Choosing Among Paradigms: Are Rival Theories of Smoking Incommensurable?

by

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I. INTRODUCTION

Cigarette smoking, says the U.S. Surgeon General, is the leading cause of preventable death and disease in the United States. Every year about 430,000 citizens die prematurely from cancers, cardiovascular disease and stroke, and many more suffer from bronchitis, emphysema and other chronic conditions (CDC 1993). Smoking also stains teeth, fouls breath, pollutes clothing, and irritates non-smokers. Worse yet, it is highly habit-forming. Among the different theoretical perspectives on smoking, there is little dispute regarding these facts: smoking is risky and hard to quit. However, there is widespread disagreement over the implications; in particular, whether smoking should be seen as a private or as a public health matter.

Public health officials and kindred scholars argue that "smoking . . . is the single most important *public* health issue of our time." (USDHHS 1982, emphasis added). In contrast, many economists and others, say that (adult) smoking should remain a private matter in the absence of market failures: missing markets that lead to (1) to an under-supply of accurate risk information or to (2) external costs. Our paper begins with a Kuhnian question: does smoking policy disagreement arise because the current empirical evidence does not successfully adjudicate between rival theoretical perspectives? Or is the policy disagreement more the product of a deeper incommensurability, a situation where evidence *cannot* adjudicate, even in principle, owing to fundamentally different conceptions of human nature and of the proper rôle for government interventions?

We proceed as follows: in Section II we introduce two rival views of smoking. In Section III we examine five pieces of empirical evidence with respect to the two alternatives. In Section IV we

consider a more refined taxonomy of theoretical perspectives on smoking, and in Section V we present some evidence for incommensurability among some influential perspectives on smoking and smoking policy.

II. RIVAL PARADIGMS FOR INVESTIGATING SMOKING BEHAVIOR

Kuhn was famously imprecise about what he meant by the term "paradigm." (Masterman 1970). We employ the term broadly, to include (1) methods, exemplars of good scientific practice, and (2) standards, the *ethos* or shared values within a research community, what Kuhn eventually termed a "disciplinary matrix." (Kuhn 1996: 176-8). Characterizing paradigms clearly involves some subtle and important issues. We deal with these difficulties first by presenting a broad-brush characterization of two paradigmatically different approaches – rational choice and non-rational choice, respectively – to the question "why do people smoke and what should be done about it?"

A. Rational Choice versus Non-rational Choice Approaches

In rational-choice theories of smoking, agents make purposeful, reasoned choices consistent with given preferences. Rational agents evaluate costs and benefits, and respond to changes therein, so rational explanations logically allow that one can be better off smoking, i.e. that the costs smokers risk can be exceeded by the benefits of smoking. The taste and feel of tobacco smoke can be pleasurable; smoking's rituals are often social, and can be comforting, even sensual (Klein 1993); and nicotine, rare among drugs, has a homeostatic affect on mood – it calms when one is nervous, stimulates when one is sluggish.

Smoking introduces two complications for the rational choice theorist: (1) intertemporal effects, and (2) nicotine addiction.[1] Intertemporal effects arise because smoking decisions and utility consequences are partly separate in time. Current and prior cigarette consumption (the consumption "stock") increases future health risks and withdrawal costs. The consumption stock also affects future

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[1] The term "addiction" no longer has, if it ever had, a widely-accepted standard clinical definition. Various definitions invoke one or more of the following: tolerance (the need for larger doses to achieve the same effect); withdrawal (painful to reduce or cease consumption); compulsive consumption even with adverse consequences; and intoxication. With respect to smoking, we employ the term as a kind of short hand for habitual use with withdrawal effects.

benefits – the pleasure of smoking can increase or decrease with past consumption, depending upon the relative effects of tolerance and reinforcement. Since smoking entails future costs and benefits, the rational agent must form some expectations and a means for evaluating them in present terms. It is thus not merely future prices and income that the agent must forecast, but also dynamically contingent utility effects, along with a method for discounting projected consumption paths. The accuracy and completeness of expectations, and discounting methods, can vary across rational-choice models, but all rational smoking theories make agents forward looking in some measure, not myopic.

Rational smoking theories treat nicotine addiction in different ways, but all make it at least partly internal to the cost-benefit decision process. In some models addiction is chosen, eyes open (Becker and Murphy 1988), while in other models addiction is more a byproduct, of *ex ante* uncertainty as to whether one is the "addictive type" (Orphanides and Zervos 1995) or of dynamically inconsistent preferences (Suranovic et al. 1999). But in rational theories of smoking, nicotine addiction is not regarded as a mistake and neither is it seen as "external" to decision making, i.e., as an avolitional compulsion that overwhelms the ability to choose rationally. Addiction unambiguously makes smoking hard to quit, but rational choice theorists generally do not regard smoking as different in kind from other hard-to-reverse choices, such as choosing a spouse or a career (Viscusi 1992) or failing to maintain a low-fat diet and exercise regimen.[2]

Non-rational choice theories of smoking, as the name suggests, are a family of approaches that quarrel with one or more or the rational choice assumptions just sketched. They are far more diverse than are rational choice theories, but all make assumptions which imply that harmful behaviors are the product of (1) decision making incompetence, or (2) decision making incapacitation (temporary incompetence), or both.

