Tobacco Taxation as Health Policy in the Third World

In a read-my-lips era of no new taxes, US legislators eagerly seek out revenue enhancers, user fees, and other euphemistically labeled devices that can reduce budget deficits while minimizing the perception of burden on the taxpayer (or revenue-enhancing citizen). A case in point is the commodity excise tax, most commonly applied in the United States to tobacco products, alcoholic beverages, and gasoline. Although not major sources of governmental revenue, excise taxes are appreciated by legislators for their low administrative cost and relative popularity.

Increasingly, the public health community also has come to appreciate the value of excise taxes on tobacco and alcohol. Empirical evidence demonstrates that price increases decrease the consumption of these products, and that desirable health consequences follow. For example:

- Cook has found statistically significant decreases in both cirrhosis mortality and the automobile death rate associated with increases in state liquor taxes.[1]
- Over a dozen studies published in the past decade provide convincing evidence that a 10 percent increase in the price of cigarettes will decrease adults' cigarette consumption in the US by at least 2 percent and possibly as much as 5 percent.[2]
- Smoking by teenagers appears to be considerably more responsive to price changes.[2,3]
- In Great Britain, analysis indicates that the lower social classes are more price responsive to cigarette price changes than are the more affluent classes.[4]
- According to two estimates, the seemingly innocuous eight-cent-per-pack increase in the US federal cigarette excise tax in 1983 ultimately will reduce tobacco's toll of premature mortality by at least 100,000 deaths.[5,6]

Such data lead to the inescapable conclusion that excise taxation of tobacco and alcohol is a powerful tool of health policy in countries like the United States. Since these user fees also raise needed governmental revenues, tobacco and alcohol taxation can be viewed by legislators as a classic case of doing well by doing good.

The price responsiveness of tobacco consumers in less developed countries (LDCs) should be considerably greater than that of their counterparts in the more affluent nations.* Like the lower social classes in England, and teens in the US, tobacco consumers in LDCs have relatively fewer resources; consequently, price increases for goods in their budgets impinge more significantly on their ability to purchase other goods and services. Furthermore, like US teens, LDC consumers on average use a smaller daily quantity of tobacco products than do their counterparts in developed countries. Therefore, they may be less physically and psychologically dependent on nicotine, hence better able to alter their personal consumption in response to a price change.

The differential price responsiveness of LDC tobacco consumers is no matter of idle intellectual curiosity. While smoking in the developed nations is falling at a rate of 1–1.5 percent per annum, it is increasing throughout the Third World at a rate of 2 percent per year.[8,9] A handful of major transnational tobacco companies—half US-based, half from Great Britain—aggressively push their wares on Asian countries[9]; observers believe them to be eagerly eyeing Eastern Europe and Africa as well.[10] The worldwide mortality toll of tobacco—already a pandemic of 2.5 million deaths each year—is projected by the World Health Organization to rise five-fold to 12 million by the middle of the next century, with most of the increase occurring in the LDCs.[10] Novotny and Peto have predicted that of all the Chinese children alive today, 50 million will eventually die as a result of tobacco.[11] The mortality toll of tobacco in the Third World does not lie exclusively in the future, however. In India, an estimated 630,000 people die each year of tobacco-produced diseases, accounting for a quarter of the worldwide total.[12]

In the face of these dismal numbers and terrifying projections, the need to understand the determinants of tobacco consumption in LDCs—and to learn how to combat consumption—is self-evident. Hence, the article by Chapman and Richardson in this issue of the Journal[7] is particularly welcome. The first analysis of tobacco consumers' response to price changes in an LDC, the article provides important empirical evidence that expectations generated by theory hold true in practice. Tobacco users in Papua New Guinea appear to be highly sensitive to the price of their products. Taxes seem to significantly decrease consumption. Health policy makers have valuable new information and tobacco-and-health activists have an effective new weapon.

A methodologic limitation of the study accounts for the equivocating verbs, "appear" and "seem", in the preceding paragraph. Rather than measuring the response of tobacco consumption to changes in retail prices, the analysis examines changes in consumption associated with changes in excise tax rates (expressed in terms of "elasticities"**). The reason is simple: the authors had what they believed to be valid and reliable data on tobacco sales and tax rates but no data on market prices. Purists will be dissatisfied with this proxy measure of price response, to the point, for some, of dismissing the study. Policy-oriented pragmatists, in contrast, will delight in a half-full analytic cup.

Other things being equal, an *excise* elasticity corresponds to a *price* elasticity of considerably greater magnitude (in absolute value) because excise tax is only a component of total retail price. For example, if tax constituted half of retail price, the price elasticity of demand would be twice the excise elasticity. In the case of demand for cigarettes in Papua New Guinea, since Chapman and Richardson estimate the excise elasticity to be −0.71, the price elasticity would be −1.42, meaning that a 10 percent increase in price, produced by a 20 percent increase in tax, would decrease cigarette consumption by 14.2 percent.

