

RESEARCH ARTICLE

Repugnant innovation

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(Received 1 October 2021; revised 18 September 2022; accepted 19 September 2022; first published online 11 October 2022)

Abstract

Repugnant innovation is a form of evasive entrepreneurship that occurs in repugnant markets. Repugnance is an informal institution – controlled by long-lived norms, attitudes, customs and traditions – and repugnant innovation acts to shift institutions at the lowest level of the institutional stack. The paper considers three examples of repugnant innovation: e-cigarettes, online gambling, and webcam modelling. Each repugnant innovation challenges the complex mixture of material and moral concerns that contributes to repugnance in their respective markets. The paper adds to and expands on a body of evidence about innovation in apparently unsupportive institutional environments.

Key words: Evasive entrepreneurship; innovation economics; institutional entrepreneurship; repugnant innovation; repugnant markets

1. Introduction

In the Schumpeterian tradition, innovation involves the creation of a new good or service, a new method of production, a new source of supply, a new market, or a new method of organisation. This paper considers the particular dynamics of innovation in repugnant markets (Roth, 2007) – what we term ‘repugnant innovation’. Repugnant innovation is a form of evasive entrepreneurship (Boettke and Coyne, 2010; Thierer, 2020) that acts as an arbitrage around a society’s institutional framework. The evasive entrepreneurship literature focuses on how this form of entrepreneurship challenges the institutional framework by exploiting contradictions within that framework, and sometimes leads to institutional change (see for example Elert and Henrekson, 2016). Repugnant innovation fits clearly in this category of entrepreneurship.

However, the evasive entrepreneurship literature thus far has focused on its interaction and effect on formal institutions – regulations, laws, and constitutional structures. For example, the development of ride sharing in the form of Uber and Lyft challenged the regulatory framework around taxis and hire-cars (Thierer, 2020). The secret privatisation of land by farmers in countries under agricultural collectivisation enhanced pressure for land reform (Elert and Henrekson, 2016). We argue here that repugnance – understood as a belief that some activity is immoral (Leuker *et al.*, 2021; Roth, 2007) – is an *informal* institution, one of the norms and values that underpin and buttress formal institutions. These informal institutions are those that are what Williamson (2000) locates as embedded as Level 1 in the institutional stack. Thus entrepreneurship in repugnant markets faces the constraints of both formal and informal institutions and the complex incongruities that exist between the two (Boettke and Coyne, 2009; Safran, 2003). Those incongruities, along with the shifting justifications for formal institutional restrictions, provide the institutional arbitrage opportunities for repugnant innovation.

We consider examples of innovation in three repugnant markets: gambling, sex work, and tobacco consumption. The repugnance in each of these markets has its source in a combination of material concerns (such as a concern about the externalities caused by the relevant exchanges) and moral

concerns (a disgust or displeasure that such a trade should take place at all, or that there should be money exchange as part of the activity). The sale and consumption of gambling, sex work, and tobacco are considered to be repugnant transactions. Innovation here is unsurprising as the existence of a missing market suggests that (some) entrepreneurs will attempt to create a market in that space. As it is, the existence of repugnant goods represents a market failure. Markets for particular goods and services either do not emerge at all, or if they do emerge, they are smaller than what would otherwise be optimal, and gains from trade are not fully realised in the economy. The nature of repugnance, however, creates additional challenges for those entrepreneurs and dynamics for institutional evolution.

Our paper is complementary to Kuchař (2016). He investigates how entrepreneurs brought about institutional change and subsequently acceptance of surrogacy. While he does not locate his investigation in the study of repugnant markets, what is notable for our purposes about the surrogacy example is the rapid pace that the norms which governed surrogacy – itself at one time a repugnant good – shifted in response to entrepreneurial activity. This is a challenge to the Williamson (2000) claim that Level 1 institutions shift slowly – only in the space of centuries or even millennia. Our contribution provides a richer explanation and interpretation of the process whereby repugnant innovation occurs and acts upon the nature of the repugnance and the informal institutions that sustain it.

This paper proceeds as follows. In Section 2 we locate repugnance as an informal institution governing the boundaries of repugnant exchange, distinguishing between (perceived) material and (perceived) moral harms caused by those exchanges. By locating repugnance within the institutional literature we shed light on how entrepreneurial activity challenges or subverts those institutions. In Section 3 we explore our examples using the framework of evasive entrepreneurship. In Section 4 we focus on the effect of repugnant innovation on institutions by considering the contrast with altering and abiding entrepreneurship (Henrekson and Sanandaji, 2011). We conclude in Section 5 with some observations about the relationship between innovation and innovation policy, adding repugnant innovation to a growing body of evidence that challenges the neoclassical understanding of market failure in innovation.