Decision making incompetence arises, notably, when the agent is immature, or insane, or otherwise incapable of rational choices with respect to smoking. Children, for example, may be unable

[2] Sticking to a low-fat diet and maintaining an adequate exercise regimen can reduce mortality risk nearly as much as not smoking (McGinnis, JM, Foege W.H. 1993). Casual empiricism and obesity rates suggest that these goals are often as hard to achieve as quitting smoking.

to fully contemplate life-threatening risk, or may lack a adequate means of discounting future costs, or may be especially susceptible to suasion, such as tobacco promotion or peer pressure. This is not inconsistent with rational choice *per se*; but it raises the difficult question of when children become mature enough to be deemed rational. Policies that aim to protect these incompetents from risky endeavors (driving, soldiering, sex, truancy, gambling, drinking, marriage) are sometimes referred to as "soft" paternalism (see New, 1999; "hard" paternalism is non-consensual interference in the self-regarding decision-making of a competent adult, intended to further his welfare, while "soft" paternalism is reserved for incompetent adults or children).

Intervening to protect adults from themselves is more controversial. Adults may be deemed incompetent when they are entirely myopic. Chaloupka and Warner (1999) identify a class of "myopic models of addictive behavior." In these models, behavior is non-rational because it is not forward looking (following Pollack 1975): "an individual recognizes the dependence of current addictive behavior decisions on past consumption, but then ignores [what logically must follow] the impact of current and past choices on future consumption decisions when making current choices." [3] (op. cit, p. 22).

Incapacitation holds that adults, who are ordinarily competent decision makers, have their rational faculties overwhelmed by nicotine addiction. "Once they have started smoking regularly," says David Kessler, a former commissioner of the Food and Drug Administration, "most smokers are in effect deprived of the choice to stop smoking."[4] (Sullum 1997). The "primrose-path" model (see Prelec and Herrnstein 1992) combines incompetence and incapacitation in a life-cycle story: smokers take up smoking as youths owing to incompetence. When mature enough to properly ascertain a poor choice, they are already hooked and the preferred choice is foreclosed by addiction (incapacitation).

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[3] With the exception of this class of models, it is rare to find formal models displaying nonrational choice approaches. In part, this is because most nonrational choice theorists come from intellectual traditions that typically do not employ the formal modeling techniques so ubiquitous in economics.

[4] In the medical literature on addiction, involuntary choice is sometimes referred to as a disease process, wherein using addictive substances causes biological changes in the brain, as evidenced by brain imaging technology (see Satel, 1999).

As indicated above, policies to protect competent adults from themselves are sometimes referred to as "hard paternalism."

Classifying diverse perspectives on smoking using a simple rational/ nonrational dichotomy has obvious limitations. However, both because it is revealing in itself, and because it helps to motivate a subtler taxonomy, we consider the question of how one might choose between the rational choice and nonrational choice paradigms. Can one be shown to be clearly superior, or do "incommensurability-like" problems arise?

III. CHOOSING BETWEEN A RATIONAL AND NONRATIONAL CHOICE APPROACH

How might one evaluate the relative merits of these two broad paradigmatic approaches? There are many possible criteria for appraising and comparing theories. Leonard provides a list of 21 different desiderata for a good theory, as proposed by distinguished commentators from economics or philosophy (1997, p. 27). [5] Our appraisal criterion will be narrowly empirical. We ask whether there are accepted facts that are clearly inconsistent with one of the paradigms, but not the other. We consider five pieces of empirical evidence that have been invoked to challenge one view or the other: (1) consumer response to price incentives, (2) expressed regret by smokers, (3) brain imaging evidence; (4) quitting behavior, and (5) subjective risk assessment.

A. Response to price incentives

There is widespread consensus that the empirical evidence suggests that current and potential smokers respond to price incentives. Higher excise taxes, for example, decrease cigarette consumption.[6] This evidence is of course consistent with the rational choice approach, which predicts

[5] For example, good theories should: "increase understanding of phenomena (Steven Toulmin); predict phenomena accurately (Milton Friedman)...; always be expressible in the notation of formal logic (A.J. Ayres);be chosen based on their relative expected profitability (Charles Sanders Pierce);....Have survived criticism (William Bartley);...be persuasive (D. McCloskey); ...aim for empirical adequacy (Bas van Fraassen):...;be falsifiable . . . (Karl Popper)." (Leonard 1997: 27).

[6] Empirical studies by Townsend (1987), Becker, Grossman and Murphy (1991,1994), Chaloupka (1991), and Farrelly and Bray (1998), among others, find that consumption is sensitive to changes in price. Viscusi (1992: 102-105) tabulates 41 studies, from the US and abroad, that estimate price elasticities.

responsiveness to price changes. In contrast, a theory that emphasizes strong incapacitation, would seem to rule out systematic responses consistent with the Law of Demand. Thus widespread demonstrated response to price appears to disconfirm a theory emphasizing strong incapacitation.

