The law and economics of Grindr

THE LAW AND ECONOMICS OF GRINDR: A RESPONSE TO CARSON.

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Abstract:　　　In the December 2017 edition of this Journal, Dr Carson outlined an economic approach to the epidemiology of HIV transmission within the gay community, with a special emphasis on mobile apps. His conclusion is that HIV transmission amongst the gay community constitutes a collective action problem, which is resolved by the social norm of using a condom. This article critiques Dr Carson's approach from an economic perspective. By utilising classic law and economic theory, this article will argue that HIV transmission may not, in fact, constitute a collective action problem in economic terms, and that instead condom use as a method of disease protection in theory can arise from purely rational, market driven actions. To do so, it borrows from transactional theory of information asymmetry to show the potential to alert counterparts as to serostatus. This conclusion provides an important supplement to Carson: rather than social norms being the core driver in condom usage to prevent HIV, instead condom use may arise solely as a result of rational, private decision making arising from market signalling. The article then critiques its own findings to demonstrate that it is unclear whether Carson's argument or the argument in this paper is, indeed, correct – which may represent a limitation in the analytical techniques advanced.

1. Introduction

The December 2017 edition of this journal published an article by Dr Byron Carson which provides an economic analysis of the norms of HIV protection for casual sex between men who have sex with men (MSM).[1] The article's conclusion is that HIV prevention is a collective action problem, which is solved by use of social norms, one of the common methods to solve collective action problems, in the form of the Condom Code. This paper will argue that simple market mechanics may explain the proliferation of condom use amongst MSM from an economic perspective. To advance this argument, this paper will firstly outline Dr Carson's argument. The third paragraph will then explore the concept of a collective action problem. The fourth paragraph will then review whether HIV protection amongst MSM in fact falls within this category. By adapting Akerlof's "Market for Lemons" to one-off sexual encounters between MSM who have met via on-line platforms (which we shall call hook-ups), we shall establish that HIV prevention may not be, in fact, a collective action problem, but one which is solved by rational market forces alone through market signalling. From this analysis we see the Condom Code in a new light – rather than a social response to a market inefficiency, instead the Condom Code would become merely descriptive of private actions. However, the assumptions on which this argument is based will prove to be too simplistic and flawed – meaning that neither Carson's argument, nor the argument in this paper, is conclusive evidence as to why condoms are used. This demonstrates that purely theoretical and analytical economic approaches to epidemiology struggle to provide definitive explanations of human behaviour in isolation without further study.

2. Carson's Argument

Carson's argument is that, ultimately, formal laws to require condom use are ineffective.[2] The presence of "free riders" affect people's decision making process.[3] Free riders occur when private transactions create positive externalities: a free rider gains from other people's actions. Thus, improved infrastructure improves the value of all affected properties, whether or not their owners fund the project. This creates a "meta hold out" problem – if all can benefit without expending, then no-one has an incentive to expend on the infrastructure.[4] Carson adopts this to HIV protection - many participants in the MSM market engaging in preventative measures reduces the incidence of HIV, providing (in the lack of compensation)

little incentive for an individual to adopt preventative measures themselves. This is exacerbated by a lack of information about the HIV status of the individual one is considering having sex with.[5] Carson then turns to discussion of informal norms, being norms which provide decentralised, normative statements but provide fewer secondary rules about when they apply. Compliance with any informal norm involves the market participant weighing up whether the benefits of compliance exceed the costs incurred, and also whether it is expected that others will follow that rule.[6] Carson then applies this to the concept of HIV prevention:

> "As gay men learned how HIV spread in the 1980s and they associated the disease with sexual behaviours, a set of informal norms, referred to as the "condom code" by Chambers (1994) helped to encourage preventative behaviour."[7]

Carson states that this informal rule (not just condom use, but specifically condom use as a result of a social obligation) has been internalised into MSM, and spread due to the homogenous nature of MSM communities across America, and high numbers of civil society organizations within such communities which helped reinforce the Condom Code.[8] Carson then reviews modern developments: the rise of anti-retroviral therapy (ART), which makes HIV less likely to turn into AIDS, and the rise of pre-exposure prophylaxis (PrEP), which reduces the chance of contracting HIV from exposure to it. Each of these make MSM at the margin between safe and unsafe sex more likely to engage in unsafe sex.[9] Carson then reviews the rise of online sexual communities, and states that they "facilitate serosorting", which in turn renders informal norms less valuable.[10]

Carson's economic analysis therefore emphasises two key economic elements. Firstly, he views HIV prevalence through unsafe sex as a collective action problem. Secondly, he views the rise of the condom code to solve it as use of an informal norm. This paper will demonstrate that both of these statements may not show the full picture. To achieve this it will explore the economic nature of collective action problems and conclude that HIV prevention does not inevitably fall within this category.