2. Repugnance as an informal institution

Repugnant goods (and services) are those goods and services that many individuals do not wish to transact for themselves, nor do they wish that other individuals transact in those goods and services. The market for kidneys is a classic example of a repugnant market (Roth, 2007). At different times and places these products have been subject to either outright prohibition or, at least, high levels of regulation. This policy hostility – often resulting in heavy regulatory costs or banning – might shift innovation and entrepreneurial resources away from these repugnant markets to less repugnant markets (see Baumol, 1990).

Those products that are more dangerous – that is, likely to impose high disorder costs (Djankov *et al.*, 2003) by being more risky to participants and society – are likely to be more highly regulated in use. Tobacco consumption, for example, is known to be associated with various cancers. Passive smoking imposes costs on non-smokers. As a consequence, the sale and consumption of tobacco is highly regulated. Pornography is associated with exploitation of both its producers and consumers and so too the production and consumption of pornography is highly regulated. Gambling is associated with several forms of anti-social behaviour and so too is highly regulated. Despite this policy hostility, there are forms of innovation that could mitigate the harms associated with the consumption and production of those goods and services.

What makes a market repugnant? Repugnance is a judgment, and varies significantly between individuals, groups, and locations. What is repugnant in one community is not necessarily repugnant in all communities, both across jurisdictions and cultures and between sub-communities. Roth (2007) noted that a feeling of repugnance could be expressed self-interestedly and strategically – an interaction between self-interest and moral objection similar to Yandle's (1983) idea of the 'bootleggers and Baptists' that supported prohibition.

At the same time Roth found that repugnance could be sometimes lightly held and moral objections to certain transactions could be overcome through discussion and reason. However, there is a finding in the literature on moral disgust that suggests that such judgments can vary little in response to changes in context (Haidt *et al.*, 2000; Ortony *et al.*, 1988; Russell and Giner-Sorolla, 2011). One path through this apparent contradiction is to dive more deeply into the complex and mixed sources of repugnance for each repugnant transaction. Not all repugnant transactions are equally repugnant and not every repugnant transaction is repugnant in its own way.

Leuker *et al.* (2021) provide a comprehensive overview of the sources of repugnance, and conduct a survey of respondents that allow them to rank exchanges and activities according to their perceptions of repugnance. Using a survey conducted in the United Kingdom, unsurprisingly alcohol and medical marijuana rank relatively lowly on perceived repugnance and the hunting of endangered species, vote selling, and bride prices rate more highly. The surrogacy discussed by Kuchar (2016) is middle-ranking along this spectrum. Our examples are similarly middle ranking: gambling and cigarettes are in the bottom half of the survey, while the camming we examine below can be described as a combination of pornography, prostitution and the companionship offered by escort services.

Critically, Leuker *et al.* (2021) break down the psychological dimensions of this repugnance across five factors: moral disgust, need for regulation, incommensurability, exploitation, and unknown risk. Moral disgust captures the emotional reaction, asking respondents questions such as whether they felt that the transaction conflicted with their values; whether they were made angry by the transaction; or whether it harmed the dignity of the seller of the good or service. The need for regulation asked whether the respondents felt simply whether it should be regulated for whatever reason. Incommensurability asked whether the activity was somehow associated with sacredness and whether there was any amount of money that would be appropriate as part of a transaction. Exploitation captured whether the transaction was perceived to be exploitative or could contribute to inequality, and unknown risk sought to capture a concern about whether the consequences of an exchange were known or predictable.

This decomposition of the elements of repugnance is critically important to understand the dynamics of repugnant innovation because it emphasises the often correlating but sometimes diverging relationship between how individuals rationalise their repugnance. In his 2007 paper, Roth noted that repugnance and negative externality are often correlated but that some goods and services might be considered to be repugnant even in the absence of negative externality. Indeed, the act of internalising an externality can itself be seen as repugnant, as Ambuehl *et al.* (2015) show in their comparative survey of economists' and ethicists' attitudes to paid participation in medical trials.