However, this preliminary verdict is incorrect. The reason is that rationality, while sufficient for the Law of Demand, is not necessary.[7] Gary Becker (1962), the archetypal rational choice theorist, shows how non-rational consumers can behave consistent with downward-sloping demand. In his model, consumers choose consumption randomly, though on their budget constraints. Prices affect the range (probability distribution) of consumption bundles available to the random chooser, so an individual may choose less or more with higher price, but, at the market level – if income is constant – aggregate consumption must fall with higher prices. It is thus scarcity in the form of budget constraints, not individual response to costs and benefits per se, that creates downward-sloping market demand curves. In theory, then, observed negative price elasticities need not be inconsistent with a view that agents are incapacitated or incompetent.

Kenneth Warner points out that animals also obey the Law of Demand: “drug-addicted laboratory animals do exactly the same thing when the 'price' of their drug – the number of times a lever must be pushed, for example – is increased.” (Warner 1999). These laboratory animals presumably are not purposefully evaluating expected costs and benefits, so systematic price responsiveness does not, by itself, disconfirm nonrational choice models.

B. Smoker’s regret

Survey evidence and casual empiricism suggest that many smokers regret taking up the habit. The fact that revealed preference (smoking) appears inconsistent with stated preference (quitting)

The short-run price elasticities consistently cluster around -0.4. There is also evidence of differential price effects. Younger smokers, for example, appear to be more responsive to increases in cigarette prices (Farrelly and Bray 1998). Viscusi (1995) suggests that teenage consumption elasticities are in the range of -1.2 to -1.4. Chaloupka and Grossman (1996) concur; they estimate a price elasticity of youth demand for cigarettes of -1.313. Similar summary readings of the elasticity estimation literature appear in Adams and Brock (1999, pp.64-69).

[7] Sufficient, that is, for normal goods and for inferior goods with small income effects. Income elasticity evidence suggests that cigarettes are normal goods.

presents an empirical challenge to rational smoking theories. Hanson and Logue, in a monograph-length critique of the rational choice view, argue that "economists . . . for the most part have failed to provide a plausible account of the apparent conflict between smokers' revealed preferences and their stated preferences."[8] (1998: 1193-94).

However, smoker's regret does not refute the rational choice approach, depending upon what regretful smokers actually mean. If smokers mean "I wish I didn't smoke," this is not inconsistent with rational choice. It means only that current choices are unpleasant. The pain of quitting can be seen as part of the cost paid for the pleasures enjoyed along the way, analogous to being overweight or hung over, or in debt. One can clearly regret that the bill has come due, but this regret does not demonstrate a nonrational choice (in lifetime terms), it just implies that much of the benefits are sunk.

Suranovic, Goldfarb and Leonard (1999) and Goldbaum (forthcoming), for example, assume that health costs arise late in life, so it can be rational to smoke when young, then quit when health costs become more proximate in time. When discounted health costs exceed current benefits, there is also the cost of quitting , which may exceed net health costs. This situation is consistent with statements like "I'd like to quit, but I cannot." Smoking is bad but quitting is worse. As expected net health costs continue to increase with age, they can exceed withdrawal costs, at which point the smoker quits. Moreover, as the time to rationally quit draws closer, one can regret being a smoker, because the pain of withdrawal, though rational to endure, still lies ahead.

Uncertainty can also lead to addiction and regret. Orphanides and Zervos (1995), for example, assume that the propensity for addiction is uncertain *ex ante*, so that potential smokers can rationally *risk* the possibility of addiction to obtain the usual benefits of smoking. Smokers who are unlucky and prove to be addictive types can be unhappy, *ex post,* without ever being non-rational. They gambled

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[8] One time-honored response is to argue that transactions data are superior to survey data – what people actually choose is evidentially more reliable than what they say they would choose. Viscusi, for example, points out that half of Los Angeles residents say they want to move, while a vastly smaller number actually do. (1992: 120). Skepticism with respect to survey (as against transactions) data is a familiar methodological stance among economists (See Boulier and Goldfarb 1998).

and lost. So smoker's regret does not, by itself, refute rational smoking. [9]

C. Brain imaging evidence

There is evidence from brain imaging that addictive drug use causes biological changes in the brain (see Satel, 1999). If similar changes occur in smokers' brains, one could then read this as physical evidence of incapacitation, wherein habitual smoking alters the brain so as to "mask" or make it difficult to act upon one's "true" preferences.

While such evidence might seem to challenge a rational-choice approach, it does not defeat it. There are two complementary reasons why. First, since the onset of smoking occurs before the brain is affected by addiction, a rational choice model can still apply to the decision to begin smoking. Second, and more important, there are reasons to contest the claim that brain changes entail nonpurposive, nonrational choices.

