

**HOW EFFECTIVE ARE TAXES IN  
REDUCING TOBACCO CONSUMPTION?**

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## INTRODUCTION

- **Key principle: Law of the Downward Sloping Demand Curve: higher prices reduce consumption**
  - **Does it apply to consumption of addictive goods including cigarettes and other tobacco products?**
  - **Broad definition of tobacco price, includes:**
    - **monetary price**
    - **restrictions on use**
    - **limits on access**
    - **health consequences**
- **Focus on effects of monetary price which can be raised by increasing excise, *ad valorem*, import and other taxes on tobacco and tobacco products**

## **CONVENTIONAL DEMAND MODELS**

- **Past 30 years, numerous studies conclude that higher prices for cigarettes and other tobacco products will significantly reduce tobacco consumption**
  - **aggregate time-series data**
  - **aggregate pooled, cross-sectional time-series data**
  - **individual-level cross-sectional survey data**
  - **individual-level longitudinal survey data**
  - **nearly all use data from developed countries**
  - **wide variety of econometric and other statistical approaches**
  - **ignore addictive aspects of tobacco consumption**
- **Estimated price elasticities of demand:**
  - **nearly all in the wide range from -0.14 to -1.23**
  - **most in narrow range from -0.3 to -0.5**
- **Consistent with "behavioral economics" findings from controlled laboratory experiments run by behavioral psychologists**
- **Relatively inelastic estimates imply that increased taxes, while significantly reducing consumption, would also generate significant increases in tax revenues**

## CONVENTIONAL DEMAND MODELS

- **Small but growing number of studies on developing countries, including Papua New Guinea, China, Taiwan, South Africa, and Zimbabwe:**
  - **Expect demand to be more elastic given lower incomes and lower cigarette consumption by smokers in developing countries**
  - **Estimated elasticities two to three times the consensus estimate for developed countries**
- **Studies employing individual-level data separate effect of price on smoking prevalence from impact on cigarette consumption by smokers**
  - **Generally find that half or more of the impact is on smoking prevalence, reflecting reduced initiation by youth and increased cessation among adults**
    - **Farrelly, et al., U.S., 1976-1993:**
      - **prevalence elasticity: -0.15**
      - **conditional demand elasticity: -0.10**
      - **total cigarette demand elasticity: -0.25**

## **ADDICTION MODELS**

- **Growing number of theoretical and empirical studies attempt to account for the tolerance, reinforcement, and withdrawal associated with addictive consumption**
  - **Key implications of addiction:**
    - **current consumption decisions depend on past choices**
    - **gradual response to price implying long-run price elasticity will exceed short-run elasticity**
- **Two basic approaches:**
  - **Myopic demand models**
    - **earliest attempts to account for addiction**
    - **model dependence of current consumption on past behavior, but ignore future consequences of addiction**
  - **Rational demand models**
    - **based on Becker and Murphy (1988) model of rational addiction**
    - **model dependence of current choices on past**
    - **allow for farsighted behavior, implying that increases in future "costs" of addiction (i.e. new information on future health consequences) will reduce current consumption**

## **ADDICTION MODELS**

- **Estimates clearly indicated cigarette smoking is an addictive behavior in that past cigarette consumption has a significant positive impact on current consumption**
- **Estimates from rational addiction models inconsistent with myopic behavior (future factors have significant effect on current decisions)**
  - **Implied discount rates, however, not consistent with fully rational behavior**
  - **Generally consistent evidence from studies on U.S., Australia, Finland**
  - **Inconsistent evidence from U.K., Ireland, and Greece**
- **As predicted, long-run effects of price significantly larger than short run effects**
  - **e.g. Becker, Grossman, Murphy (1994):**
    - **short-run elasticity: -0.36 to -0.44**
    - **long-run elasticity: -0.73 to -0.79**
- **Recent theoretical extensions to rational addiction model, yet to be tested empirically, address some of the most criticized aspects of the model, including the assumption of perfect foresight and consequent lack of regret associated with "happy addicts"**