It is useful to map these five higher order dimensions onto Williamson's (2000) institutional typology (see also Bylund and McCaffrey, 2017). Williamson discusses four levels of institutional order. Level 1 consists of 'informal institutions, customs, traditions, norms and religion'. Level 1 institutions emerge and evolve slowly – over hundreds of years, as Williamson suggests – and constrain Level 2 institutions. Level 2 institutions constitute the formal 'rules of the game' and consist of property rights and the judiciary and the like. Level 2 institutions also emerge and evolve slowly, but not as slowly as Level 1 institutions. These Level 2 institutions in turn constrain Level 3 institutions that consist of governance and organisational structures. Level 3 institutions evolve relatively quickly compared to Level 2 institutions. Level 4 institutions consist of resource allocation and employment institutions (spot markets). Markets continuously evolve.

Moral outrage and incommensurability interact with Level 1 institutions – customs, traditions, norms, and religion. Exploitation interacts with Level 2 institutions – the formal rules of the game. The need for regulation is a Level 3 (governance and organisations) institutional issue. Unknown risk operates at Level 4 – within markets. At a first reading, the complex admixture of factors behind repugnance operating at different institutional levels suggests that attitudes towards some repugnant goods and services will change more slowly than others. Furthermore, this suggests that different factors of the repugnance of goods and services will shift more slowly than drivers at other levels of Williamson's framework. Repugnance that is based on moral outrage or incommensurability will be

harder to overcome than repugnance based on unknown risk. In other words, if a repugnant transaction is repugnant primarily due to moral disgust (a Level 1 institutional norm), overcoming that disgust is a matter of decades or centuries of work. If the repugnance originates simply in a belief that government should provide an intermediary role to protect participants, or just because of unknown risk, the repugnance should be able to be shifted quickly.

Repugnant innovations also shift these institutional levels in different ways. Day-to-day efforts of repugnant entrepreneurs can facilitate trade in those repugnant markets such as by reducing transaction costs (operating at the ‘resource allocation’ level). Other repugnant innovations change or evade regulatory frameworks, partly by bringing into question their applicability (operating at the ‘governance’ level). Indeed, some repugnant entrepreneurship might be directed at cultural or regulatory reframing of a product or, seeking to reduce perceived repugnance (or indeed discover the driver of the underlying repugnance). Repugnant innovations can shift the norms of society – where for instance the material harms in that market begin to decline due to repugnant innovations, it might shed light on the underlying moral repugnance (operating at Level 1).

3. Shifting repugnance in response to evasive entrepreneurship

While Leuker *et al.* (2021) provides a rich and compelling map of contemporary attitudes to repugnant markets in the United Kingdom and a broader set of countries, we unfortunately lack comparable historical data that would allow us to track changes in either relative repugnance or the components of that repugnance for different exchanges over time. There is ample reason to believe that the components of repugnance (sacredness, welfare, the appropriateness of regulation, attitudes to exploitation and so forth) do change historically, as the Williamson model suggests.

As a baseline, let us consider the charging of interest for borrowing, which illustrates the slow evolution of Level 1 norms. Moneylending and usury have a long history as the subject of moral opprobrium above and beyond the material harms of exploitation that it can cause. Aristotle believed that interest was ‘money born of money’ and thus ‘contrary to nature’ (Aristotle and Lord, 2013: 52), usurers ended up in Dante’s seventh ring of hell, and Luther exhorted Christian communities to ‘hunt down, curse and behead all usurers’ (cited in Brook, 2007: 93). Evasive entrepreneurship around both the formal and informal institutions was concentrated in persecuted and outsider communities (Ferguson, 2009). While prohibitions on usury remain in Islamic finance, in the modern era controls on interest outside the Islamic world are almost never justified on any grounds other than protection against exploitation or material concerns about financial stability. Leuker *et al.* (2021) find low levels of moral outrage when respondents are asked about charging interest, and (perhaps surprisingly) low fears of exploitation. The evaporation of moral disgust as a rationale for interest over the early modern period reflects the rise of the commercial virtues (McCloskey, 2006, 2011).