Why? Because there may not be any behavioral changes that correlate with the observed brain change, and, even if there are correlating behavioral changes, it's uncertain as to whether the behavior or the drugs are causing brain change. (Shaffer in Lambert 2000). Satel (1999) argues that, for illegal drugs and alcohol, there is no scientific evidence that the brain changes that come with addiction correlate with changed behavior.[10] She reads studies of addicts' behavior as showing that they are capable of choice and control behavior "inconsistent with a brain-bound, involuntary model of addiction." (Ibid). Says Satel, "calling addiction a chronic and relapsing disease is simply wrong...in the general population remission from drug dependence (addiction) and drug abuse is the norm...relapse is

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[9] If the regretful smoker means "I prefer quitting to smoking and yet I choose to smoke," – he truly prefers *x* to *y* and chooses *y* – then this is more problematic for rational choice theories. The possible explanations are 1) the choice is not meaningful, the desire for *y* is so overwhelming as to be non-volitional – incapacitation. Alternatively, 2) preferences change between decision and execution, or 3) preferences are not singularly ordered, as, for example, in schemes that permit meta-preferences (see for example George, 1998)

[10] "Harvard biochemist Bertha Madras acknowledges a virtual library of documented, replicable brain changes with drug exposure, but she also points out there are no scientific studies correlating them with behavior...(A) psychiatrist and nuclear radiologist at Yale University School of Medicine has called the notion of predicting behavior from brain pathology "modern phrenology."'

not.” She cites a famous study which found that “only 14% of [returning Vietnam War veterans] who were dependent on heroin in Vietnam — and who failed a publicized urine test at departure because they could not stop using — resumed regular heroin use back home... the rest had access to heroin, and had even used some occasionally, but what made them decide to stop for good...was the “sordid” culture surrounding heroin's use, the drug's price, and fear of arrest.”[11]

The brain imaging evidence we have cited refers to drugs and alcohol, not to cigarettes. But the argument above suggests that, even were there such direct imaging evidence for cigarettes, it would not by itself challenge the rational choice approach.

D. Quitting behavior

Two well-established empirical facts about quitting behavior are: (1) on any given attempt to quit, the smoker is very likely to fail, and (2) many of those who try to quit eventually do succeed after numerous attempts.[12] The first fact challenges the rational choice approach. It suggests people are unable to carry out what appear to be their intentions. But its strength as a challenge is mitigated by the second fact; many people who want to quit do succeed in doing so. The second fact, in turn, might be seen as a challenge to the nonrational choice approach. Quitting is a purposive act, showing that those addicted to nicotine are not so incapacitated that they are unable to shed the habit.

But just as the first fact does not defeat the rational choice view, the second fact does not of refute a nonrational choice view. Some smokers never try to quit, and some of them may fit the nonrational paradigm. Moreover, some who try to quit repeatedly, may repeatedly fail. In summary,

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[11] Relapse rates are high for addicts who go to clinics or other treatment facilities, but relying on these data may introduce a selection bias, since most addicts don’t go to clinics, and relapse rates among the non-clinic addicts are far lower (Heyman in Lambert 2000: 67).

[12] A CDC survey of 20,000 adults found that about one third of smokers try to quit in a given year, and that only about three percent of smokers actually succeed, a successful quit rate of eight percent. (Cited in Hanson and Logue 1998: 1193). In 1980, about 40 percent of smokers reported three or more lifetime attempts to quit; and about half of former smokers report three or more attempts before success, where “success” is defined as no cigarettes in the previous two years. But many smokers do shake the habit. For example, half of all Americans who have ever smoked have successfully quit, over 50 million people. (Schelling 1992).

these facts are not sufficient to convince a reasoned advocate of one of the paradigms that the other view was definitely superior.

E. Accuracy of health risk information

Anti-smoking advocates often argue that prospective and current smokers underestimate the health costs risked by smoking (e.g, Hanson and Logue 1998).[13] We consider two aspects of this matter: how accurate is the risk information people possess, and what are the implications for our two smoking paradigms? Because smoking risk assessment is subjective, the data are scarce. Two important studies (Viscusi 1992 and Shoenbaum 1997) give mixed and partly contradictory results.

Viscusi 1992 asked 3,119 respondents in 1985 to estimate the likelihood of developing lung cancer for a lifetime smoker. The average respondent put the risk at 43 percent, which is at least a four-fold *overestimate*, since the actual objective risk is estimated to be between 5 and 10 percent. Even smokers vastly over-estimated the true risk, putting the risk at 37 percent.[14] Viscusi also found that respondents, again including smokers, significantly over-estimate the total smoking mortality risk, that is, the risk of dying from all smoking-related causes.[15]

Viscusi's result that people *overestimate* the dangers of smoking is partially contradicted by Shoenbaum (1997), who found that, among white men and women aged 50 to 62, heavy smokers (25 or more cigarettes daily) have expectations of reaching age 75 that are nearly twice as high the true

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[13] It is also argued that prospective smokers underestimate the likelihood (and perhaps the cost) of becoming addicted. We do not consider this arguments separately, on grounds that it is of a piece with health risk information accuracy.

[14] The youngest age group (ages 16-21) was found to have the highest risk perceptions, consistent with the fact that this cohort has received a higher fraction of health messages (Viscusi 1992: 72-3).

