MODELING THE FEDERAL REVENUE EFFECTS OF PROPOSED CHANGES IN CIGARETTE EXCISE TAXES

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CONTENTS

OVERVIEW

H.R. 976, the "Children's Health Insurance Program Reauthorization Act of 2007," recently vetoed by the President, raises the Federal excise tax rate applied to cigarettes from $0.39 per pack to $1.00 per pack, and makes comparable increases in the rates applied to other tobacco products.[1] This pamphlet describes the economic modeling that the staff of the Joint Committee on Taxation (the "JCT staff") undertook to assess the revenue effects of these tobacco excise tax increases.[2]

A JCT staff revenue estimate is an estimate of the increase or decrease in future Federal receipts expected to result from the enactment of a proposed change to the Internal Revenue Code, when compared with the future Federal receipts projected to be received under present law. Under relevant budget rules, the JCT staff's comparison of projected future receipts under the new legislation and under current law covers the "estimating window" – the ten years following the year in which the new proposal is assumed to be enacted. The starting point for JCT staff revenue estimates is the Congressional Budget Office's ("CBO") revenue "baseline," which projects estimated Federal receipts from all sources for the same ten-year period.

In preparing every revenue estimate, the JCT staff identifies the new economic incentives faced by taxpayers as a result of the proposed change in law. The JCT staff then considers taxpayers' likely behavioral responses to the new tax environment in light of those incentives.

This exercise of predicting behavioral responses to new tax legislation frequently is the most challenging and time-consuming aspect of preparing a revenue estimate. In every case, the JCT staff must first build from CBO baseline data a more detailed baseline for the current law tax provision in question. Both CBO and JCT staff baseline estimates reflect long-term economic, social, and population trends, to the extent those trends will affect tax revenues. In the case of tobacco excise taxes, for example, the construction of a baseline requires modeling the projected long-term decline in the percentage of the population that smokes, among other factors.

Once a detailed baseline of projected revenues under current law has been developed, the JCT staff must identify all the plausible taxpayer reactions to the new tax regime, from simple acceptance of the new rules, to alternative tax planning strategies or substitutions of goods or services, to outright evasion (taking into account, of course, the same long-term economic, social, population trends that were relevant to establishing the baseline). Finally, the JCT staff must assign both probabilities and projected revenues to each of those possible reactions, and from those estimates in turn calculate the estimated difference in revenues anticipated under the

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[1] For a complete explanation of the tax provisions of H.R. 976 see Joint Committee on Taxation, *Technical Explanation of the Revenue Provisions of H.R. 976, the "Children's Health Insurance Program Reauthorization Act of 2007," As Passed by the House on September 25, 2007*, (JCX-91-07), September 26, 2007.

[2] This document may be cited as follows: Joint Committee on Taxation, *Modeling the Federal Revenue Effects of Proposed Changes in Cigarette Excise Taxes*, (JCX-101-07), October 19, 2007. This document is also available on the web at www.house.gov/jct.

change in law, when compared to the revenues that we would have expected to be collected under the baseline (*i.e.*, under current law).

By increasing the tobacco excise tax, H.R. 976 will raise the cost of tobacco products to the consumer. Our research pointed to two important behavioral responses to this effective price increase for a pack of cigarettes that we needed to incorporate into our estimate of the expected revenue consequences of H.R. 976.[3] First, the number of smokers will decline more rapidly than would have been the case under our baseline predictions. Second, the number of cigarettes purchased by each smoker also will decline more rapidly than would have been the case in the absence of the legislation. In preparing our detailed revenue estimate, we also considered other possible behavioral reactions to higher tobacco excise taxes (for example, the possibility of increased tobacco excise tax evasion).

In order to prepare our revenue estimate for H.R. 976, we therefore constructed a detailed baseline using current-law tobacco excise tax rates for smoking participation (the number of smokers in the United States) and smoking consumption (the number of cigarettes purchased by each smoker) for each of the next ten years (the relevant estimating window). We then repeated that exercise using our predictions of how the tax increase contemplated by H.R. 976 would change those two key behavioral determinants. The difference between the two figures yielded our revenue estimate.