The example of gambling also shows shifting factors of repugnance moves at different paces. Historically gambling is one of the quintessential repugnant transactions. Reith (2007: 4) writes, ‘Throughout history, perhaps the only thing that has been as ubiquitous as gambling has been condemnation of the activity, a feature that has cast a persistent shadow over its popularity.’ In his historical study of gambling regulation in British history, Munting (1993) outlines the intertwined material and moral (i.e. repugnant) objections to gambling which have been representative of the arguments of anti-gambling moralists and activists since. Gambling suffered by association with other vices. Horse race meets were occasions for not only betting but drunkenness and prostitution, which were themselves disapproved of on a mixture of material and moral grounds. The act of betting was seen to degrade the gambler, and the object of the bet. To wager on horses was to undermine the race itself – an attitude that continues to exert influence over regulations such as those that prevent in-game betting.

While telephone betting became available in the 1960s, and betting agencies were digitising their operations from the 1980s, the rise of online gambling in the mid-1990s (see Williams *et al.*, 2012) presents a significant innovation that altered many of the material claims historically made about

the harms of gambling. Online gambling sites evade regulatory barriers to gambling by establishing themselves in friendly jurisdictions to serve customers in countries where online gambling is highly regulated or prohibited (the first, InterCasino, was based in Antigua).

At the same time, online gambling sites typically market themselves as a safer, more secure alternative to traditional gambling markets. For example, the connection between gambling and prostitution has been an historical constant. A gambling den offered its customers drink, gambling and access to sex workers. While some sexual imagery remains associated with online gambling (Banks, 2014), for the most part that connection is mostly severed in the online space. Even grey and black-market gambling that exists online has little of the direct association with criminality that grey and black-market gambling does in the real world. Banks (2014) nonetheless identifies persistent relationships between gambling and criminality that have extended into the online space, particularly around cybersecurity, money laundering, sports match fixing, criminal acts by problem gamblers, and fraudulent behaviour by the gambling service provider. Black-market gambling debts online are not correlated with the same forms and types of criminal activity as in person gambling. However, these risks need to be understood relative to traditional gambling – in both regulated and unregulated gambling markets. Regulatory intervention in gambling has much of its origin in the fact that gambling is viewed as repugnant, and historically regulation has driven gambling into black markets.

Fraud remains a concern in grey-market online gambling. As gamblers cannot rely on domestic consumer protection when interacting with offshore websites, phenomena such as ‘deposit only’ betting sites and rigged games present a significant risk. However, here there is also substantial innovation. Open source ‘smart contracts’ on decentralised blockchain platforms such as Ethereum offer the possibility of online gambling in an environment where anti-fraud protections can be verified, and assets secured. There have been some attempts to build betting markets on blockchains (e.g. Augur) that protect users through the trust-minimisation properties of blockchain technology (Berg *et al.*, 2019). Nonetheless, the innovation of online gambling, which dates back less than three decades, present a substantial shift in the profile of factors that constitute repugnance.

Possibly the oldest attested repugnant market is sex work. Sex work includes a large array of activities including prostitution, pornography, stripping, telephone sex, and live sex shows (Weitzer, 2010). In Leuker *et al.* (2021) prostitution and pornography are rated almost indistinguishably repugnant. For Roth (2007), sex work fits into a category of repugnant behaviours that are not repugnant if there is no commercial transaction. Historically this is not the case, however. The Gilgamesh epic from Mesopotamia features a temple prostitute, Shamhat, who civilises the wild figure of Enkidu. Lerner (1986) speculates that there was a moral division in Gilgamesh between prostitution in the service of religious activity and ‘commercial’ prostitution, the latter which was seen as morally corrupting.

Sex work has been seen as corrupting of its direct participants but also of the social fabric as well – the existence, particularly public visibility, of sex work has been described as corrosive to traditional institutions such as the family. In addition to these moral disgust, exploitation and incommensurability responses, sex work has also been historically repugnant because of the risks posed to the workers themselves: violence from customers, human trafficking or other coercive structures, or public health concerns around sexually transmitted diseases. Benoit *et al.* (2019) focus on two streams in the academic literature, one which describes prostitution as reinforcing traditional gender hierarchies and sexual exploitation of women by men, and another which focuses on the intersectionality of exploitative labour. Despite their modern sophistication, Day (2010) suggests that many of these arguments draw on the same traditions as historical repugnance of sex work.