[15] According to Viscusi, the best scientific estimates put smoking mortality risk between 0.18 and 0.36. The average respondent, however, assayed the risk at 0.54, and, here again, even current smokers overestimated the true risk at 0.47 (Viscusi 1992: 77). A related result is in a 1993 CDC survey of 3669 smokers in 1989. It found that 83 percent (87 percent of those aged 25-34) thought it "likely" or "very likely" that smoking cessation "will avoid or decrease serious health problems." (*MMWR* 39(38): 653-56, 9/28/90).

actuarial probability – that is, heavy smokers *underestimate* their risk of premature mortality.[16] But Schoenbaum also found and failed to emphasize that female respondents who formerly smoked, or currently smoked fewer than 25 cigarettes daily, all overestimated their chances of dying by age 75. (ibid: 757). In fact, of the 1,914 current smokers he surveyed, about 40 percent *over*estimated their chances of dying prematurely, while about 32 percent underestimated their odds — the remainder estimated correctly.

A neutral observer might take the two studies to show that most smokers either have accurate risk information, or overestimate the hazards of smoking, with the exception of the heaviest smokers, for whom the risks are greatest. As before these results are not decisive. Rational choicers will emphasize that nearly everybody (in the U.S.), smokers included, recognizes that smoking is risky, and, moreover, departures from accuracy tend to *over*estimate smoking risks. Non-rational choice partisans will emphasize that heavy smokers — the very people with the most to lose — tend to underestimate the hazards.

F. The problem of non-adjudicating data

The mere fact that compelling evidence fails to decisively knock down either paradigm is consistent with but does not prove incommensurability. We have not yet shown that there is *no* evidence that could *ever* adjudicate. Even good and widely accepted evidence rarely functions in crucial-experiment fashion. This is especially true with the vague and accommodating theoretical perspectives sketched above, since inconvenient evidence can be accommodated with vagueness, or with flexible adjustment of auxiliary assumptions. Therefore a pragmatic response might be: "theories are malleable, and theorists are ingenious with unfriendly data, so what did you expect?"

Another response is to reject our premise, i.e. to reject the very idea that theory choice can ever be influenced by recourse to data. This response rejects in principle theory choice based on

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[16] Schoenbaum took data on peoples' beliefs about their likelihood of reaching age 75 from the Health and Retirement Survey, a national probability sample of adults age 50 through 62. These expectations were compared with epidemiological predictions from life-tables for never, former, current light and current heavy smokers. The life tables were constructed from the 1986 National Mortality Followback Survey and the 1985 and 1987 National Health Interview Surveys.

empirical evidence. There is a family of epistemological views that adopt this stance. In addition to incommensurability, there is the view that theories are underdetermined by the data meant to adjudicate among them. In it's strong form, this stance argues for theory *un*determination (e.g., Woolgar 1988): empirical evidence, on this view, never influences selection of the "superior" theory, it serves a purely ceremonial function. Rather, theories advance for purely social reasons, so the student of theory choice must revert to purely social-science explanations. Since this extreme position is not, so far as we can tell, the view of any theorist in either theoretical camp, we set it aside to focus on pragmatic explanations.

The pragmatic critic responds less categorically. She doesn't believe that theory choice is wholly a social matter, but recognizes that theory underdetermination in practice is nonetheless likely. It occurs when the data are inadequate, or when theorists are tempted to immunize their claims against recalcitrant data. The data with respect to subjective risk assessment, for example, are currently too limited to determine the accuracy of individuals' risk information, but there is nothing in principle that prevents obtaining better evidence.

The vagueness of our rival smoking paradigms can be seen as deliberate — don't stick your neck out and your view will survive, perhaps long enough to influence public policy — or as the legitimate result of having to take positions on a complex and controversial set of claims regarding human action (or both). The pragmatist does not necessarily expect vigorous Popperian winnowing by refutation, but she recognizes that even vague theories are not wholly immune to decent evidence. If, for example, it turns out that people do not underestimate the risks of smoking (consistent with Viscusi), then the claim that they do is refuted. A partisan of the non-rational choice view can and likely will retreat behind other defenses — addiction is incapacitating, for example — but arguably, intellectual progress will have been made. Theoretical refinement is another avenue for progress, and we take it up next.

IV. A MORE REFINED TAXONOMY OF SMOKING THEORIES

First we offer some general speculation on the evidential consequences of greater theoretical refinement, and then we develop some more conceptual (i.e., internal) aspects of different smoking

theories, with an eye towards possible incommensurabilities.

Greater theoretical refinement combats vagueness by making theoretical commitments more precise. More precision means greater falsifiability. A more refined theory is more likely to be refuted because it risks more, which is why Popper advocated bold conjectures. Becker and Murphy's (1988) rational addiction model, for example, requires that long-term price elasticities are greater than short-term, and that more present-oriented persons (youth, the poor, the less educated) are more responsive to price changes. These predictions clearly risk refutation.[17]

But more precision usually involves taking on additional theoretical commitments. And more commitments require more evidence, because there are now more theoretical components to be comparatively appraised. Becker and Murphy's results, for example, depend on the assumption that preferences are dynamically consistent, an assumption that, among other things, rules out temptation and is thereby inconsistent with costly and ubiquitous self-control practices, such as smoke-ending clinics or purchases by the pack rather than the carton (Schelling 1984).

Thus, for a given body of evidence, it's ambiguous whether greater refinement makes theory choice easier or harder. It's more likely that a given theory will have some theoretical component clearly refuted, but there are also more theoretical dimensions to be contested. Rival theories will each have refuted aspects, but there are now other fronts on which to fight, as when the hypothetical non-rational choice theorist abandons information to base the fight instead on addiction as incapacitating.