As a result of this analysis, the JCT staff estimates that the increase in the excise tax on cigarettes from $0.39 per pack to $1.00 per pack will reduce by 1.9 million the number of individuals who choose to smoke in 2017. We further estimate that those smokers will decrease their consumption of cigarettes by four percent. Our estimate of the actual revenues to be collected as a result of the proposed change in cigarette excise taxes incorporates the combination of these two behavioral components.

Our revenue estimate for H.R. 976, like all JCT staff revenue estimates, is "dynamic," in that we explicitly considered anticipated behavioral responses to the new legislation. Again like other JCT revenue estimates, our estimate for H.R. 976 did not take into account the legislation's possible secondary non-tax consequences for Federal government spending (e.g., the effects on Medicare costs of a population where the percentage of smokers declines more rapidly than otherwise would be the case), or "macroeconomic" consequences (the effect on Gross National Product of increased tobacco excise tax revenues). In light of the size of the GNP of the United States (some $13.2 trillion in 2006), the JCT staff believes that a "macroeconomic" analysis of H.R. 976 would produce essentially identical results to those reported by us.[4]

The remainder of this pamphlet describes both our methodology and our revenue estimate in detail. We welcome comments from analysts who have studied markets for tobacco products.

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[3] This pamphlet focuses on cigarettes, to the exclusion of other tobacco products, because approximately 96 percent of tobacco excise tax revenues come from sales of cigarettes.

[4] For more details on macroeconomic revenue estimating, see Joint Committee on Taxation, *Macroeconomic Analysis of Various Proposals to Provide $500 billion in Tax Relief*, (JCX-4-05), March 1, 2005, (http://www.house.gov/jct/x-4-05.pdf).

A. Modeling Approach

A change in the Federal excise tax on cigarettes affects cigarette consumption through two avenues. By raising (or lowering) the cost of tobacco products to the consumer, an excise tax increase (or decrease) affects the decision whether to smoke and the decision of how much to smoke conditional upon deciding to smoke. For example, an increase in the price of cigarettes resulting from an increase in the excise tax may lead some individuals to not become smokers, or induce some current smokers to give up smoking.[5]

Among individuals who choose to smoke, a price increase may induce some individuals to reduce their consumption of cigarettes, and in some cases it may lead some individuals to purchase untaxed, or "black market," cigarettes. The JCT staff's revenue estimates reflect the possibility of increased evasion; that calculation is embodied in our estimate of the consumption of "taxed" cigarettes (in contrast to all cigarettes).

Because of these behaviors, the JCT staff employs a two-step procedure that first estimates the percent of the adult population that smokes and then estimates the quantity of tobacco products that smokers consume. Our model considers such factors as price, income, and smoking restrictions as determinants of the decision as to smoke and the decision of the quantity to smoke by those who choose to smoke.[6]

In the first step of our two-step model, the JCT staff estimates the percentage of the population that will choose to smoke cigarettes conditioned on the price of cigarettes, household income, and other variables. In this first step, we assume that as prices (including any excise taxes) increase, the percentage of the population that chooses to smoke will decline.

In the second step, we project the aggregate quantity of taxed cigarettes that will be consumed annually by those individuals who choose to smoke. The analysis estimates cigarette consumption by smokers as depending upon the price of cigarettes, household income, and other variables. In this second step, we assume that as prices (including any excise taxes) increase, smokers will reduce their consumption of taxed cigarettes.

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[5] See for example, Grossman, Michael, J. L. Sindelar, J. Mullahy, and R. Anderson, 1993. "Alcohol and Cigarette Taxes," *Journal of Economic Perspectives,* vol. 7, 1993, pp. 211-222, and Farrelly, Michael C., J. W. Bray, T. Pechacek, and T. Wollery, "Response by Adults to Increases in Cigarette Prices by Sociodemographic Characteristics," *Southern Economic Journal*, vol. 68, 2001, pp. 156-165. We obtained much of our historical information on cigarette prices and tax-paid consumption from "The Tax Burden on Tobacco," published annually by the consulting firm Orzechowski and Walker.

[6] If a change in the excise tax applicable to cigarettes were made in the absence of commensurate changes in other tobacco products, the model would also incorporate the potential for some tobacco users to substitute other tobacco products for cigarettes.

