demand functions (Liu 2011, p. 53), implying that *income effects* are excluded (Cowen and Tabarrok 1995, p. 253).³ Since repugnant goods are frequently associated with addiction, implying that a consumer is likely to spend a considerable part of their income on them, it seems that excluding income effects is a questionable practice.

The final limitation of the basic model is in our eyes the most damning. This limitation is the indeterminacy of what are considered the two relevant goods in question. In the case of pornography, if we replace “extreme” pornography by “ethical” pornography, which can also be assumed to be more expensive than “normal” pornography, the existence of the Alchian-Allen effect suggests that after the imposition of the common unit cost the relative amount of ethical pornography that the consumer buys has increased. For a regulator who does not categorically reject pornography, the conclusion is therefore radically different. Mobilizing the Alchian-Allen effect to oppose the regulation of repugnant goods is highly sensitive to the goods considered.

The choice of relevant alternatives in the case studied is therefore crucial. Existing economic studies present goods as clearly distinct from each other, but this is of course not the case. A regulator interested in limiting the consumption of a particular good faces difficult questions about the boundaries of markets and product categories. The history of pornography regulation is full of

³ A notable exception is Minagawa and Upmann (2015). In their article, they examine the conditions under which the Alchian-Allen effect holds for uncompensated demand functions, when income effects are included in the model exposed in the previous section. They demonstrate that the Alchian-Allen effect holds for uncompensated demand functions “unless the income elasticity of the lower priced good substantially exceeds the income elasticity of the higher-priced good” (2015, p. 1906).

examples of blurry boundaries and contested categories. A good example is the rise of artistic nudity in the 1960s, which posed new challenges for regulators. More broadly a category of erotica has emerged which is frequently distinguished from pornography, although some interest groups have rejected such distinctions (Van Dyke 1987).

The regulator must also consider the difficulty in measuring the characteristics of the different goods. While the alcohol content of a beverage can be measured objectively and at low cost, and beverages be categorized based on this criterion, evaluating the violence of pornographic content is more subjective and costly. It is likely that both regulators, lobbyists and producers of the goods will seek to influence categorizations, and respond strategically to the introduction of legislation. This political economy of goods categorization further undermines the relevance of constant-quality models.

The tendency in microeconomics to assume of well-defined list of goods, with clear properties, accepted by all economic agents, has been termed the “nomenclature postulate” (Orléan 2014, p. 61). This assumption allows economics to ignore the issue of goods categorization (Gradoz 2023). But it creates an important blind spot for the analysis of the regulation of goods, which depends on the ability to define clear goods categories which must be accepted by different interest groups, and which cannot be easily manipulated or circumvented by market actors.

3 The Alchian-Allen Effect and the Iron Law of Prohibition

Actual studies on the regulation of repugnant goods are much less careful in their invocation of the Alchian-Allen effect, in this section we analyze a few of them. One widespread problematic extension is the mobilization of the Alchian-Allen effect as the underlying mechanism explaining the “iron law of prohibition,” which is sometimes summarized by the formula “the harder the enforcement, the harder the drugs” (Cowan 1986).

To examine why this is problematic we first restrict ourselves to some studies about alcohol regulation. Austin and Ressler (2012) assessed the effectiveness of the designated drivers campaigns

as well as workplace policies designed to limit alcohol consumption of especially younger drivers. They notably suggested that an age restriction on alcohol consumption would likely increase alcohol consumption of the underage. Their study stands out for using a careful specification.

“Consider the price ratio $r = P_a/P_b$ where $P_a < P_b$. Now suppose a constant, c , is added to both prices: $r = (P_a + c)/(P_b + c)$. The value of r will increase as c increases, thus rendering the more expensive good (or behavior) increasingly attractive to consumers. [...] Suppose the two goods are (1) consuming one or two drinks and (2) binge drinking. These two goods each carry costs which may include the cost of the drinks and the subsequent consequences of consuming the respective amounts of alcohol (hangover, risk of DUI, etc.). For example, those under 21 carry the risk of arrest for underage drinking and that additional cost accrues *if either* of the two goods is purchased. This additional cost changes the relative costs facing consumers of the two goods. The Alchian-Allen effect thus encourages underage drinkers to consume more drinks per drinking episode—much like prohibition resulted in more *liquor* being consumed in speakeasies as opposed to *beer*. It is therefore expected that underage drinkers would drink more heavily” (2012, p. 105)⁴.