As with online gambling, the online production of sex work substantially changes sex work’s profile of repugnance. Live webcam modelling (‘camming’) has much in common with older forms of sex work such as stripping, pornography, and telephone sex. With the invention of consumer-grade internet connected still cameras and video cameras in the mid-1990s, early ‘camgirls’ broadcast their routine daily lives, apparently unfiltered. Dedicated cam sites, where sex workers were able to put on live shows, interact directly with viewers, accept tips and gifts, and charge for premium content were launched in the subsequent decade (Jones, 2019). Camming combines ‘liveness’ and intimacy of

other forms of sex work (such as stripping) with a distance between the worker and consumer in a way that significantly effects the material harms of sex work. Consequently, camming is seen by many sex workers as a much safer alternative to forms of work that require physical proximity to consumers. As Jones (2019: 104) writes, ‘sexual violence against women is pervasive, and camming allows sexually agentic women to explore their desires and acquire pleasure in a way that feels safe’. Given the deep and longstanding concern of policymakers to reduce violence against sex workers, camming represents substantial potential reduction of this material harm that provides one of the justifications for regulating sex work.

Camming does not eliminate all material harms of sex work. The distance over a webcam can veil coercive control akin to that which has been of concern in other sex work markets. Online pseudonymity can be violated, putting sex workers at risk of stalking in the real world. Some models work in commercial studios built specifically for camming and report exploitation and low wages (Jones, 2019: 70–77). Sex workers may still be exploited by their employers. However, here too technical advances, increasingly better payment rails and reduced costs of equipment has resulted in a trend towards platforms that increasingly enable solo entrepreneurship (such as the individual subscription service OnlyFans).

The final example we consider here is the market for tobacco (and nicotine). Here we see the strategic attempts to shift norms around moral disgust – the strategic use of repugnance suggested by Roth (2007) – colliding against innovation that reduces the material harm. Like gambling and sex work, tobacco has a long history of associated moral disgust. King James I of England’s *A Counterblaste to Tobacco* claimed smokers were ‘sinning against God’. However, Leuker *et al.* (2021) find that sale of cigarettes rates low on each repugnance factor – particularly low on the factors of moral disgust and exploitation – but nonetheless cigarette sales rank relatively high overall on repugnance (higher, for example, than surrogacy or the sale of marijuana). Despite this reported low level of moral disgust, in the last decades of the twentieth century ‘tobacco control’ started to take the characteristics of ‘morality policy’, as tobacco control advocates moved towards the ‘denormalisation’ of tobacco use. This shift from regulating tobacco as a product to regulating tobacco use as a behaviour represents a moral condemnation of tobacco (see Bailey, 2004; Leichter, 1991) over and above any public health considerations due to the health consequences of tobacco consumption.

Electronic cigarettes (‘e-cigarettes’), first patented in 2003, use an electronic heating component to heat a cartridge of liquid containing nicotine and flavouring agents. Tobacco gets its stimulant properties from the compound nicotine, which occurs in several edible plants (such as tomatoes and potatoes) but is most concentrated in the tobacco plant. While non-smoking tobacco products exist (such as chewing tobacco, snuff, and Swedish-style snus), the dominant delivery medium of nicotine is through burning. Burning tobacco in cigarettes exposes the smoker to a toxic mix of chemicals including 70 known carcinogens as well as carbon monoxide (Drope *et al.*, 2018). By contrast nicotine is not a known carcinogen (Britton and Bogdanovica, 2014). In an e-cigarette, the nicotine and flavouring liquid turns into a vapour that resembles ‘smoke’, but is not burned, which is then inhaled by the user. By doing so, e-cigarettes remove the primary vehicle by which nicotine products cause harm. An additional harm-reduction feature is that e-cigarettes control dosage to reduce the risk of nicotine overdose. While e-cigarettes remain addictive and are still associated with some side-effects in some users, the United Kingdom’s Royal College of Physicians (2016: 189) states that ‘provision of the nicotine that smokers are addicted to without the harmful components of tobacco smoke can prevent most of the harm from smoking’.

The emergence of e-cigarettes as an alternative vehicle to tobacco burning for nicotine consumption has exposed a core fissure in the material concerns and repugnant concerns for nicotine and tobacco product regulation. Some advocates of tobacco control have expressed concern that to support e-cigarettes as a harm-reduction strategy risks encouraging new users of nicotine who might then ‘graduate’ to traditional cigarettes or e-cigarettes ‘renormalise and re-glamorise’ tobacco consumption. As the Royal College of Physicians observe in their report, *Nicotine Without Smoke*, the tobacco control movement has focused much of its attention on the firms that produce, market and sell tobacco

themselves, bringing to the policy foreground the actual repugnant exchange. The World Health Organization's Framework Convention on Tobacco Control specifically notes the risk of allowing tobacco companies influence over tobacco control policies. As many of traditional tobacco companies have expanded into the production and sale of e-cigarettes, there has arisen a clear and disruptive tension between the politics of repugnance and the material harm reduction possibilities of e-cigarettes as an innovation in that repugnant market.