3. Law and Economics

Law and Economics

Prior to critiquing Carson's argument, it is helpful to explain how different law and economic approaches can be applied to the same subject matter. There are many different ways to categorise theorists within law and economics,[11] however for the purpose of this paper we shall concentrate on different approaches to interactions between laws and markets. There are three different core beliefs on the interaction between the two. Firstly, Coaseans[12] hold that markets will produce efficient outcomes regardless of the law or informal norms.[13] This approach is based on a series of assumptions, the key of which are zero transaction costs and symmetric information. Coasean conclusions do not always hold when these assumptions are not correct.[14] Secondly, Posnerians believe that markets tend to, but do not always, produce efficient outcomes. Where they do not, positive law can provide a state-backed assistance towards efficiency. Posner has stated "many legal doctrines rest on inarticulate gropings towards efficiency" – this is especially thought to be the case for common law rules.[15] Thirdly, Ellicksonians hold that markets sometimes do not provide efficient outcomes, and where they do not then positive, state-enforced and centralised law is not useful: instead the primary way to solve such inefficiencies is by use of informal norms, or social norms, in which society finds its own way to exert pressure on markets to correct themselves to efficient outcomes.[16]

Carson's argument is fundamentally Ellicksonian in tone – condom use will not be attained on its own, and social norms in the form of the condom code are required to enforce it. He also begins the article by debunking a Posnerian approach – formal, centrally enforced laws do not result in condom usage.[17] However, Carson does not address the possibility of a Coasean response to condom use other than to assert that a problem of free-riders means that the market cannot operate efficiently in epidemiology. However, what if neither formal nor informal norms are responsible for condom use – could condom use simply be a private rational course of action which require no laws, formal or informal?

What are Collective Action Problems?

To commence this paper's critique of Carson's analysis it shall examine collective action problems to establish whether, economically, it is inevitable that HIV prevention through condom use by MSM falls

within this category. The two most common examples of collective action problems from an economic perspective are the prisoners' dilemma and the tragedy of the commons.

The prisoners' dilemma is a classic and well known economic tool.[18] It has multiple iterations,[19] but fundamentally proceeds on the following terms: two individuals (the prisoners) are arrested. Their options are to stay silent or to incriminate the other. There are therefore four possibilities: prisoner A stays quiet as does prisoner B, prisoner A incriminates prisoner B but prisoner B stays quiet, prisoner A stays quiet but prisoner B incriminates prisoner A, or each prisoner incriminates the other. If each of them stays silent then each of them will serve one year in prison, if each betrays the other then they will each get two years in prison and if one betrays the other then the betrayer is freed but the betrayed spends 3 years in prison. A tabular portrayal is therefore:

	Prisoner A Silent	Prisoner A Betrays
Prisoner B Silent	A 1, B 1 (Total 2 years)	A 0, B 3 (Total 3 years)
Prisoner B Betrays	A 3, B 0 (Total 3 years)	A 2, B 2 (Total 4 years)

Efficiency can mean various different things economically,[20] but under any definition from the prisoners' perspective it is efficient for them to minimise their aggregate time in prison. The optimal outcome is, therefore, that both stay silent, as then an aggregate of two years is spent in prison. The least efficient outcome is both betraying the other, as then an aggregate of four years is spent in prison. However, from the perspective of either individual prisoner if they stay silent then they will either spent 1 or 3 years in prison (an average of 2 years), whereas if they betray then they will either spend 0 or 2 years in prison (an average of 1 year). It is therefore rational for a prisoner to betray the other. The issue arises that, economically, each prisoner behaving rationally will result in an inefficient outcome. If the figures were different and aligned the rational actions of the parties with an efficient outcome, then there would be no dilemma and thus no collective action problem. It is the misalignment between individual choices and efficient outcomes, and only this, which produces collective action problems.[21]

The same can be seen in the tragedy of the commons.[22] In such circumstances there is a common resource, such as a field or a lake, which various farmers exploit, by grazing their cows or fishing

respectively. In such circumstances, once more the interests of participants are not aligned with overall efficiency of the market: each farmer is incentivised to maximise their own profit from the common resource, which they do by maximising their use of the common resource past the sustainable levels of use. As a result, the common resource becomes depleted. Once more, it becomes rational for each actor to behave in a manner which is, overall, inefficient.

Carson's first economic pillar is that condom use for HIV prevention amongst MSM is a collective action problem. From the foregoing we can see that for this to be correct, there must be a misalignment between rational actions of participants and efficiency as a whole. If, instead, rational actions of market participants produce an efficient result, then there is no collective action problem and so Carson's social norms are not required to ensure condom usage. Is there, therefore, a way in which we can consider the use of condoms in hook ups to be a rational actions?