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*Much of the following commentary applies to alcohol taxation in LDCs, as well as tobacco. As the editorial was prompted by an analysis of tobacco taxation in an LDC,[7] however, the remaining discussion focuses explicitly on tobacco.

**Elasticity is the economist's principal measure of the responsiveness of demand to a price change. An elasticity is calculated as the percentage change in the quantity demanded of a good or service divided by the percentage change in its price. Normally, a *price elasticity* of demand estimate employs retail price as the dominator. Chapman and Richardson's *excise* elasticities use the percentage change in the tax only.

Unfortunately, we do not know what figure best approximates the true price elasticity of demand for cigarettes in Papua New Guinea, because we do not know the tax share of retail price. Chapman and Richardson could have helped us out in this regard by performing even a casual, non-random sampling simply to distinguish whether tax constitutes a small minority of price or a large majority of it, or whether the answer lies in between.

Neither do we know that the "other things being equal" condition holds. While analysts often assume that tax and wholesale price changes occur independently, it is conceivable that manufacturers would try to offset the retail price effects of tax increases by decreasing wholesale prices. Alternatively, as was the case recently in the US,[5] manufacturers could piggy-back wholesale price increases on top of excise tax hikes. If either of these were to occur, the excise-to-price-elasticity conversion illustrated above would *under-* or *over*-estimate true price elasticity, respectively (once again, in terms of absolute values).

Absent concurrent wholesale price changes of the same relative magnitude and in the same direction as tax changes (which seem highly unlikely), the present analysis provides a floor on the absolute value of the price elasticities of demand for cigarettes and tobacco in Papua New Guinea. Realistically, price elasticities are likely to be larger than the excise elasticities, possibly considerably so. As such, this study suggests that increases in the price of cigarettes (and non-cigarette tobacco) in a developing country will produce a proportionate decrease in consumption considerably greater than that experienced in developed countries.

The greater reduction in tobacco consumption implies that the financial incentive for LDC governments to increase taxes will be less than that of the developed countries. In the case of Papua New Guinea, however, Chapman and Richardson's data offer reassurance to treasury officials: the excise elasticities are less than 1.0 (in absolute value). Hence, revenue increases will outpace consumption decreases (i.e., the tax rate will rise proportionately more than consumption will fall).

The data problems that caused Chapman and Richardson to violate the purity of price elasticity estimation reflect the lack of the infrastructure of adequately funded governmental agencies in LDCs needed to carry out the requisite data collection. Moreover, LDCs often lack the heavy reliance on formal market structure that characterizes developed countries, and permits access to pertinent data; tobacco products are often fabricated in cottage industries in LDCs, and not infrequently "purchased" through barter.

Assessing LDC consumers' responses to tobacco product price increases is further complicated by the extraordinary variety of ways in which tobacco is consumed in many LDCs, in contrast to the situation in most developed countries in which cigarette smoking constitutes the vast majority of tobacco consumption. In India, for example, tobacco is consumed by large numbers of people in each of more than a dozen different forms: cigarette, bidi, chutta, cigar, cheroot, dhumti, chillum, pipe, and hookah (all methods of smoking tobacco), pan masala and other forms of chewing tobacco, alone or in the form of betel quid (tobacco mixed with lime and areca nut, rolled in a betel leaf), and as mishri, snuff, and tobacco toothpaste. The sizable tobacco industry in India—the world's third largest tobacco producer—is fairly characterized as a cottage industry. For example, bidis, the pervasive small cigarette-like products, are typically hand-rolled and account for one-third of all leaf tobacco consumption in India.[13] Betel quids are assembled from the raw ingredients by the individual street vendor at the time of purchase.

In such an environment, determination of tobacco use prevalence data and price data is an extraordinarily difficult task. Furthermore, the process of taxation is exceedingly difficult, particularly with regard to the nonmanufactured products. Indeed, the practice in India seems to be to tax those tobacco products that can readily be taxed; manufactured cigarettes are subject to a hefty excise tax.

One consequence of variations in tax policies with regard to the different tobacco products is that Indian tobacco consumers switch product types in response to changes in their relative prices. Most notably, consumption of manufactured cigarettes is declining in India, while estimated consumption of bidi is rising. The government recently imposed a new excise tax on cigarettes; consumers responded in part by switching to the less expensive, and less heavily taxed, bidi.[13]

Chapman and Richardson recognize this phenomenon. Their analysis shows clearly that tobacco consumers in Papua New Guinea do switch between cigarettes and loose tobacco as the relative tax price of the other commodity increases. As such, the study emphasizes the importance of taxing all forms of tobacco consumption in LDCs, if conditions permit. If they do not, control of tobacco-related disease will be that much more difficult.