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Let us now turn to the matter of more theoretical dimensions among theories of smoking. With greater refinement, theories we've collected under the rational-choice rubric become more differentiated. There are three dimensions we wish to emphasize: (1) stability of preferences (2)

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[17] If, for example, David Kessler had hypothesized that addiction implies that aggregate cigarette consumption is wholly unresponsive to higher prices, then the fact of downward sloping demand would be a refutation. But Kessler's claim, recall, was that "*most* smokers are *in effect* deprived of the choice to stop smoking" [emphases added]. The modifiers "most" and "in effect" are sufficient to ensure that his claim is consistent with the evidence. We do not suggest that Kessler is deliberately using weasel words, for it is unlikely he believes cigarette demand curves are vertical.

information, and (3) computational accuracy.

Becker and Murphy (1988) insist on using the word "rational" for dynamically consistent preferences, which in turn requires constant exponential discounting.[18] But whether the discount rate is constant or time-variant seems more of an empirical matter than a postulate of rational choice, and, indeed, the assumption of time invariance was originally made for tractability reasons (Loewenstein 1992). Some would make fixed preferences a postulate of economics. However, there's nothing in rationality as we've defined it that requires fixed preferences, so models that permit preference change can be wholly rational in spirit; they need not imply incompetence or incapacitation (see O'Donogue and Rabin (1999) and Loewenstein and Thaler (1989).[19]

Nor, in our scheme, does rationality require complete information. To be meaningful, a rational decision clearly requires *some* information on costs and benefits, and it would be non-rational not to use valuable information that one already possesses. But if agents apply rationality to information search, then they will gather information as long as the benefits of more information exceed the costs. High information costs and low benefits can make some ignorance rational, so rationality, on this reading, does not entail a position on the completeness of information If health information has public good aspects, then it may be under-supplied, but this should be seen as a market failure not a failure of reason.

Computational error or bounded rationality is the third aspect. Decision-making resources are scarce, so, analogous to information collection, it can be rational to economize when deciding. This can take the form of "stopping rules" or rules of thumb. Hence, not all imperfect choices are non-rational when decision making is costly. Of course, thoughtless or sloppy decisions are also common, as are

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[18] A time-consistent choice requires that the relative preference for consumption at an earlier date over a later date be invariant over time. Preferring one drink today to two drinks tomorrow, requires the time-consistent person to prefer one drink a year from now to two drinks in a year plus a day. Time *in*consistency arises if two drinks in 366 days is preferred today, but is reconsidered when the smaller but earlier option proves more tempting. (Adapted from Thaler 1981).

[19] Related approaches which allow ambivalence or "multiple selves" do not require preferences to be ordered along a single metric,. Such approaches can also entail preference change, as different selves compete internally (see, e.g., Schelling 1984, Elster ed. 1986, and Thaler and Sheffrin 1981).

mistakes, so imperfect choice can also be non-rational in nature.

With bounded rationality, even completely informed agents can make mistakes, like taking up cigarettes. The psychological literature labels systematic errors in judgment as “biases.” Recall the data on subjective risk assessment: *if* these risk perceptions are incorrect, why are they biased?
If people overestimate smoking risks, this is consistent with evidence from the psychological literature which suggests that people tend to overestimate especially well-publicized but lower-probability events, while underestimating less publicized but higher probability events. Ordinary citizens, for example, generally vastly overestimate the mortality risk of nuclear power accidents, while underestimating the mortality risk of surgery, for example. (See Slovic, Fischhoff and Lichtenstein 1979, cited in Viscusi 1992: 22-27). Smoking dangers are surely in the "well-publicized" category.

Or if agents systematically believe that they are less susceptible to risk — *the "I'm immune" bias* — this could partially reconcile the divergent findings, since Viscusi asked about dangers “on average to others,” while Shoenbaum asked about individual risks. Teenagers are known to regard themselves are relatively immune to risk.

Intellectually, it’s clear that different assumptions about preference stability, information and decision making prowess are not “rational- versus -nonrational dichotomous. Theories which are rational choice in spirit can and do permit some mutability of preference, different size information sets, and even, if less commonly, bounded rationality.

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Table 1 presents a number of alternative paradigmatic positions based on a slight modification of the three categories–preference, stability, information, and computational accuracy–just discussed. Specifically, it combines information and computational accuracy into one “computational accuracy”category; preserves the “stable preference” category: and adds a category “Is the individual forward looking?”.