In each of these three examples, a market exchange with a long association of repugnance has been subject to technological change, resulting in an innovation that addresses at least in part some of the underlying repugnance of those exchanges. At the very least, the innovation has attempted to address the negative externalities that are associated with either the consumption or production of the good or service.

4. Evasive, altering or abiding?

The repugnant innovations that we have discussed in this paper – camming, e-cigarettes, and online gambling – emerge from a process of discovery for the most part outside existing organisations that fit into the existing regulatory and legal framework. Sex workers in the pornography business exist on the boundary between independent contractors and employees and are subject to employee-like constraints and protections (Berg, 2021; Kopp, 2020). Working in a strip club is likewise subject to strict house rules and obligations (Jones, 2019: xii). Camming is done by independent entrepreneurs. While the hosting websites impose fees on performers with pricing models, independent platforms like OnlyFans offer performers more control over their working conditions. Likewise, the early innovation in online gambling and e-cigarettes occurred outside their existing corporate ecosystems. For the most part the early online gambling market was dominated by companies that did not have existing gambling businesses; reflecting the outsider status of evasive entrepreneurs (Williams *et al.*, 2012). For their first decade, e-cigarettes were pioneered by independent firms and sold over the internet. They were largely dismissed by the large global tobacco firms until they brought them in with a wave of corporate acquisitions in the 2010s (Zhu *et al.*, 2014).

More marginal innovations in repugnant markets also occur within firms, partly to manage the negative moral meaning attached to their activities (Dekker and Gradoz, 2021). These innovations are curious because they are not directly the result of the levers of innovation policy. Repugnant innovation shapes, and is shaped by, existing institutions. Institutions shape entrepreneurial behaviours, including through the generation of uncertainty (Frølund, 2021). A hostile policy environment (e.g. banning or costly compliance) might either shift innovation resources away from repugnant markets (for fear of regulatory consequences), or incentivise innovation in repugnant markets to reduce the material harms (and thus reduce repugnance if that repugnance is highly correlated with the existence of negative externalities). In this section we place our findings on repugnant innovation within the broader literature on innovation, entrepreneurship, and institutions.

Institutional change can be driven through various forms of institutional entrepreneurship (Kingston and Caballero, 2009; Van Der Steen and Groenewegen, 2009). The choices of institutional entrepreneurs can, intentionally or not, shape institutional frameworks. There is an increasing attention on how entrepreneurs can use digital technologies to create alternative institutional systems, with different dynamics and feedback to existing institutions (see Safner, 2016). Repugnant entrepreneurs shape those institutions at different levels (e.g. societal norms versus regulations) and through different mechanisms (e.g. through evasive entrepreneurship). Interestingly, their efforts do not tend to seek institutional change through the typical avenues of politics. That is, repugnant entrepreneurship might be a form of public entrepreneurship, but is generally not the subset categories of political entrepreneurs or policy entrepreneurs (on some of these definitions, see Mintrom, 1997; Schnellenbach, 2007). Repugnant entrepreneurs tend to place pressure on existing institutions through the development of new products and services.

Is all innovation in repugnant markets evasive? Elert and Henrekson (2016: 95) define evasive entrepreneurship as 'profit-driven business activity in the market aimed at circumventing the existing

institutional framework by using innovations to exploit contradictions in that framework'. Thierer (2020) defines evasive entrepreneurship more broadly as 'innovative activities that do not always conform to social or legal norms'. Henrekson and Sanandaji (2011: 53) define evasive entrepreneurship as 'an activity aimed at circumventing the institutional framework'. Repugnant innovation is an evasive entrepreneurial action to the extent that entrepreneurs are seeking to leverage different institutional inconsistencies between institutional levels. For instance, the development of e-cigarettes products could be an intentional effort to evade existing regulations that define cigarettes. But at the same time while challenging Level 2 and Level 3 institutions, they shift the informal norms and customs of Level 1 institutions. Similarly, by shifting tobacco consumption in the form of cigarettes to vaporising nicotine in the form of e-cigarettes, repugnant innovation is also evasive in the sense that it seeks to circumvent Level 1 norms – to redefine the type of activity and thus challenge the underlying sources of repugnance.