B. The Current-Law Baseline

According to the Alcohol and Tobacco Tax and Trade Bureau, total tobacco excise tax collections have been falling since fiscal year 2003,[7] from $7.9 billion in that year to $7.7 billion in fiscal year 2006. The CBO projects total tobacco excise tax receipts to decline from $7.5 billion in 2007 to $6.7 billion in 2017.

Our baseline assumptions for fiscal year 2009[8] are that approximately 18.9 percent of the 240.6 million U.S. residents age 16 and over smoke.[9] This yields a smoking population of about 45.4 million people.[10] Our model predicts that smokers, on average, will consume about 400 packs of cigarettes annually. Thus, we forecast that under present law about 18.2 billion taxable packs of cigarettes will be sold in fiscal year 2009. Present law provides for a Federal excise tax of $0.39 per pack of cigarettes. Therefore, these projections on the percentage of smokers and rates of cigarette consumption are consistent with the CBO's baseline receipts forecasts of approximately $7.1 billion in Federal cigarette excise tax revenue in fiscal year 2009.[11]

We forecast that, under present law, the smoking rate will decline by roughly 0.3 percent per year to 16.6 percent in 2017. The projected 2017 population of U.S. residents 16 and over is 258 million. Thus, we expect that without any changes to Federal excise tax rates there will be 42.6 million smokers in 2017. Furthermore, we expect each of these smokers to consume about 387 taxable packs of cigarettes per year, yielding total projected fiscal year 2017 taxable cigarette sales of 16.5 billion packs. These projections on the percentage of smokers and rates of cigarette consumption in 2017 again are consistent with the CBO's baseline receipts forecasts of approximately $6.4 billion in fiscal year 2017.

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[7] The Balanced Budget Act of 1997 (Pub.L.No. 105-33, sec. 9302) increased Federal excise taxes on tobacco in two stages, effective at the beginning of calendar years 2000 and 2002, so that years before fiscal year 2003 are not strictly comparable.

[8] The proposed tax increases of H.R. 976 would be effective January 1, 2008. The JCT staff reports revenue effects on a fiscal year basis. The Federal fiscal year commences October 1. The discussion above starts with fiscal year 2009 in order to include a full-year effect of the proposed tax increase.

[9] All population estimates are calculated from data provided by the Population Projections Branch of the U.S. Census Bureau.

[10] Due to the rounding of large numbers the reader may not be able to reproduce the exact arithmetic results presented in this pamphlet.

[11] The CBO provides the JCT staff with estimates of Federal excise revenue attributable to the following tobacco products: cigarettes, cigars, cigarette papers and tubes, smokeless tobacco, and pipe roll-your-own tobacco, and imports. The JCT staff apportions the imports to the other categories and attempts to separate large and small cigars, pipe and roll-your-own-tobacco, and snuff and chewing tobacco using information supplied by the Alcohol and Tobacco Tax and Trade Bureau.

This decline in smoking participation in our baseline is a continuation of a long-term trend. There are many reasons for this long-term decline. A large portion is certainly due to the greater recognition of the health dangers associated with the consumption of tobacco products in general and especially cigarettes. Further, in the mid-1980s, States began to increase State excise taxes on cigarettes that has the effect of lowering consumption. Table 1, below, shows smoking rates over the last 40 years.

Table 1.–Historical Smoking Rates

Year	Smokers as a Percentage of Population 18 Years of Age and Older
1965	42
1974[1]	37
1985	30
1995	25
2005	21

Source: National Center for Health Statistics
[1] The smoking rate for 1975 is not listed.