TABLE 1 INFORMATION/PREFERENCE ASSUMPTIONS ABOUT THE INDIVIDUAL			
	IS THE INDIVIDUAL FORWARD-LOOKING?	IS THE INDIVIDUAL AN ACCURATE CALCULATOR?	DOES THE INDIVIDUAL HAVE STABLE PREFERENCES?
POSSIBILITY I	Yes	Yes	Yes
POSSIBILITY II	Yes	No:makes flawed calculations (but has accurate info)	Yes
POSSIBILITY III	Yes	No: has inaccurate information	Yes
POSSIBILITY IV	Yes	No: has both flawed info and calculates incorrectly	Yes
POSSIBILITY V	Yes	Yes	No: teenager has different preferences than adult (variants include preference malleability in teenagers)
POSSIBILITIES VI-VIII	Yes	No:information variation as in possibilities II through IV above	No: same as possibility V
POSSIBILITY IX	No	Not meaningful if not forward looking	Yes
POSSIBILITY X	No	Not meaningful if not forward looking	No: same as possibility V

How do these possibilities translate into paradigms? We group them into 5 paradigmatic categories as follows:

PARADIGM 1, the "Full Rationality and Stable Preferences Paradigm," consists of POSSIBILITY I from TABLE 1 above

PARADIGM 2, the "Full Rationality But Changing Preferences Paradigm" consists of POSSIBILITY V

PARADIGM 3, the "Forward-looking but Flawed Rationality and Stable Preferences Paradigm," consists of POSSIBILITIES II-IV

PARADIGM 4, the "Forward-looking but Flawed Rationality and Unstable Preferences Paradigm" consists of POSSIBILITIES VI-VIII

PARADIGM 5, the "Not Forward Looking" paradigm, consists of POSSIBILITIES IX-X

Note that Paradigm 5 can be viewed as including the “completely nonrational” individual (paradigm). Moreover, the person who calculates inaccurately once his or her brain becomes addled from nicotine addiction can be viewed as in Paradigms 3 or 4, displaying “flawed rationality.”

There have been at least two gains from moving from the Rational-Nonrational framework to these more elaborate distinctions. First, these categories better capture the important distinctions identified in the intellectual issues set forth above. Second, our original broad-brush designations "rational" and "nonrational" seem now to best apply to paradigms 1 and 5 respectively. The three categories in between seem not well described by either of those terms. Third, we will show below that this "five paradigmatic category" classification points to a paternalism versus liberalism distinction that may in fact involve an incommmensurability beyond disputes about empirical evidence. Where one sets the dials of preference mutability, information and decision making quality is a theoretical choice with policy consequences: as one moves away from fixed preferences, complete information and optimal choice, the potential scope for paternalistic policy interventions grows larger.

V. Smoking Policy: Liberal vs. Paternalist

We are not strong Kuhnians in the following sense: we believe instead that there are some aspects of the smoking debate that can ultimately be settled by recourse to evidence. But we also argue that other key aspects of the smoking debate *do* display incommensurability. They arise in particular from a longstanding and fundamental debate over when the state may intervene to save people from themselves — a.k.a. liberalism versus paternalism — a debate which is unlikely to be settled by better

data.

Recall the definition of "hard" paternalism as non-consensual interference in the self-regarding decision-making of a competent adult, interference intended to further that person's welfare. (See New 1999). "Soft" paternalism is reserved for incompetent adults and children. Physicians and public health practitioners are far more positively disposed towards hard paternalism than are economists and other rational choice partisans, who tend to be liberals in Mill's sense, believing in maximal liberty consistent with a like liberty for all. Liberals thus see competent adults as the best judge of what's in their own best interest.[20]

With respect to policy, liberals and paternalists agree that minors need to be protected from risky choices like smoking (though they may disagree on which intervener — state or parent — is best placed, and perhaps on the appropriate age of majority). They also can agree that smokers should be made accountable for external costs imposed on others — fires, higher insurance premia, environmental tobacco smoke (ETS), etc. But the empirical debate on the external costs of smoking, and a related dispute over the appropriate unit of appraisal — a household or an individual — reveal more fundamental differences.

Early estimates of external costs took the household as the unit of appraisal (thus ignoring costs borne by *in vivos* non-smokers, including fetuses), and ignored ETS costs. Manning et al. (1991), for example, estimated external costs to be roughly $0.33 per pack (rendered in 1995 dollars), which roughly comports with Viscusi's (1995) analysis.[21] Hanson and Logue (1997) strenuously disagree,

[20] "Best" does not mean perfect; lapses from good judgment are common and open the door to paternalistic interveners. But such lapses, on the liberal view, are not by themselves sufficient for paternalism. Also required is proof that the state is better placed than the paternalized person (and any other interveners), and that intervention does more good than harm. (For more on this, see Leonard, Goldfarb and Suranovic 2000).

[21] The most comprehensive study on the costs of smoking (Manning et al. 1989, 1991) carefully computes and itemizes external costs per pack smoked. Smokers consume medical care ($0.26) and sick leave ($0.01) beyond what they pay for; they raise the cost of life insurance premiums ($0.05); cause fires ($0.02), and pay fewer taxes ($0.09) by dying prematurely. On the other hand, premature death also saves society part of the cost of providing pensions (-$0.24) and nursing home care (-$0.03). The total net external costs per pack is therefore 15 cents (in 1986 dollars, with $0.01 rounding error). Updated

and estimate per pack external costs at $7.00.

But disagreements on definition — should fetuses and spouses be counted in calculating external costs, should ETS be counted — or disagreements on the relevant magnitudes are ultimately quibbles that do not create this large disparity. Hanson and Logue's external cost estimate is higher because they include as "external" costs smokers impose on *themselves* ($6.00), and because they refuse to consider as external benefits the lower pension payments, and lower nursing home care expenditures that results from smokers dying earlier. It is these two assumptions that explain the difference, and they both seem to derive from an incommensurable normative view of how one should determine social welfare.