This increase in alcohol consumption is undesirable from the perspective of those who advocate a minimum drinking age. However, the mobilization of the Alchian-Allen effect in this study is problematic for four reasons. First, for a relatively technical reason. The first good (one or two drinks) and the second good (binge drinking) are mutually exclusive alternatives for the consumer. This implies that we have a corner solution in the consumption function, a situation to which the Alchian-Allen effect does not apply (Cowen and Tabarrok 1995).

Second, for this scenario to be valid, the cost, here the risk and consequences of being arrested, should increase by the same amount (t) for each drink. However, once the consumer decides to

⁴ In the United States, where this study is conducted, the “National Minimum Drinking Age Act” of 1984 sets the minimum legal drinking age at 21 years (23 U.S.C. § 158).

drink, this cost represents a *sunk cost*. Cowen and Tabarrok have made clear that a common fixed cost “does not create a substitution effect. The fixed fee, once paid, is treated as a sunk cost and consumers face the same relative prices they faced initially” (1995, p. 254). Since the Alchian-Allen effect deals with substitution effects, it is not relevant for situations involving sunk costs.⁵ In our example, the consumer, after the first drink, should simply drink the quantity of alcohol that maximizes her utility function. To overcome this objection, one might impose additional behavioral assumptions, such as the idea that individuals are prone to engage in *sunk cost fallacies* (Ho, Png, and Reza 2018, p. 1761). But other problems would remain.

Third, the probability of being found out for driving-under-influence, and therefore arrested, is likely to depend on the visible state of intoxication of the consumer, implying that the cost increases with alcohol consumption. Therefore, we do not face a common unit cost applied to the goods. As underlined by Umbeck: “it might appear that after careful consideration the theoretical constraints on the Alchian and Allen theorem are so restrictive as to render it empirically empty, with the exception of transportation charges and per unit taxes” (1980, p. 203). We suggested, above, that an identity verification for each connection to a pornographic website could be considered as a common unit cost. Identity verification for the access of pornographic websites has come into effect on February 17, 2024, in the European Union through the *Digital Services Act*. But that analogy, too, is at best imperfect. A consumer of extreme pornography is likely to be more concerned about the consequences of their identity being known by others than a consumer of normal pornography. Alcohol and pornography pose different risks to mental and physical health (Room, Babor, and Rehm 2005; Rothman 2021), but they are related here because some regulation policies associated with them are mistakenly considered as a common unit cost.

⁵ Liu et al. (2011) proposed a model of repeated consumption to explain the phenomenon of *binge drinking*, which is distinguished from the Alchian-Allen effect, because it involves a common fixed cost rather than a common unit cost.

Fourth, even if we leave these considerations aside, the limitations identified in the previous section still apply. The regulation might increase the relative compensated demand for binge drinking but it does not tell us what the effect is on the absolute compensated demand for binge drinking, except if we assume that having one or two drinks and binge drinking are the only two goods available to the consumer. This assumption is not reasonable and the two goods categorization is arbitrary. If we consider relevant substitutes, it might well be the case that both binge drinking and mild alcohol consumption decrease in absolute levels. Here, we do not seek to dispute the empirical results of studies finding evidence suggesting unintended consequences of regulation. But empirical results of course never directly prove the presence of a particular effect, other dynamics might be at work. It seems that the Alchian-Allen effect is invoked here as a *post hoc* rationalization of the results. This tendency in the literature on the Alchian-Allen effect has been criticized before, for instance by Bertonazzi et al. (1993, p. 383).