4. Information Asymmetry

To answer this question we shall now examine the approach that other economic theorists have taken to the issue of HIV protection and propose our own economic rationale for condom use in casual intercourse.

Other Approaches to HIV Prevention

Philpson and Posner examine the issue from a different perspective.[23] Starting from the proposition that people prefer sex without condoms,[24] they are able to build a simple but compelling economic model: someone will participate in unprotected sex so long as the benefits to them doing so exceed the costs, where costs are calculated as a function of probability that the sexual counterparty has HIV (P1), the probability of transmission if they have (P2), the probability that the person themselves have HIV (P3), the seriousness of HIV (P4) and the treatability of HIV (P5).[25] As a result, when the probability that the counterparty has HIV increases by a general increase of HIV in the population, P1 will increase and so fewer people will opt to undertake unprotected sexual activity. The result is that people engage in risky sex if either both partners believe there is a high chance of both having HIV or both believe there is a low chance.[26] In turn, this will increase the private demand for HIV testing.[27] Philipson and Posner's analysis produces a Coasean result: that any attempt of the state to interfere in HIV testing is likely to increase the

likelihood of HIV rather than decrease it.[28] There are further complications to the model but, ultimately P1 is calculated by Philipson and Posner by reference primarily to the proportion of the population with HIV as a whole.[29]

Schroeder and Rojas approach the issue from the perspective of game theory.[30] They model a game theory game that they refer to as the "risky sex game". It has the following rules:

> "(a) the game contains two actors: #1 and #2;
>
> (b) each actor is either HIV + or HIV -;
>
> (c) both actors have a commonly shared belief that the other actor may be HIV + but they do not know with certainty and do not find out the truth, even if they eventually have sex. Call this probability "p";
>
> (d) actor #1 offers to have either protected sex (PS) or risky sex (RS);
>
> (e) actor #2 makes a counter offer of PS or RS;
>
> (f) actor #1 either accepts the final offer or ends the interactions with no sex (NS);
>
> (g) actions #2 confirms, and the pair has the type of sex offered by #2, otherwise #2 ends the interaction;
>
> (h) at every point in the game, each actor updates his or her belief that the other has HIV…;
>
> (i) the preferences of the actors depend on whether they are HIV + or HIV -."[31]

The preferences indicated are that actors of the same serotype will prefer RS over PS as will HIV + actors with HIV – actors, but that HIV – actors will prefer PS and NS over RS with an HIV + actor. Each actor has private information as to their own HIV status. Schroeder and Rojas use a Bayesian technique (i.e. that player update their assessment of the HIV status of the other actor) over the course of the game.[32] This means that the course of interaction in preparation for a hook up can provide some insight into the HIV status of a potential counterpart: P1 is updated over the course of interaction between counterparts. However, proposition of this paper is that it may be possible for an actor to be able to reach some insight as to the HIV status of their counterpart before commencing such interaction: for the purposes of Philipson and Posner it may be possible to identify the probability of P1 by reference to the initial market signalling received from a counterparty.

Further analysis has been advanced by Francis and Mialon.[33] Francis and Mialon integrate law into signalling, by examining the incentives that are created depending on what is criminalised. Their modelling demonstrates inefficiencies in laws – most US states criminalise transmission of HIV and exposure to HIV equally, which disincentives safe sex as it is equally as criminal. Secondly, most US states only criminalise knowing transmission/exposure, which disincentives testing. Francis and Mialon's analysis takes matters further by factoring in legal incentives to obtain HIV tests, and formulating the model laws to deal with this. Francis and Mialon state that "if the potentially infected individual knows his HIV status, his choice of whether to propose safe or risky sex may be a signal about his status".[34] Whilst this is correct, it is limited to when actors know their own HIV status. We can use economic analysis to expand this to show that signalling has wider application.

Information Asymmetry

Philipson and Posner do not identify how P1 is ascertained, Schroeder and Rojas start their game with a known risk that their sexual counterpart may be HIV+, and update the probability that this is the case (i.e. P1) throughout the game by "in game" signalling, and Francis and Mialon highlight that there can be "pre game" signalling if the actor knows their own HIV status. This paper's addition to the field is to use economic methods to demonstrate that there may be "pre game" signalling which influences P1 which apply regardless of whether one actor is aware of whether the other knows their HIV status. Let us focus on the rise of mobile applications which rank other users by proximity, such as Grindr after which this article takes its name. Grindr has been said to result in increased number of "casual hook up"s, which are transactional in nature.[35] As a result, we can borrow from transactional literature to resolve whether HIV protection amongst the MSM community constitutes a collective action problem. Carson notes that location based applications assist with serosorting, in that they allow for inclusion of HIV status within the profiles and have instituted campaigns to encourage testing – stating "members have ample opportunity to inquire about a prospective partner's HIV status; whether or not they actually ask is not always clear."[36] However, by viewing location-based applications as transactional we can add to this analysis to demonstrate how condom use in respect of such applications may not be a collective action problem: even without a market participant asking about the serostatus of their counterpart, initial signalling can affect the P1.