C. The Revenue Effect of Increasing the Federal Excise Tax on Cigarettes

The JCT staff assumes that increases in the Federal excise tax will be reflected fully in higher prices to the consumer. The estimating questions posed by the proposed tax increase of H.R. 976 are (1) what effect will the resulting higher price of cigarettes have on the incidence of smoking in the U.S. population and (2) what effect will the resulting higher price of cigarettes have on the consumption of cigarettes by those individuals who choose to smoke.
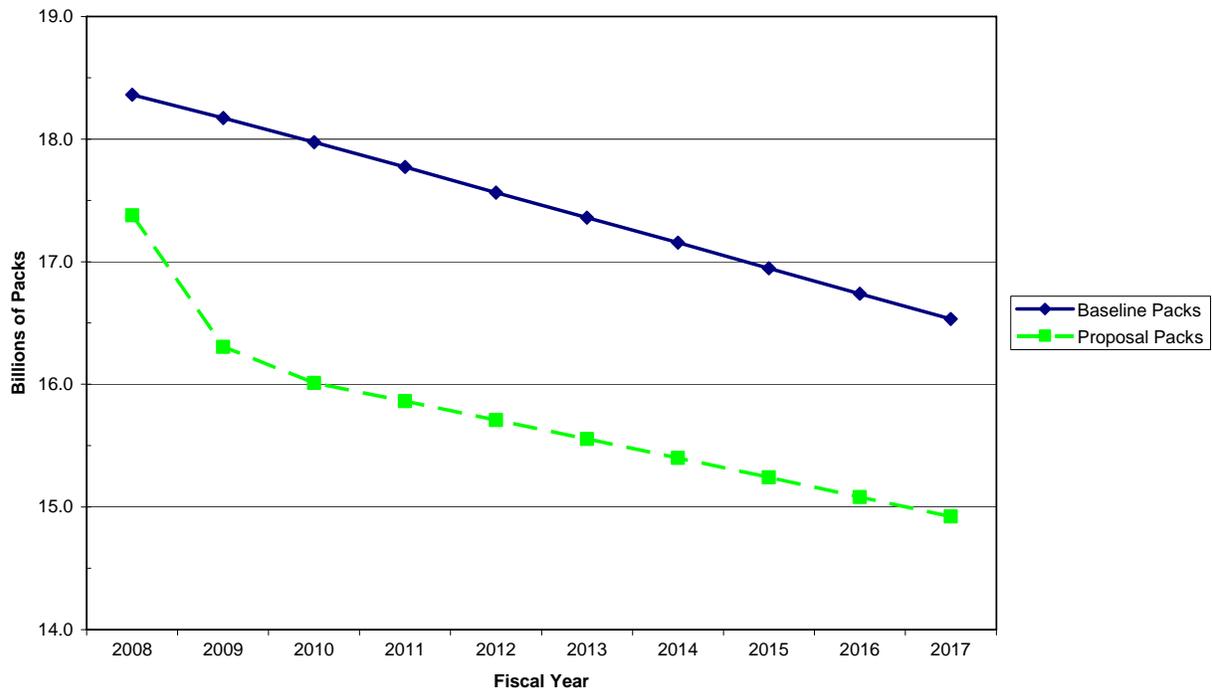
Step one.–As noted above, the JCT staff estimates the percentage of the population that will choose to smoke cigarettes conditioned on the price of cigarettes, household income, and other variables. We estimate that the increase in the excise tax from $0.39 per pack to $1.00 per pack will have a modest effect upon both the smoking participation rate and the consumption of tobacco products per smoker.[12] We estimate that the 2009 smoking rate will be 17.9 percent, representing about 43.1 million smokers. This is a decrease of about 2.3 million smokers, or five percent, from the 45.4 million projected smokers in the absence of changes to Federal tobacco excise tax rates. By 2017, we estimate the smoking rate given the proposed tax increase to be 15.8 percent, a decrease of about four percent relative to our baseline projections, reducing by 1.9 million, to 40.7 million, the currently projected 42.6 million smokers.

Step two.–As noted above, the JCT staff estimates the aggregate quantity of taxed cigarettes that will be consumed annually by those individuals who choose to smoke. The analysis estimates cigarette consumption by smokers as depending upon the price of cigarettes, household income, and other variables. We estimate the average consumption of cigarettes in 2009 after enactment to be 381 packs per smoker per year, a decline of almost five percent from the baseline forecast. We estimate that the average consumption of cigarettes in 2017 would be 370 packs per smoker per year, a decrease of about four percent.

Combined effects.–Combining the effects of a projected number of smokers and the number of cigarettes consumed after the tax increase, we estimate taxable sales of cigarettes to total 16.3 billion packs for fiscal year 2009 and 14.9 billion packs for fiscal year 2017. Figure 1, below, shows projected sales of taxable cigarettes under both present law and given enactment of the proposed tax increase.