In addition to evasive entrepreneurship, Henrekson and Sanandaji (2011) also propose two alternative paths for entrepreneurship to affect institutions: entrepreneurship that abides by institutions (and is institutional entrepreneurship in the sense it places pressure on reform); and entrepreneurship that alters institutions through political activity (including directly rent seeking through coalition-forming). Both abiding and altering entrepreneurial efforts can either directly or indirectly place pressure on institutions.

It is rare for repugnant innovation to abide by existing institutions. One of the reasons for this is the heavy regulatory burdens and political and public hostility within repugnant markets. By definition, existing institutions are hostile to repugnant goods and services. It is easy to imagine that a new tobacco product is introduced (a different brand of cigarette), or a new form of pornography is depicted (point-of-view for example), or another casino is built, or a new version of poker invented – these would all be examples of abiding within existing institutions. It is not clear, however, that these examples would constitute a Schumpeterian innovation. They would constitute a variation on an existing theme or even just an expansion of an existing product. In markets with tight formal institutional constraints, the window for innovative activity is narrow. Furthermore, repugnant innovation clashes with the norms, values and codes of conduct that led to heavy formal regulatory rules or quasi-bans in the first instance. Repugnant innovations might abide by existing formal rules – for instance because of regulatory ambiguity, or a lack of foresight in those regulatory frameworks to the innovation in question – but generally repugnant entrepreneurial activities are better classified as either evasive or altering.

Repugnant innovations can also be the result of altering entrepreneurship – where entrepreneurs seek to alter existing institutional frameworks. The cases of repugnant innovation we have emphasised in this paper demonstrate how repugnant entrepreneurs focus on lowering the costs of repugnant trade. The harms from these activities can be lowered through innovations that incentivise good behaviour (e.g. reputation ratings), reducing the scope of harm (e.g. online delivery of trade), or hard-coded consumer protection within innovations (e.g. betting limits). By reducing the material harms of such activities – leaving only the social stigma of those activities – these innovations can bring into question existing institutions (or the need for new ones), engendering institutional change. Furthermore, radical repugnant innovations that do not fit neatly into existing frameworks, such as e-cigarettes, can raise new policy debates on the objectives and merits of existing rules.

From a welfare perspective reducing repugnance provides space for more market exchanges to occur. However, repugnance is subjective – both at an individual level and culturally. Innovation within repugnant markets is evasive around Level 1 institutions by definition, but how desirable such evasion is will be a matter of contention. It is certainly easy to conceive of evasive entrepreneurship in repugnant markets that might make some exchanges more prevalent but do little to alter the material harms of exchange – or alter some secondary harms but not those that are most salient. For example, the online 'dark' marketplace Silk Road reduced the barriers to accessing drugs, and potentially dangers associated with physically buying drugs in person (including questions around the quality of street drugs), but did not necessarily reduce the medical harm from drug use (Hout and Bingham, 2013). Silk Road clearly meets our definition of repugnant innovation but the extent to

which it reduces the repugnance of drug use will vary from observer to observer. Indeed, much of the political and policy debate around whether e-cigarettes can contribute to harm reduction or represent a ‘renormalization’ of tobacco consumption (Erku *et al.*, 2020; Notley *et al.*, 2018) – a contest around the stability or otherwise of a social norm that opposes smoking (East, 2020). Just as not all repugnant markets are the same, we should be careful not to apply an ecological inference fallacy to the Leuker *et al.* (2021) evidence and assume that aggregated perceptions of repugnance describe how individuals feel about specific repugnant markets.

In our examples it is not clear that entrepreneurs set out with the objective of challenging existing institutional arrangements. Almost certainly many of them simply wish to earn a profit by providing consumers with an improved good or service. Challenging existing institutional frameworks may be a by-product of their intentions – nonetheless the desire to earn a profit by bringing a new or different product to market can and does alter or evade existing institutions. While Schumpeter (1934) famously differentiated between types of entrepreneurial activity – including new goods, new markets, and new methods of production – Baumol (1990) extended this contribution to focus on how institutions shape the types of entrepreneurial activity (and thus innovation) that occurs. From this perspective, if we take some fixed level of entrepreneurial effort, the rules of the game affect the payoffs to different entrepreneurial activities – including productive, unproductive, and destructive entrepreneurship.

