

**Report of Casey B. Mulligan, Ph.D.,
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I. Executive Summary

Health warning messages displayed on cigarette packs are different in Canada than in the United States. Among other things, Canadian labels are larger and placed more prominently than U.S. labels. If the size, graphical content, placement etc. of warning labels affected smoking behavior, with “stronger” warnings resulting in lower smoking rates, then all else equal smoking rates in Canada should be lower than in the United States.

I have examined the two countries’ data on smoking behavior among youth and young adults, who lived most of their smoking lives since Canada’s 1988 change in labeling legislation. The best available data on youth and adult smoking behavior that can be reliably compared between the United States and Canada are for the years 2003 and before.

If the warnings displayed on cigarette packs sold in the U.S. did less to prevent people from smoking and less to encourage them to quit than the warnings displayed on packs sold in Canada, then I should find smoking rates to be higher in the U.S., at least when the rates are adjusted for other determinants of smoking rates that may differ between the countries.

The data suggest otherwise. Daily smoking rates – the percentage of people of a given age group who smoke daily – were not lower in Canada than they were in the U.S., even after being adjusted for prices and demographics. Occasional smoking rates and former smoking rates were also no higher in the U.S. than in Canada. The average Canadian smoker began to smoke at least as young as the average U.S. smoker did. These results are based on a uniform cross-national survey methodology that includes a common questionnaire, allowing for the computation of a comparable smoking statistic.

Thus, my Canadian-U.S. comparisons do not support the hypothesis that the warnings displayed on cigarette packs sold in the United States discourage smoking less than the warnings displayed on packs sold in Canada.

The details of my qualifications, assignment, analysis, and conclusions are provided below.

II. Qualifications

My name is Casey B. Mulligan. I am a Professor of Economics at the University of Chicago, where I have taught since 1993. I teach graduate and undergraduate level economics courses that cover a variety of topics, including taxation, consumer behavior, international comparisons, and regulation.

In addition to my position at the University of Chicago, I have served as an economic consultant in regulatory matters, class action lawsuits, antitrust cases, and the Master Settlement Agreement between the major cigarette manufacturers and 46 of the U.S. states.

I earned a doctorate degree in economics from the University of Chicago in 1993. Prior to that, I received my bachelor's degree, also in economics, from Harvard College in 1991.

I have published a book and have authored or co-authored more than twenty-five articles on a variety of topics in economics. Those articles have been published in leading scholarly journals, including the *American Economic Review*, the *American Law and Economics Review*, the *Journal of Law and Economics*, the *Journal of Political Economy*, and the *Quarterly Journal of Economics*. I have also been awarded grants from the National Science Foundation, the Sloan Foundation, the Olin Foundation, the Smith-Richardson Foundation, and other foundations and research centers to support my academic research. My qualifications are more fully documented in my curriculum vitae, which is included as Attachment A to this report.

I was assisted by staff at Navigant Economics (formerly Chicago Partners) in preparing this report.

III. Assignment and Summary of Opinions

I was asked to provide Philip Morris International with my opinion on the following question: "Does a comparison of smoking rates in Canada and the United States provide any support for the hypothesis that the larger warning labels used in Canada discourage smoking more than the labels used in the United States?"

In analyzing this question, I compared smoking rates in Canada and the United States for adults aged 18-25 and persons aged 11-17.¹ Economic and other evidence show that smoking rates are affected by factors other than health warnings, including price, demographics, economic variables, and other factors. If the size, graphical content, placement etc. of warning labels affected smoking behavior, with "stronger" warnings resulting in lower smoking rates, then smoking rates in the United States should be higher than in Canada, at least when the rates are adjusted for other determinants of smoking rates that may differ between the countries. If, instead, I find that U.S. adjusted smoking rates are no higher than those in Canada, I would then

¹ I interchangeably refer to the percentage of persons in a given group (e.g., Canadian persons aged 15) who smoke cigarettes as the group's "smoking rate," its "smoking prevalence rate," its "smoking prevalence", or just its "prevalence."

conclude that smoking rates in Canada would not increase substantially if cigarette packs in Canada displayed the same warnings as those in the U.S.