## **DIFFERENCES IN DEMAND**

- **Many analyses using individual-level data explore differences in price sensitivity among population subgroups defined by age, race/ethnicity, socioeconomic status, and gender**
- **Most explored differences are with respect to effects of price by age; economic theory suggests an inverse relationship between age and price sensitivity:**
  - **youth smokers likely to spend a larger share of income on cigarettes than are adult smokers**
  - **peer influences imply a multiplying effect of price on youth smoking**
  - **young smokers likely to be less addicted than are adult smokers**
  - **youth behave more myopically than adults**

## **PRICE ELASTICITY AND AGE**

- **Earliest estimates by Lewit and colleagues for the U.S. implied inverse relationship between price elasticity and age:**
  - **adults:**
    - **overall: -0.42; prevalence: -0.26**
  - **young adults (20-25):**
    - **overall: -0.89; prevalence: -0.74**
  - **youth (12-17):**
    - **overall: -1.44; prevalence: -1.20**
- **Two 1991 studies, by Wasserman et al. (youth) and Chaloupka (young adults), found no significant effects of price on youth smoking**

## **PRICE ELASTICITY AND AGE**

- **Several more recent studies using much larger samples of youth and young adults confirm earliest findings that youth and young adults are more responsive to price increases than adults**
  - **Youth:**
    - **Chaloupka and Grossman (1996), over 110,000 U.S. youth ages 12-18**
      - **overall: -1.31; prevalence -0.68**
    - **Lewit et al. (1997)**
      - **prevalence: -0.87**
      - **intentions: -0.95**
    - **Evans and Huang (1998)**
      - **prevalence, 1985-1992: -0.50**
  - **Young Adults:**
    - **Chaloupka and Wechsler (1997), college students:**
      - **overall: -1.11; prevalence: -0.53**
    - **Farrelly, et al. (1998):**
      - **overall: -0.58; prevalence: -0.37**
- **Consistent with recent evidence from qualitative, focus-group-based research on youth smoking initiation and cessation**

## **SMOKING INITIATION AND PRICE**

- **A few recent studies used longitudinal data to examine impact of price on smoking initiation:**
  - **"Cornell Study" - DeCicca, et al. (1998):**
    - **examines onset of regular smoking between eighth and twelfth grade**
    - **finds little or no effect of cigarette tax or price increases on smoking onset**
  - **Dee and Evans (1998):**
    - **reanalysis of data used by DeCicca et al.**
    - **price elasticity of smoking onset of -0.63**
    - **very consistent with estimates based on cross-sectional survey data**
  - **Douglas (1998) and Douglas and Hariharan (1994):**
    - **use of retrospective data on age at initiation**
    - **find little impact of price on smoking initiation**
    - **note that errors-in-variables bias price effects towards zero**
    - **find strong effects on cessation (Douglas, 1998)**
    - **estimate that duration of smoking is approximately unitary elastic with respect to price**

## **RACE/ETHNICITY AND SOCIOECONOMIC STATUS**

- **Two recent studies find significant differences in price elasticity across different racial/ethnic populations:**
  - **Farrelly, et al. (1998):**
    - **Hispanics: total: -1.89; prevalence: -1.31**
    - **Black, non-Hisp.: total: -0.32; prevalence: -0.36**
    - **White, non-Hisp.: total: -0.14; prevalence: -0.05**
  - **Chaloupka and Pacula (1998) find similar patterns for Black and White youth**
- **Racial/ethnic differences may reflect differences due to socioeconomic status:**
  - **Townsend, et al. (1994) find strong inverse relationship between socioeconomic status and price elasticity in the U.K.**
  - **Farrelly, et al. (1998) find similar evidence for U.S.:**
    - **At/below median income:**
      - **total: -0.29; prevalence: -0.20**
    - **Above median income:**
      - **total: -0.17; prevalence: -0.05**
  - **Chaloupka (1991) finds that less educated fairly sensitive to price, while more educated virtually insensitive to price**
- **Key implication: while tobacco taxes may be regressive, differences in price sensitivity by income level imply that increases in tobacco taxes will reduce the regressivity**