Similar issues plague other studies on alcohol regulation. Thornton (2007) points out that, during the American Prohibition, penalties were generally levied on the basis of the volume of the good, and not on the percentage of alcohol it contained (2007, p. 96).⁶ Additionally, goods with a higher potency (and relatively less volume) were easier to hide. Therefore, according to him, this regulatory policy constituted an incentive to purchase goods with a higher percentage of alcohol per liter. To put it differently, it constituted an incentive to increase the *potency* of the goods (Thornton 1998).⁷ And indeed: “The application of this restrictive regime generated a rapid transition from less potent forms of alcoholic beverages to highly distilled spirits like gin and moonshine. Specifically, Americans’ expenditure on distilled spirits as a share of total alcohol sales skyrocketed from around 40% pre-

⁶ On January 16, 1919, the 18th Amendment to the United States Constitution was ratified, prohibiting the production, transport, and sale of “intoxicating liquors” within the United States. This category encompassed most alcoholic beverages at the time. The amendment came into effect on January 17, 1920, and was later repealed on December 5, 1933. For more information on the legal aspects of American Prohibition, see McGirr (2015).

⁷ Lawson and Nesbit (2013) suggest this is also applicable to marijuana, where penalties levied on the basis of the volume constitute an incentive to increase the amount of tetrahydrocannabinol (THC) contained in the goods.

Prohibition to almost 90% directly following, as the consumption of spirits and fortified wines quintupled” (Beletsky and Davis 2017, p. 157).⁸ Thornton attributes these patterns to the Alchian-Allen effect. However, problems abound in this loose application of the effect. There was no common unit cost during the American Prohibition. The likelihood of arrest, interpreted here as the common unit cost, as in the previous discussion, depended on the type of good which was purchased. Moreover, the Alchian-Allen effect focuses on compensated demand functions, therefore excluding income effects. But income effects surely played a role during the American Prohibition. Thornton argues that “addicts attempt to hold income constant by resorting to criminal activities” (2007, p. 93). However, this argument is unconvincing. Even if this happened to supplement incomes, it would clearly impact the associated risks (and therefore the costs).

More generally, it is problematic to apply the Alchian-Allen effect to long-run scenarios like the American Prohibition. The effect, as we highlighted above, is focused on the narrow effects between two goods of constant quality. But as Alchian and Allen argue, according to what they call the second fundamental law of demand, “the longer any price change persists, the greater the elasticity” (Alchian and Allen 1964, p. 56). This greater elasticity occurs because more adjustments take place within the market as consumers and producers adjust to the new circumstances. The American Prohibition was not just a cost associated with the risk of being caught drinking or selling alcohol, it also gave rise to new products and places to consume, such as “speakeasies.” The empirical studies mention these innovations, but they make little of the fact that they changed the context in which alcohol was consumed, and sometimes the very product (and the associated health risks).

Such changes might well have boosted the consumption of stronger liquor, but they cannot be simply attributed to the Alchian-Allen effect. For the effect to be valid, t must not provide utility to the consumer (Silberberg 1990, p. 387). Umbeck (1980) first developed this insight to critique a certain

⁸ Likewise, “The potency of alcohol products during Prohibition is estimated to have risen by more than 150% relative to pre-Prohibition and post-Prohibition periods” (*ibid.*).

type of extension of the Alchian-Allen effect which suggests that the effect could explain why the consumer was more likely to choose high-grade meat relative to low-grade meat in a restaurant rather than at the grocery store (because the price of the two grades of meat was assumed to be increased by the same amount t in the restaurant). But the difference in price t , between the grocery store and the restaurant, represents the price of the goods that are “bundled” with the consumption of meat in a restaurant (decor, waiters...), and which have a value for the consumer. Eating meat in a restaurant must therefore be considered as a “bundle of goods”, and, as such, it is not possible to infer the evolution of $x_1(\cdot)/x_2(\cdot)$ between the grocery store and the restaurant when a common unit cost is applied to the two grades of meat. During the American Prohibition, the bundle of goods which was bought in the speakeasies differed considerably from the liquor bought in grocery stores before the American Prohibition.