The starting point is George Akerlof's 1970 article "The Market For Lemons: Quality Uncertainty and the Market Mechanism".[37] Akerlof uses the example of the automobile market:

> "Suppose (for the sake of clarity rather than reality) that there are just four kinds of cars. There are good cars and bad cars (which in America are known as "lemons"). A new car may be a good car or a lemon, and of course the same is true of used cars."[38]

A purchaser of a new car will not know whether they are buying a good car or a lemon, but after they have owned it for a while they will know the quality of their car. This causes issues with the used car market. Used cars are worth less than new cars. A buyer will be unaware whether the car is a good car or a lemon, whereas the seller will know. Good cars are worth more than lemons. As the buyer will not know whether a car is a good car or a lemon, good cars and lemons will sell at the same price. This will result in the price for used cars being the average price between the value of a good car and the value of a lemon: owners of good cars can only sell cars for less than they are worth, whereas owners of lemons can sell cars for more than they are worth. This means that owners of good cars will not sell their cars at the price of average quality, whereas owners of lemons will be keen to sell their cars, causing a lowering of quality of car in the market, which in turn causes a lower average price. As a result, only lemons are sold in the used car market. Akerlof also applies this to health insurance for the over 65s in America- no matter how many checks are undertaken, the insured will know more about their own health status than the insurer. This will result in the price of insurance being the average amongst the same demographic, i.e. healthy and unhealthy. For those that are healthy, therefore, the price will be more than they are likely to have to expend in the absence of insurance, making them less likely to take out insurance. For those that are unhealthy, the price is less than their likely expend in the absence of insurance, making them more likely to take out insurance. The result is that insurance prices increase, which further exacerbates the problem.[39] To generalise, information asymmetry between the buyer and the seller as to the quality of the product can result in the exit of high quality products from the market place. In a market where the seller knows the quality of their good, the objective value of such good and the price at which they are able to sell, this process can be instantaneous. The analysis behind the market for lemons applies when exchanges apply, goods can be of different quality and market participants have a way to know this.

What application, however, does this analysis have to the subject matter at hand? Information asymmetries apply to serostatus when meeting putative sexual partners for casual meetings. Even despite a lack of an overt exchange of a product for cash, market principles still apply for casual "hook-ups". Each participant is willing to trade something, their giving of pleasure (in whatever form that may take), for something, their receiving of pleasure (in whatever form that may take). There is therefore an exchange – rather than a definite "buyer" and a definite "seller", however, each participant is, at the same time, a buyer and a seller: buying pleasure for them in exchange with granting pleasure. The market for lemons can be directly applied to the market for unprotected anal intercourse (UAI) in hook-ups. Each participant knows either their serostatus or their historic risk profile in respect of UAI. However, they do not know their counterparts' serostatus, nor their historic risk profile. We therefore have an information asymmetry.

Where the Grindr market is more complicated, however, than the automobile market is the knowledge that market participants have of the potential for an information asymmetry. In the automobile market, this arises naturally due to price: prices are set on average value, sellers know the value of the goods they are selling and can directly compare the price that they would receive for entering the market to the value of their good. This is not the case for the market for UAI. However, a directly analogous position arises. Public knowledge about the risks of UAI[40] alert market participants of the potential of HIV risks from using UAI. This public knowledge of the risk results in, at the margin, those without HIV exiting the UAI market, whereas those with HIV have no need to leave the UAI market. When coupled with information asymmetry as to the serostatus of your counterpart, this will result in a rational HIV negative actor adopting a cautious attitude to UAI, as those without HIV will be aware that, at the margins, other HIV negative actors will have left the market for UAI.