## **GENDER DIFFERENCES**

- **Mixed evidence on differences in price sensitivity by gender:**
  - **Most U.S. studies conclude that men are more sensitive to price than women:**
    - **Mullahy (1985), in myopic addiction models**
    - **Chaloupka (1990) in rational addiction models, also finds that men behave more myopically**
    - **Farrelly, et al. (1998) in conventional demand models**
    - **Chaloupka and Pacula (1998) for youth**
  - **Most U.K. studies conclude that women are more price elastic than men:**
    - **Townsend, et al. (1994) in conventional demand models**

## **OTHER TOBACCO USE**

- **Relatively small literature concludes that increases in taxes and prices on other tobacco products would lead to similar reductions in prevalence and consumption**
  - **Ohsfeldt and colleagues (1994, 1997, 1998) - prevalence of smokeless tobacco use among adult males in U.S.**
  - **Chaloupka, et al. (1997) - prevalence and frequency of smokeless tobacco use among young males in U.S.**
  - **Thompson and McCleod (1976) - other tobacco use in Canada**
  - **Pekurinen (1991) - other tobacco use in Finland**
- **In general, these studies also conclude that various tobacco products are substitutes for one another**
  - **i.e. increases in relative price of cigarettes will lead to reductions in smoking but increased use of other tobacco products**

## **COMPENSATING BEHAVIOR AND HEALTH**

- **Evans and Farrelly (forthcoming) suggest different type of substitution in response to higher cigarette taxes: switch to longer cigarettes and cigarettes that are higher in tar and nicotine content**
  - **find significant negative effect of higher taxes on smoking prevalence**
  - **find evidence of compensating behavior by continuing smokers, with smokers in higher tax states smoking longer cigarettes and cigarettes higher in tar and nicotine content**
  - **greater compensation among younger smokers**
  - **suggests that health benefits of higher tobacco taxes may be overstated and that tar and nicotine based taxes may be appropriate to maximize the health benefits of increased taxes**
- **Moore (1996) directly examined impact of taxes on health using data on tobacco related mortality from U.S. states**
  - **concludes that higher cigarette taxes would significantly reduce premature, smoking-related deaths**
  - **estimates that 10 percent increase in cigarette taxes would cut premature deaths annually by 6,000**

## **CAVEATS**

- **Conclusions that higher tobacco taxes would significantly reduce tobacco use contingent on maintaining the real value of the tax increase over time**
  - **infrequent and small changes in excise taxes on tobacco products can be eroded by general inflation, reducing their impact on consumption**
    - **e.g. stability of federal and state taxes in U.S. during the 1970s largely responsible for 40 percent decline in real cigarette prices**
- **Given the substitutability of tobacco products, comparable increases in taxes on all products are needed to maximize the reductions in tobacco consumption and the health benefits of the tax increases**

## CAVEATS

- **Impact of tax increase on tobacco consumption depends on impact of tax increase on prices of tobacco products**
  - **Some evidence that price increases exceed tax increases given the oligopolistic nature of the tobacco industry**
  - **More recent empirical evidence for U.S. suggests that federal cigarette tax increases are fully passed on to smokers, while state tax increases are less than fully passed on given the potential for cross-border shopping**
- **Smuggling and black market in tobacco products may partially offset the effects of tobacco tax increases on consumption**
  - **Recent studies by Joossens and his colleagues (1995, 1997, 1998) suggests, however, that price differentials arising from tax differences, while important, are not the only key determinants of cigarette smuggling**
    - **other factors include presence of informal distribution network and weak and poorly enforced policies related to smuggling**
    - **little evidence of smuggling in some high price European countries but extensive evidence of smuggling in some low price countries**

## **SUMMARY**

- **Increases in taxes on cigarettes and other tobacco products are very effective in reducing cigarette smoking and other tobacco use**
- **Increased taxes likely to be the single most effective policy in reducing the demand for tobacco products**
- **Increased taxes are effective in reducing tobacco consumption in populations that are most difficult to reach with other tobacco control efforts, including youth and young adults, racial and ethnic minorities, and lower income and less educated populations**
- **Combination of increased taxes with other tobacco control efforts funded by earmarked taxes produces even larger reductions in tobacco use and the public health toll associated with tobacco**