Even without the bundling argument one might have worries about the nature of the good. The Alchian-Allen effect assumes that the good does not change because of the introduction of t (Borcherding and Silberberg 1978, p. 133). One could model the chance of being arrested purely as a cost which does not change the nature of the good. But this is a significant simplification. It is likely that the signaling value associated with a pattern of consumption changes after the good has become illegal. More conforming consumers might wish to avoid illegal goods to not harm their reputation, while more deviant consumers might be attracted to illegal goods, which allow them to signal their willingness to transgress social norms (Atkin, Colson-Sihra, and Shayo 2021; Chiesa and Dekker 2024). This effect has been noted repeatedly in the literature on drug use (Miron and Zwiebel 1995; Copes and Williams 2007). It is especially relevant for repugnant goods, given their contested moral (and therefore symbolic) status.

For these reasons, the reliance on the Alchian-Allen effect as the underlying mechanism explaining the iron law of prohibition is unwarranted. A small number of legal restrictions might under specific circumstances be plausibly reinterpreted as a common unit cost. But we can certainly not say that

“the Alchian-Allen theorem suggests that there is a tendency for drugs to become more potent and more dangerous when they are prohibited” (Wheeldon and Heidt 2022, p. 124). The further we move from the domain of excise taxes the more tenuous the analogy becomes. Therefore, when Bradley et al. (2023) recently suggested that implementing anti-terrorist policies will increase the lethality of terrorist attacks because of the Alchian-Allen effect, we should be very skeptical. Specifically, they argued:

“In the context of terrorism, the different qualities of goods, from the perspective of the terrorist, refer to more-deadly methods (higher quality) and less-deadly methods (lower quality) and the fixed cost refers to counterterrorism policies—for example, the cost of avoidance, the associated punishments if caught, or the expectation of being labeled a terrorist and incurring the associated costs. In this case terrorists substitute toward more-deadly methods as they become relative cheaper” (Bradley, Coyne, and Hall 2023, p. 13).

This application contains most of the problematic issues we have identified in this section: it concerns a corner solution, the costs involved are fixed costs to the terrorists, other relevant substitutes are ignored, and the nature of the criminal act is likely to be altered by being labeled “terrorist.”

4 The Barzel Theorem and the Dynamics of Regulating Repugnant Goods

In his overview article of the effect of excise taxation Nesbit (2018) has made a useful distinction between the Alchian-Allen effect and what he calls “the Barzel theorem”. Yoram Barzel (1976) started his alternative analysis of the effect of taxation on “sin goods” from the observation that tax statutes can never cover all dimensions of a good. Some taxes are explicitly aimed at a particular dimension of the good, such as the volume, or the quantity of a particular substance such as ethanol or THC, in other instances attempts are made to cover all dimensions but (necessarily) unsuccessfully. In all such cases producers have an incentive to alter their product so as to (partially) evade the tax, obviously while still offering a product that consumers are willing to buy. In the realm of possible adjustments,

quantity is just one margin on which consumers and producers can adjust, and frequently not the most effective. He makes his basic point assuming that producers can adjust either quantity or quality: “The excise tax induces a substitution of quality for quantity, resulting in a greater increase in the price per unit than predicted by the constant-quality model. The ad valorem tax induces a reduction in quality and a lower after-tax price than predicted” (Barzel 1976, p. 1185). In other words, when a common unit cost is introduced (here labeled an excise tax), there will be substitution towards goods of relatively higher quality, while when an ad valorem tax (based on the value of the good) is introduced, the substitution will move in the opposite direction, towards goods of relatively lower quality. Barzel assumes a simple link between quality and price, which, as we demonstrated in the first section, is not evident.