Let us make the following assumptions about the market for MSM hook-ups. Firstly, each participant either has HIV or does not have HIV. Secondly, an information asymmetry as to serostatus (or historic risk profile) occurs between the parties. Thirdly, that UAI is preferable to protected anal intercourse (PAI), but that the costs of contracting HIV outweigh the benefits of UAI over PAI. Fourthly, that the only risk of UAI is HIV.[41] Fifthly, that there is only one strain of HIV (the combination of the fourth and fifth assumptions meaning that once you have HIV there is no additional risk of UAI).[42] This means that

HIV negative participants will want to undertake UAI if they can be certain that their counterpart is HIV negative, whereas HIV positive participants will always want to undertake UAI. In the presence of a risk that their counterpart has HIV, the rational HIV negative actor will chose PAI over UAI (in line with the assumptions advanced by Shroeder and Rojas). The result of the information asymmetry, together with knowledge of the risks of UAI, will result in those without HIV from exiting the market for UAI. This results in an analogous situation to the market for lemons – as those without HIV exit the UAI market, the proportion of those remaining in the UAI market with (or who are more likely to have) HIV increases. In the same way that the information that good cars are leaving the market will filter into the price for used cars, so the knowledge that those without HIV have left the UAI market will. This therefore provides strong signalling to the market that those in the UAI market have a higher chance of having HIV than those in other markets, including the PAI market. In turn, this disincentives those without HIV from entering the UAI market. The result of this feeds in to the previous analysis: in addition to being able to update your assumptions about the probability that your counterpart has HIV based on the population percentage (as per Philipson and Posner) and interactions that you have with them (as per Shroeder and Rojas), the fact that they are in the market for UAI at all indicates a higher probability of being HIV positive, regardless of whether they have private knowledge as to their own serostatus (thus extending from Francis and Mialon's analysis). This means that we can ascertain that P1 is greater for those in the market for UAI than elsewhere, in turn further driving those without HIV out of the UAI market. This disagrees with the approach taken by Francis and Mialon, who argue that criminal sanctions may mean that an offer for PAI may signal HIV status.

In other words, whilst a different situation to the automobile market that created the market for lemons, the UAI market is analogous. Given our assumptions listed above, in the UAI market someone with HIV can be considered as providing a less valued product than someone without HIV,[43] as with a lemon in the automobile market. As with lemons in the automobile market, HIV positive entrants in the UAI market result in the exit of the other category from the market. In the case of HIV, this means that a signal from someone that they wish to undertake UAI (already a venture in respect of which an HIV negative person is aware of a risk) alone signals their increased chance of having HIV to a counterparty without HIV.

Why does this matter? This signalling is initial. It is, therefore, different than the game theory played out by Schroeder and Rojas which concentrated on signalling responses, and provides a nuance to the Philipson and Posner argument. It applies regardless of whether the signaller is aware of their own serostatus, and thus advances the Francis and Mialon proposition. It also makes the abstract risk of HIV more specific and concrete, and means that those without HIV are less likely to enter into the UAI market. In other words, it is rational for someone without HIV, who does not want to contract HIV, to avoid the UAI market, by utilising condoms. In turn, this means that condom use in casual meetings on online platforms is rational. We have seen that collective action problems arise when it is rational for actors to behave in a way which is inefficient. If we view avoiding HIV, and therefore condom use, as efficient, then the above analysis shows us that rational actions of market participants lead to the efficient outcome. In other words, using condoms to minimise the risk of contracting HIV is not a collective action problem – it is the position that the market itself will provide once knowledge of the serostatus in the UAI marketplace percolates across market participants.

If using condoms is not a collective action problem, then informal norms are not required to solve it. This allows a different take on the use of condoms – rather than being an external pressure applied by the gay community which is internalised by market participants, instead using condoms becomes the rational choice that would be taken by market participants. Rather than social norms being the answer, instead perhaps simple market action is. In other words, we move from Ellickson law and economics to Coasean law and economics.

Instinctively, this makes sense: it is difficult to monitor breaches of the condom code. Whilst Carson cites issues with overt and public rejection of condoms,[44] decisions to use condoms are normally private to the participants in question. As failure to use a condom applies equally to that person who wished to not use a condom and the person who acquiesced to such request, there is little incentive for either party to publicise the lack of condom use for any particular sexual activity. Accordingly, it is difficult to monitor widespread compliance. It is not possible to establish lack of compliance from a positive HIV result, as HIV can be contracted from parents,[45] blood transfusions,[46] sharing of intra-venous needles,[47] and others. Conversely, not using a condom does not automatically result in HIV transmission. This combination means that in addition to not being able to privately track compliance with the condom code, it is not

possible to establish it after the fact either. The analysis advanced by this paper therefore seems instinctively sensible – condom use arises from a private decision based on a cost/benefit analysis rather than by way of social pressure to follow norms to do so. Of course, it is not the case that such cost/benefit analysis and social norms exist in isolation, instead norms can be internalised and factored in to the cost/benefit analysis.[48] However, this internalisation is just one factor, and may be less important than it seems to be under Carson's analysis.