A public heath perspective treats longer life as an unmitigated social benefit, whereas economists regard it as a private benefit (Warner et al. 1995). On the public health view, then, policies that extend life are a social good, period. Conversely, if a behavior risks shortening life, it is bad. In this sense, the public health view of welfare is unavoidably paternalistic, since it cannot abide any decision that risks shorter life, (and must support a policy that extends life), and because it assumes that individuals cannot sensibly want to trade off length of life for quality of life. Traditional religious or ethical paternalism says "if it's bad, the law must proscribe it." Public health paternalism merely substitutes "risky" for "bad." Jeffrey Harris, a physician and self-described "warm" economist active in the anti-smoking movement, regards Economics as "cold" when it insists that self-inflicted costs are not social, or when it counts lower social costs from premature death as social benefits.[22] (Harris 1993). On his view, which is the public health view, the economist's consequentialist social accounting is immoral; deontologically impermissible.

One can support anti-smoking policies without recourse to the hard paternalism embedded in the public-health view of social welfare. A version of the Primose path argument, for example — many

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to 1995 prices, the per pack external cost of $0.33. In 1995, average excise taxes were $0.50 per pack ($0.24 Federal, the balance state and local). On this estimate, then, external costs created by smokers are exceeded by the taxes they pay.

[22] Regarding the latter, Harris says: "this is not the kind of calculation that a civilized society engages in." (ibid).

smokers get addicted as minors — is not incompatible with the rational choice paradigm. Most rational choice theorists do not object to protecting minors.[23] Rational choice theorists are less comfortable with the idea of addiction as incapacitating, but can accept the idea that minors are unlikely to adequately anticipate the risk of addiction, or the cost of withdrawal.

This exception noted, it seems clear that paternalist scholars like Harris and Hanson and Logue are prepared to go beyond market failure remedies or exceptions for children in order to save informed adults from themselves, whereas liberals will not. Consider another illustration of this divide (from Leonard, Goldfarb and Suranovic *E&P* forthcoming), where a paternalist and a liberal view information in fundamentally different ways. The case is *dis*information. A paternalistic public health official who believes that even well informed adult smokers exhibit a failure of reason might endorse a policy of greatly exaggerating the risks of smoking, as a means to the end of smoking reduction. Since the paternalist's goal is not to inform per se, but to promote paternalized persons' welfare as she sees it, disinformation can be consistent with paternalism. For the liberal, in contrast, a policy of disinformation is incoherent, because the liberal's goal is to inform — to provide missing information — not to produce a particular outcome. For the liberal, fraud, even well intended fraud, cannot be justified, as it cannot improve self-regarding individual choices.

CONCLUSION

Our initial instinct was that smoking behavior would be an attractive and instructive case study of paradigm choice, because the question at issue–why do individuals smoke?-- is so narrow. Could incommensurability across paradigms be defeated, given such a narrow focus?

Examining this case has generated a number of relevant findings. First, an appropriate characterization of the competing paradigms is difficult. We started with a broad-brush distinction between a rational choice and nonrational choice paradigm, but found that a subtler classification was more accurate. Still, for a given set of empirical evidence, it's ambiguous whether more recsie delineation helps or hinders theory choice.

[23] One survey finds that 53 percent of ever-daily smokers (which includes once daily smokers who've since quit) became daily smokers before age 18, 77 percent before age 20. (CDC 1994, p. 65).

Second, whether we use the two-category broad-brush distinction or the subtler five category classification, the incommensurability problem is alive and well in two different senses: empirical, and conceptual.

-At the empirical level, one cannot show that one of the paradigms clearly and definitively dominates all of the others, given our current state of information and knowledge about smoking. However, this “empirical incommensurability” could conceivably be resolved at least in part by the future onslaught of better information.

-At the conceptual level, the underlying divide between paternalist and liberal views seems much more fundamental, permanent and unbreachable.

Third, it is interesting to speculate on why empirical incommensurability still rears its ugly head in what seems a fairly narrowly-defined case. Among the possible explanations are:

(i) "why people smoke," which looks like a narrow question, turns out to be symptomatic of very broad issues about human behavior: how forward looking are individuals, how do they handle complex calculations, how stable are their preferences, and so forth.

(ii) what at first seemed like compelling stylized facts favoring one paradigm over the other turned out on careful examination to be unable to "shoot down" the rival paradigm.

(iii) related to (ii), theories within paradigms are very "malleable": by altering auxilliary assumptions, many things can be made to be analytically compatible with a particular paradigm. Thus, Suranovic, Goldfarb and Leonard (1999) and Goldbaum (forthcoming) show how regret is compatible with a rational choice approach, and Becker (1962) has shown how irrational consumers are consistent with price responsiveness of demand.

If paradigms "have to" co-exist empirically, it becomes interesting to investigate whether survivor paradigms have any common policy implications. Such shared implications might be ones the reasonable observer might want to take especially seriously, since they are robust to changes in paradigms. We argued above that protecting minors from risky choices such as smoking is an example of a shared policy implication.

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