This basic insight is a simple illustration of Barzel’s more general point that any type of regulation will be incomplete, analogous to how contracts are believed to be incomplete. Curiously, Barzel does not mention the analysis by Alchian and Allen, but it clearly qualifies as what he calls a “constant-quality model”. Barzel provides an excellent critique of constant-quality models, by insisting that they fail to take account the many other margins of adjustment. It is therefore surprising that Nesbit (2018) in an otherwise excellent overview of the literature presents the Alchian-Allen effect and the Barzel theorem as if they were in near-perfect harmony.

If we look at actual adjustments in repugnant markets, his broader insight about the incompleteness of any regulation becomes clearer. Allen et al. (2023) analyze adjustments and innovation in repugnant markets. Their analysis is not based on changes in the regulatory regime, but they rightly argue that repugnance also acts as a moral constraint, in the form of an informal institution, independent of state regulation. Firms facing this moral constraint are motivated to adjust their goods or mode of production to attenuate the moral opposition their business practices encounter. They provide examples from the sex work, gambling, and cigarettes industry in which firms adopt new technologies and introduce innovations to reduce the repugnant nature of their goods and

practices. Online gambling has largely disconnected gambling from related repugnant goods such as prostitution and alcohol consumption. The introduction of webcamming and platforms like *OnlyFans* have provided more control over the product for sex workers and have (partially) shielded them from potentially violent interactions with customers. Electronic cigarettes reduced many of the morally problematic aspects of smoking, among them the removal of carcinogens for users and bystanders, and some of the addictive features, although certainly not all.

In related work Dekker and Gradoz (2023) studied how firms evaded the moral constraint, for instance, by enabling more anonymous transactions, or by insulating workers from the morally problematic aspects of the firms' activities. Moreover, they highlighted how new technologies such as cryptocurrencies enabled pornography platforms to send and receive payments, when established financial firms were reluctant to do business with them. These innovations happen on margins which are impossible to foresee, so that regulation is necessarily incomplete as Barzel argued. Regulation might be updated in light of them, as for instance has been extensively debated for e-cigarettes, but it is to be expected that this will lead to new dynamic adjustments. These examples illustrate that the margins of adjustments are sometimes desirable from the perspective of those raising the moral opposition, while in other cases the adjustments take the form of evasion or obscuring the transaction from the view of others.

The margins of adjustments are *ex ante* hard or impossible to predict. However, for morally contested goods, it might be assumed that consumers are interested, and willing to pay a premium, for variants of the goods which are considered less or not morally problematic by their peers or themselves. The likelihood of this kind of substitution depends on the moral disapproval of the goods in question. The American Prohibition period stands out because it appears that regulation was deeply at odds with moral beliefs among the majority of consumers and their peers. Developments in the cigarette industry over the past forty years, on the other hand, suggest that moral disapproval and legal

restrictions and taxes, broadly kept step with each other, so that adjustments largely took place in the direction favored by those morally opposed to cigarettes.

This can be beautifully illustrated with another example. The consumption of meat is sometimes considered repugnant because its production necessitates animal suffering and it is an important source of pollution. A recent article has warned that a common unit meat tax will lead to the Alchian-Allen effect, towards higher-grade meats (Grant 2022). But what does it mean to say that we substitute to higher-grade meats? Is this not exactly what is desired by many critics of intensive farming? Improving the conditions in which the animals are bred is costly because it requires more space, frequently more labor, and sometimes different feed. Therefore, animal-friendly variants of meat products are more expensive than regular meats. In this context, the existence of the Alchian-Allen effect on the meat market, which could result from the introduction of a common unit cost t , would be effective in the eyes of moral critics, worried about animal welfare. Of course, those who categorically oppose meat consumption from a deontological perspective or who are concerned about the environmental impact of meat production are indifferent to this substitution. However, as we have shown earlier, taking income effects into account implies that t reduces total meat consumption, which will be seen as a beneficial outcome from the perspective of these individuals.