Carson indicates that market mechanics (i.e. Coasean solutions for our purposes) do not work due to free rider problems – that condom use by others, or perceived condom use by others, will mean that people freely enter the market for UAI relying on the preventative measures taken by others. There is a risk, however, that this misstates the free riding problem. Free riding occurs when parties enjoy external benefits without the need to incur private costs. Carson indicates that the increased use of condoms by third parties lowers the prevalence of HIV in the market as a whole. This is correct, however it does not create an external benefit to a market entrant in the UAI market, it reduces the potential cost to the market entrant. Thus the presence of condoms, ART and PrEP lowers the risk of HIV transmission (P2 in the Philipson and Posner probabilities). However, it does not create an isolated benefit for UAI participants – it slightly lowers the risk. At the margin, this may be enough to convince some people that the risk is worth it, however does not fundamentally alter the analysis.

It can therefore be seen that the solution to condom use amongst MSM for hook-ups may be a purely rational response to the knowledge that HIV can be spread through UAI. As the market functions efficiently, there is no need for any informal norms to correct it. Market signalling mechanism may provide an alternative way to view sexual behaviour which is of greater importance than informal norms.

5. **Critique**

This analysis, however, is not without its limitations. It makes several assumptions which are known to be incorrect. Firstly, it views sexual activity as purely a transactional matter. This is likely to be more to sexual activity than this. As a result, the foregoing analysis may not be correct as a decision to undertake UAI may not result from purely rational economic considerations. In addition, repeat transactions change the signalling effects between parties,[49] which could skew the perceptions of P1 in the market for UAI.

Secondly, it presumes that there is a uniform risk from UAI. This is not the case, as receiving UAI results in a higher chance of transmission than giving it.[50] Similarly, there are other diseases which can be transmitted even if a participant already has HIV, and there are different strains of HIV which increase complexity. Whilst concentrating on risks, the foregoing presumes that all HIV positive participants provide the same risk to HIV negative participants, whereas the rise of ART means that HIV positive participants may be less likely to pass on HIV,[51] and PrEP means that HIV negative participants may be less likely to contract it.[52] This results in complications to the signalling mechanisms – not all participants in either serotype are fungible. ART and PrEP add further complications. Generally, the medical sources quoted are now quite outdated, and so the analysis advanced is not reflective of the most modern medical thinking.

Thirdly, it presumes that those without HIV will value avoiding HIV over UAI. It may be that HIV is not a consideration in the participant's analysis, and that people will not behave as rationally as defined in this paper.

Fourthly, it presumes that the only signs as to serotype are implicit and ignores explicit statements made by participants – an explicit statement by an HIV positive participant that they are HIV negative, or on ART, may prevent the market developing as above.

Fifthly, it ignores the effect of modern developments that Carson highlights. It is possible that by reducing HIV transmission, through ART and PrEP, HIV drops to levels such that the market changes to the UAI market do not occur or, to the extent that they have already occurred, are reversed.

Sixthly, its economics may be suspect: it may be that those without HIV in the UAI market never become aware that others without HIV have left the UAI market. Without this information becoming part of the market, the market may not develop in the manner outlined above. Similarly, the definition of efficiency deployed though-out the paper can be criticised: that those without HIV, who value UAI but value avoiding HIV over UAI, chose to leave the UAI market could be seen as failure of the UAI market rather than its efficient operation.

6. **Conclusion.**

The analysis advanced in this paper has shown that Carson may be incorrect. Using economic analysis, we have shown that condom use may result from rational actions of market participants as HIV negative participants in the wider MSM market exit the UAI market. If this is the case, then condom use for hook-ups amongst MSM is not a collective action problem. If it is not a collective action problem, then it does not need social norms to remedy it. This leads to the conclusion that Carson's conclusions may not demonstrate the full picture.

However, this analysis is, in turn, based on simplistic assumptions which, when subjected to complexity, undermine the analysis. For a myriad of reasons, it is possible that the market will not react as outlined above to remove the market for UAI. As with Carson's argument, there is a possibility that it is an accurate description, but also a possibility that it is not.

Law and economics analysis is always fraught with difficulty due to the malleability of economic concepts in isolation. As Leff once famously stated,[53] law and economics can be used to explain to an old widow who has defaulted on her mortgage why it is in her own interest to be evicted from her home.[54] This risk is highlighted in the conclusions reached by Carson and in this paper: Carson concludes that any problem that there has been has been solved by informal norms, and the logic of this paper indicates that ever since the initial knowledge was promulgated that HIV can be caught through UAI then there has been no problem. Both of these are stark and clear propositions to be made in the abstract, and neither may prove to be empirically correct. It is likely that, in different situations and to different extents, each of the arguments in this paper and in Carson's paper hold partially true. As such, it is likely that the foregoing analysis supplements Carson's analysis and demonstrates additional richness to the tapestry of the issue.