5. Conclusion – innovation policy in the light of repugnant innovation

Neoclassical economics – with its strong perfect knowledge assumptions – has long suggested that innovation is subject to a market failure. Firms in a capitalist economy would under-invest in innovation. As Nelson (1959: 304) explained, ‘were the field of basic research left exclusively to private firms operating independently of each other and selling in competitive markets, profit incentives would not draw so large a quantity of resources to basic research as is socially desirable’. That view was emphasised by Romano (1989: 863) who wrote, ‘In the frictionless perfectly competitive market, with no barriers to the use of information, the market will provide no R&D investment.’ Consequently, there is strong support for government intervention in innovation. As recently as 2000, Martin and Scott argued, ‘the strong evidence of underinvestment in technological advance justifies public action to support private innovation’ (Martin and Scott, 2000: 446).

This view of the ‘innovation problem’ calls for a Pigouvian response. Markets are said to fail for reasons relating to indivisibilities, externalities, appropriability and producer uncertainties (Arrow, 1962). For those reasons – and public choice reasons too – governments are willing to provide a suite of policies that encourage innovation. Innovation policy, however, is a highly diverse set of market interventions ranging from intellectual property (e.g. an artificial monopoly) to tax policy (e.g. R&D tax credits) to industry policy (e.g. favouring industry champions) to public procurement (e.g. defence contracting), and public science (e.g. public universities or science agencies). Innovation policy is designed, implemented, and governed in many different ways, and this has shifted over time (Edler and Fagerberg, 2017). Innovation policy operates through property law, tax policy, regulation, direct and indirect public spending, and even government ownership. Each of these component elements of innovation policy are associated with different costs and benefits (Davidson and Potts, 2016a, 2016b).

Yet there is a growing body of evidence that some industries engage in successful innovation despite not being eligible to benefit from innovation policy (Boldrin and Levine, 2004, 2008; Diamond, 2006; Kealey, 1996; McCloskey, 2011, 2016; Mokyr, 2005; Moser, 2005, 2012), and a parallel finding that innovation policy fails its stated objectives (Box, 2009; Davidson and Potts, 2016a, 2016b; Kärnä, 2020; OECD, 2003). Our examples of repugnant innovation add to that body of evidence but expand our understanding of innovation in apparently unsupportive environments.

The existence of evasive entrepreneurship obviously underlines the existence of innovation under hostile institutional environments. The literature however has focused primarily on what, using the

Williamson (2000) framework, we can class as Level 3 institutions – regulatory and legal frameworks. Uber and Lyft challenged the regulatory rules around what constituted a taxi and a hire-car, leading to widespread regulatory reform to both constrain the new ridesharing industry and accommodate it. Recent history is replete with similar evasive entrepreneurial activity such as that which challenged the frameworks governing hotels (AirBnB), banking (building societies offering bank-like deposits), television broadcasting (streaming services) and even the provision of money (cryptocurrencies). Repugnant innovation can challenge Level 3 institutions – each of our examples confronts regulatory frameworks in some way by either arbitraging around national or local laws (gambling, camming) or redefining a regulated product category (e-cigarettes).

However, repugnant innovations are a unique category of evasive entrepreneurship because they also challenge Level 1 institutions. We have argued that repugnance captures what the new institutional economics has described as the institutional foundations on which economic exchange is built: the informal institutions of norms and customs. As Roth (2007) confronted in his work with organ markets, and Leuker *et al.* (2021) map in their detailed survey work, repugnance is readily translated to the language of institutional change through evasive entrepreneurship. Our contribution is to outline a dynamic where evasive entrepreneurship can drive institutional change as innovation alters the grammar of repugnance. This lays the foundation for further empirical research on these boundaries of institutional change, repugnant markets, and evasive entrepreneurship. For example, fully fleshed out case studies of repugnant innovation could expand our understanding of market behaviour. The interaction between mainstream sectors of the economy, such as banking, and repugnant sectors of the economy, such as pornography, remain unexplored in a formal academic framework. Similarly, the welfare costs of legitimatising of previously repugnant activity are not well understood – this is especially the case in the instance of, say, online gambling and sports advertising. All these questions need analysis and investigation; our argument here is that this paper represents a framework for thinking about those questions.

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