But more importantly, the development and success of more animal-friendly farming methods, lab-grown meats, as well as plant-based alternatives on the market all suggest that consumers are willing to pay a premium for less repugnant versions of the good. As the level of moral concern about animal welfare grows, or further taxes are implemented on meat, we should expect such alternatives to rise in popularity. This effect will not necessarily be uniform, and the rise of subcultures dedicated to the consumption of raw meat and meat only diets should be understood as countervailing tendencies, arising from the morally contested nature of meat. But when regulation largely keeps step with changing moral beliefs about the repugnance of goods, we should expect the opposite of the iron law

of prohibition to be the case, because prohibition will most likely lead to the broader adoption of less morally problematic alternatives.

Someone wedded to the Alchian-Allen effect might interpret this substitution towards more animal-friendly meats or plant-based alternatives, narrowly, as confirmation of the effect. After all, the substitution is from lower-priced alternatives, towards higher-priced alternatives. But if one takes this perspective then we also must conclude that the effect tells us nothing substantive about what the higher-quality good is, for instance that it is more potent or addictive. Therefore, there is no direct lesson we can draw from the Alchian-Allen effect about the effects of regulation of repugnant goods. Normative conclusions depend entirely on what higher-quality goods happen to be studied in an empirical setting. This conclusion is at odds with so much of the common usage of the Alchian-Allen effect that it seems little helpful to reformulate it this way.

Therefore, the Barzel theorem highlights that it is unwarranted to move from the universal economic truth of substitution to the iron law of prohibition. What Barzel's analysis does is provide a cautionary note against constant-quality models such as that of Alchian and Allen. It warns us that regulation almost always affects the quality of the goods offered and consumed on a market, whether for good or for bad.

5 Conclusion

The message of those mobilizing the Alchian-Allen effect to critique the regulation of repugnant goods is clear, regulation will have significant adverse effects. Our paper does not demonstrate that such adverse effects cannot occur. We are convinced that most policies would benefit from a consideration of the likely unintended consequences they might have. But we have questioned the certainty much of the literature exudes about the direction of these unintended consequences. Such certainty is only warranted in the very narrow domain of a common unit tax on two goods of unchanging quality, in which the more expensive good is the more morally problematic of the two.

Outside this hypothetical situation, which does not seem relevant outside microeconomics textbooks, additional questions come into play. These questions are partly empirical about relative and absolute effects, and partly normative, for instance how to identify the relevant goods and how to evaluate the associated repugnance.

Upon closer examination it turns out that those advocating an iron law of prohibition also tell an unnecessarily pessimistic story about market adjustments. They suggest that if regulation attempts to steer consumers away from morally problematic (or otherwise harmful) goods, markets will adjust to provide even more problematic or harmful alternatives. This is simply misleading. Markets can, and often do, adjust in morally desirable directions and away from harmful alternatives, of course especially when consumers themselves, rather than only regulators, perceive them to be harmful. The rise of animal-friendly meats and plant-based alternatives, as well as the increased offering of non-alcoholic alternatives to popular alcoholic beverages are just some examples of the ways in which markets have adjusted in what at least for moral critics is a desirable direction. It is undeniable that regulations, even common unit taxes, sometimes reinforce this pattern. We might of course have normative reasons to still oppose such paternalistic measures, for instance because we favor voluntary moral reform, over paternalistic regulation.

We have shown that the Alchian-Allen effect is often invoked in contexts in which it is only partially or not at all applicable. Based on the work of Yoram Barzel, we have also highlighted the importance of quality changes, and the adjustments on many margins. In fact, Barzel reminds us that the dynamic nature of markets and the many margins of adjustment is the major reason why regulation frequently has unintended (or at least unforeseen) consequences. There is often a desire for certainty in policy analysis, and nothing provides certainty like an iron law. But as we have shown here, institutional details matter, and often we simply cannot quite foresee how different market participants will adjust to new regulations. Or in the case of repugnant goods, to the rise of new moral concerns or taboos.

But neither regulation, nor moral pressure, will inevitably lead to more extreme, potent, exploitative, or polluting variants of the good. Fortunately, that much is certain.

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