This is not to state that law and economics can never be of application to wider elements, as Carson has produced a strong Ellickson-esque argument for condom use through social norms, and this paper has produced as strong Coasean argument for condom use through rational market forces producing efficient outcomes. However, in the abstract, it is impossible to know which is correct. We cannot, from Carson's paper and this paper alone, fully understand the causal link for the use of condoms amongst MSM for hook-ups, which means that we cannot provide an epidemiological prognosis. It is perhaps correct that such a task falls to more empirical fields than purely theoretical and analytical law and economics.

Endnotes:

1. B. Carson, 'The Informal Norms of HIV Prevention: The Emergence and Erosion of the Condom Code,' The Journal of Law, Medicine & Ethics, 45 (2017): 518 – 530.

2. Carson (supra note 1) at 519.

3. Carson (supra note 1) at 519.

4. See L. Cohen, 'Holdouts and Free Riders,' The Journal of Legal Studies, 20 (1991): 351 – 362.

5. Carson (supra note 1) at 520.

6. Carson (supra note 1) at 521.

7. Carson (supra note 1) at 522.

8. Carson (supra note 1) at 524.

9. Carson (supra note 1) at 525.

10. Carson (supra note 1) at 525.

11. For example, law and economics can be divided into positive (which identifies efficiencies in existing legal norms) and normative (which proposes amendments to legal rules based on economic principles).

12. For terminology – see S. Schwab, 'A Coasean Experiment in Contract Presumptions,' Journal of Legal Studies, 17 (1988): 237 – 268 at 237.

13. This paper refers to it as "Coasean" based on the "Coase Theorem" that, in the absence of transaction costs, initial allocation of rules does not affect the efficiency of bargains struck (see R.. H. Coase, 'The Problem of Social Cost, ' Journal of Law and Economics 3 (1960): 1 - 44. The term "Coase Theorem" was, however, initially formulated by G. Stigler - see S. Schwab, 'Coase Defends Coase: Why Lawyers Listen and Economists Do Not,' Michigan Law Review 87 (1989): 1171 - 1198 at 1173. This can

be formulated as a strong version (that market participants make efficient choices regardless of legal rules) and a weak version (that legal rules do not make a difference to the choices that are made) – S. Schwab (supra note 12) at 242-243.

14. see Coase (supra note 13) at 15-19.

15. R. A .Posner, Economic Analysis of the Law 5th edn(New York: Aspen, 1998) at 27.

16. R. C. Ellickson, Order Without Law: How Neighbours Settle Disputes (Harvard: Harvard University Press, 1991), Chapters 7 – 9 and E. A. Posner, Law and Social Norms (Harvard: Harvard University Press, 2005), Chapter 2.

17. Carson (supra note 1) at 518 – 519.

18. See generally M Peterson, ed, The Prisoners' Dilemma (Cambridge: Cambridge University Press, 2015).

19. The typical iteration will be utilised and is taken from W Poundstone, Prisoners' Dilemma: John Von Neumann, Game Theory and the Puzzle of the Bomb (New York: Doubleday, 1992) at 132.

20. It can mean a result in which all parties are better off (a Pareto improvement) or a result in which the parties in aggregate are better off, allowing for individual actors to be harmed by the process so long as the gain of other parties is greater than the loss (Kaldor-Hicks efficiency) – see J. Hardman, 'Some Legal Determinants of Finance in Scotland: A Response to Lord Hodge' Edinburgh Law Review 21 (2017): 30 – 54.

21. See Richard H McAdams, 'The origin, development and regulation of norms' Michigan Law Review 96 (1997): 338 – 433 and Ellickson (supra note 16).

22. Which arose from a 1833 pamphlet but was made famous by a 1960s ecology article - G Hardin, 'The Tragedy of the Commons' Science 162 (1968): 1243 – 1248.

23. T. J. Philipson and R. A. Posner, 'Private Choices and Public Health: The AIDS Epidemic in an Economic Perspective' (Harvard: Harvard University Press 1993) at Chapters 2, 3 and 4.

24. See R. D. Mohr, Gays/Justice: A study of Ethics, Society, and Law (New York: Columbia University Press, 1988) at 232.

25. Philipson and Poser (supra note 23) at 33.

26. Philipson and Poser (supra note 23) at 38 – 40.

27. Philipson and Poser (supra note 23) at 91.

28. The logic is that those with a higher chance of having HIV will evade mandatory testing or alternatives, which will in turn produce more HIV negative results than exist within the population which will skew people's perception of P1 (and therefore the risks of contracting HIV through unprotected sex) to be lower than the reality, Philipson and Poser (supra note 23) at 130 – 137. Similarly, taxing people who have HIV more will result in fewer people being tested (Philipson and Poser (supra note 23) at 147).