The brown plague is metastasizing to the Third World. The level of ignorance in these countries about the effects of tobacco is profound. The marketing tactics of the transnational tobacco companies are astonishingly aggressive, devoid of even the pretense of civility in which developed country marketers attempt to cloak their advertising and promotion. Strong antitobacco health policies are desperately needed, but the prospects are limited.[13] In such an environment, encouraging governments to increase tobacco taxes to promote health will be a daunting task. But it is one well worth pursuing. Chapman and Richardson have provided LDC health professionals with a primitive but valuable tool.

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Is It Cost-Beneficial to Screen Adolescent Males for *Chlamydia*?

In this issue, Randolph and Washington present a careful and thorough analysis of the cost and benefit of screening adolescent boys for chlamydial infection by use of a leucocyte esterase dipstick method.[1] They use a decision analytic model. Decision analysis is controversial and usually provokes a wide range of responses. Appreciation of the technique is an acquired taste. To few does it come naturally. The usual complaints result from disagreement with the assumptions that have been made.[2,3] But the beauty of the method is that for those variables whose values are not firmly established, one can and should do sensitivity analyses to examine what would happen if the extremes of an hypothesized range were true. The greatest problem with the method is in its interpretation. Often, too much emphasis is placed on a simple conclusion, whereas the results should be presented to show how the conclusions are effected by varying estimates of the unknown variables. Preferably, the limits of the variable where the overall conclusion is true should be given.

For example, in the Randolph paper an assumption that is based on weak data is the proportion of infected females who will develop pelvic inflammatory disease if untreated. The estimates are derived from a few observational studies that retrospectively determined the occurrence of pelvic inflammatory disease in women exposed to fresh chlamydial infections in men. Not only are the numbers small, but we do not know that the same rate of disease outcome would hold if all the infections detected by screening methods in men were not fresh ones. The same type of criticism can be made concerning the cost benefit studies of screening in women.[4] They assume that the infections detected and prevented will have the same proportion of adverse outcomes as the consequences of fresh infection. These are important issues because all cost benefit studies of chlamydia are largely driven by the potential costs of complications of the infection in women.[5] Nevertheless, this particular study tells us in the sensitivity analysis discussion that, even if the estimates of the risk of pelvic inflammatory disease were too high, and were even as low as 10 percent, the cost of the screening test would be less than half the cost of diagnosis by an antigen detection test. In other words, the comparison remains valid.

Another area with an assumption that is based on limited data is the quality of the leucocyte esterase test. The sensitivity and specificity of the test that are used in this paper are not very well established. Again, the sensitivity analyses allow one to look at the results throughout a range of estimated values for test quality.

Where does this exercise lead us? We are not yet ready to adopt this screening method as a chlamydia control measure, since a number of unknowns remain to be answered by appropriate studies.

- First, *what would be the acceptance of the technique applied to adolescent populations?* Some of the answers are suggested by recent studies[6,7] but this must be extended to a broader set of subjects.
- Second, *would clinicians be willing to give anti-chlamydia treatment on the basis of a screening test?* It would depend upon the extended prevalences of various urethral infections in that population. In some groups, the risk of gonorrheal infection may be so high that it would be advisable to use the screening test only to select adolescents for chlamydial and gonorrheal culture. At the very least, it may be advisable to give therapy directed at both organisms. Conversely, if it is known that most screening-test-positive adolescents have chlamydial infection, the assumptions of the Randolph study regarding treatment are valid.
- Finally, *it is not clear that the detection and treatment of asymptomatic chlamydial infection in males would add significantly to control efforts.* Currently, plans for chlamydial control encompass detection and treatment of asymptomatic female cervical infection. This condition occurs in the range of 2–35 percent; in the largest sample, to date, of family planning clinics in the northwestern states, the rate in over 100,000 women is 7–12 percent.* It is surprisingly constant over widely disparate samples. We know far less about the asymptomatic infection in males. In the few studies that have been done, the rate is in the range of 5–15 percent. Thus, there seems to be little difference in the prevalences between males and females. This appears to suggest that screening and treatment of asymptomatic males might be a useful addition to chlamydia control strategies.

Presently we have no effective national chlamydia control program. Effective and inexpensive diagnostic methods are needed for the detection of asymptomatic infection. The lessons from gonorrheal control are important. In the late 1970s, inexpensive and effective methods for diagnosing gonorrheal infection in women were introduced which permitted the development of a national gonorrheal control program. This effort systematically searched for population subsets of women with rates of asymptomatic infection sufficient to warrant screening and treatment of them and their sexual partners. The result was the reversal of an ascending incidence curve, and a transition to the descending curve which is still present today. For gonorrhea, screening and treatment of asymptomatic males was not part of the program, except for detection and treatment of asymptomatic infection in the sexual partners of screened women.

We have not had the opportunity to initiate an analogous

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