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[12] Because the tax rate would be fixed at a nominal value of $1.00 per pack throughout the period 2008-2017, the real, inflation adjusted, tax rate declines throughout the period. As a consequence, the effect of the tax increase on individual behavior is greater in the earlier years of the period than in later years of the period.

**Figure 1.– Predicted Taxable Packs of Cigarettes Sold Under Present Law
and Assuming Enactment of H.R. 976**

Affect on Federal receipts.–As stated above, we estimate taxable sales of cigarettes to total 16.3 billion packs for fiscal year 2009 and 14.9 billion packs for fiscal year 2017. At a tax rate of $1.00 per pack this produces $16.3 billion in gross Federal receipts in 2009 and $14.9 billion in gross Federal receipts in 2017.

While the gross receipts from the excise tax are as estimated above, because smokers are paying more in aggregate to smoke, they consume less of other goods and services in the economy. This implies that incomes of producers and workers in other sectors will decline. As incomes in other sectors decline, receipts from income and payroll taxes decline. Consequently the net effect of an excise tax increase is less than the gross receipts carved from the incremental excise tax. The difference between the change in excise tax receipts and the change in total Federal tax receipts is referred to as the "income and payroll tax offset." This offset may be considered to be the average marginal tax rate on factors of production. The JCT staff applies a 25 percent offset to tobacco excise tax estimates to account for this effect.[13]

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[13] For a more thorough description of the income and payroll tax offset, see Joint Committee on Taxation, *Overview of Revenue Estimating Procedures and Methodologies Used by the Staff of the Joint Committee on Taxation*, (JCX-1-05), February 2, 2005.

As a consequence of the effect of the income and payroll tax offset, we estimate that in 2009 net Federal receipts from the cigarette excise tax will be approximately $12.2 billion. Our baseline projection for cigarette sales is 18.2 billion packs of cigarettes sold. At the present-law tax rate of $0.39 per pack this yields gross revenues of $7.1 billion, and after accounting for the income and payroll tax offset, a net revenue of approximately $5.3 billion. The difference between the net Federal revenue under the proposal and the net Federal revenue under the baseline is our estimate of the increase in Federal revenues of $7.0 billion for fiscal year 2009.

Similarly, in fiscal year 2017, as a consequence of the effect of the income and payroll tax offset, we estimate that in 2017 net Federal receipts from the cigarette excise tax will be approximately $11.2 billion. We estimate cigarette sales would be 16.5 billion packs if there were no changes in present law. At the present-law tax rate of $0.39 per pack, we estimate gross cigarette revenue under present law to be $6.4 billion, and after accounting for the income and payroll tax offset, a net revenue of approximately $4.8 billion. The difference between the net Federal revenue under the proposal and the net Federal revenue under the baseline is our estimate of the increase in Federal revenues of $6.4 billion for fiscal year 2017.

Table 2, below presents the revenue effects attributable to an increase in the tobacco excise tax from $0.39 per pack to $1.00 per pack, as well as the estimated revenue effects of the proposed increases in the tax rates applicable to other tobacco products in H.R. 976.

Table 2.–Estimated Revenue Effects of the Tobacco Excise Tax Increases Contained In H.R. 976

Fiscal Years
[Billions of Dollars]

Item	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2008-12	2008-17
Small cigarettes	5.7	7.0	6.8	6.7	6.6	6.6	6.5	6.5	6.4	6.4	32.7	65.1
Large cigarettes…	---	---	---	---	---	---	---	---	---	---	---	---
Small cigars……..	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.3	0.7
Large cigars……..	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	2.0	4.0
Cigarette papers and tubes………..	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]
Snuff…………….	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	0.2	0.4
Chew……………	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	0.1
Pipe tobacco….…	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	0.1
Roll-your-own tobacco………….	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.3	0.6
Expand Definition of roll-your-own tobacco……….....	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]
Total….............	6.2	7.6	7.4	7.3	7.2	7.2	7.1	7.1	7.0	6.9	35.7	71.0

NOTE: Details may not add to totals due to rounding.
[1] Is a gain of less than $50,000,000.