29. Philipson and Poser (supra note 23) at 35 – 36.

30. K. D. Schroeder and F. G. Rojas, 'A Game Theoretical Analysis of Sexually Transmitted Disease Epidemics' Rationality and Society, 14 (2002): 353 – 383.

31. Schroeder and Rojas (supra note 30) at 365.

32. Schroeder and Rojas (supra note 30) at 370 – 379.

33. A. M. Francis and H. M. Mialon, 'The Optimal Penalty for Sexually Transmitting HIV.' American Law and Economics Review, 19(2) (2008): 388-423.

34. Francis and Mialon (supra note 33) 390.0

35. C. Licoppe, C. A. Riviere and J. Morel , 'Grindr casual hook-ups as interactional achievements' New Media & Society 18 (2016): 2540 - 2558.

36. Carson (supra note 1) at 526.

37. G. A. Akerlof, 'The Market for "Lemons': Quality Uncertainty and the Market Mechanism' The Quarterly Journal of Economics, 84 (1970): 488 - 500.

38. Akerlof (supra note 37) at 489.

39. Akerlof (supra note 37) at 492 – 493.

40. See L. Kann, J. .E Anderson, D. Holtzman, J. Ross, B. I. Truman, J. Collins and J. L .Kolbe 'HIV Related Knowledge, Beliefs and Behaviours among High School Students in the United States: Results from a National Survey' 61 Journal of School Health 61 (1991): 397 – 401.

41.This is, of course, not the case – see M.A. Muñoz-Perez, A Rodrigues-Pichardo and F Camacho Martinez. 'Sexually Transmitted Diseases in 1161 HIV-Positive Patients: A 38-month prospective study in Southern Spain,' 11 Journal of the European Academy of Dermatology and Venereology 11 (1998): 221 – 226.

42. Once more this is, of course, not the case - see O. Dyer, 'New HIV Strain drives growing Philippines Epidemic,' British Medical Journal, 360 (2018): k1323.

43. It cannot be stressed enough that this is limited entirely to the economic market assumptions outlined and is not a more general statement intended for any wider application than the analogy advanced.

44. Carson (supra note 1) at 523.

45. See T. Betancourt, E. Abrams, R. McBain and M. Fawzi, 'Family-centred approaches to the prevention of mother to child transmission of HIV,' Journal of the International AIDS Society 12 (2012): s2.

46. See A. Moore, G. Herrera, J. Nyamongo and others, 'Estimated risk of HIV transmission by blood transfusion in Kenya', The Lancet 358 (2001): 657 - 660.

47. see T. W. Valente and D. Vlahov, 'Selective Risk Taking among Needle Exchange Participants: Implications for Supplemental Interventions,' American Journal of Public Health 91 (2001): 406 – 411.

48. A M Francis and H M Mialon. 'Tolerance and HIV.' Journal of Health Economics, 29(2) (2010): 250-267.

49. Akerloff indicates that using a "brand" or a chain of entities is a way to avoid the market for lemons as it provides a signal of quality. However, in the case of repeated non-exclusive UAI, the fact that a

counterparty was HIV negative on a previous occasion is no indication of their current serostatus, although it may seems to a market participant that it is. This may result in them significantly underestimating P1 when it comes to a regular but non-exclusive sexual partner – a complication which is avoided by instead concentrating on the one-off transactional aspects of hook-ups.

50. See S. M. Goodreau, L. P. Goicochea and J. Sanchez , 'Sexual Role and transmission of HIV Type 1 among men who have sex with men in Peru' Journal of Infectious Diseases 191 (2005): 145 - 158

51. See K. Yoshimura, 'Current status of HIV/AIDS in the ART era,' Journal of Infection and Chemotherapy 23 (2016):12 - 16

52. See C. D. Spinner, C. Boesecke, A. Zink and others, 'HIV pre-exposure prophylaxis (PrEP): a review of current knowledge and oral systemic HIV PrEP in humans,' Infection 44 (2016): 151 – 158.

53. See Hardman (supra note 20).

54. The argument proceeds on the basis that she probably wont die, and will only face discomfort. However, the effect of granting her relief would be to prevent other lenders from moving to the mortgage market for old widows, which will mean that it is less likely that old widows to be able to get mortgages, which reduces optionality for old widows and is not in their interest as a class. As the evicted widow falls within that category, it is in her own interest to be evicted- A. A. Leff, 'Economic Analysis of Law: Some Realism about Nominalism,' Virginia Law Review 60 (1974): 451 – 482.