Based on my analysis of the available studies, I find that the Canadian-U.S. smoking rate comparisons do not support the hypothesis that the warnings displayed on cigarette packs sold in the U.S. discourage smoking less than the warnings displayed on packs sold in Canada.

My work on this matter is ongoing and I reserve the right to update my opinions as additional information becomes available to me.

IV. Cigarette Warning Labels have been Different in the United States than they have been in Canada

My analysis uses the differences between warning labels on cigarette packs in the United States and Canada as the basis for understanding how Canadian warning labels affect smoking rates, if at all.

From 1975 to 1988, the Canadian tobacco industry complied with a voluntary bilingual warning label for tobacco products. The label text read: “WARNING: Health and Welfare Canada [The Department of National Health and Welfare] advises that danger to health increases with amount smoked. Avoid inhaling.”² During the same period, the United States had a couple of warning label formats. From 1971-84, the law required that all cigarette packs carry the warning “Warning: The Surgeon General Has Determined that Cigarette Smoking is Dangerous to Your Health.”³ The 1984 *Comprehensive Smoking Education Act* required four rotating warning labels on cigarette packages. Each version of the warning text included a reference to the Surgeon General and the warnings were more explicit than their predecessors.⁴

² See “Cigarette & Cigarette Tobacco Advertising and Promotion Code of the Canadian Tobacco Manufacturers’ Council,” Effective 10/15/1975. See also Garfield Mahood, “Canada’s Tobacco Package Label or Warning System: ‘Telling the Truth’ about Tobacco Product Risks,” Non-Smokers’ Rights Association and the Smoking and Health Action Foundation WHO (2003).

³ This was required by the Public Health Cigarette Smoking Act, effective January 1971. http://www.cdc.gov/tobacco/data_statistics/by_topic/policy/legislation/index.htm

⁴ The rotating warnings were: “smoking causes lung cancer, heart disease, and may complicate pregnancy;” “quitting smoking now greatly reduces serious risks to your health;” “smoking by pregnant women may result in fetal injury, premature birth, and low birth weight;” and “cigarette smoke contains carbon monoxide.” See *Comprehensive Smoking Education Act*, Public Law 98-474, 10/12/1984.

Until 2009,⁵ no U.S. legislation regarding cigarette warning labels mandated the size of labels as a percentage of the pack's principal display area; however, U.S. warnings have typically occupied about 5 percent of the package's surface.⁶ Past legislation is also unclear as to the location of the warning label on the package, merely requiring that it be "in a conspicuous place."⁷ Most U.S. warning labels, however, appear on one of the side panels of a cigarette pack.⁸

From 1988 until the 2009 *Family Smoking Prevention and Tobacco Control Act*, U.S. warning labels stayed the same. Conversely, Canadian warning labels went through a series of changes after 1988. The first such change occurred in 1989 when the *Tobacco Products Control Act* and *Tobacco Products Control Regulations* mandated that warning labels occupy 20 percent of each of the two principal display panels, one side in English and one side in French. These regulations also obliged cigarette manufacturers to rotate four new warning label messages instead of using one standard message text.⁹

In 1994, an amendment to the *Tobacco Products Control Regulations* required that the warning labels occupy 25 percent or 12 cm² of each of the two principal display surfaces, whichever is greater, one side in English and one in French. The amendment also increased the number of rotating warning message texts from four to eight.¹⁰

⁵ Family Smoking Prevention and Tobacco Control Act, June 22, 2009.

⁶ See Macksood Aftab, Deborah Kolben, Peter Lurie and Sidney M. Wolfe, "Smokescreen: Double Standards of U.S. Tobacco Companies in International Cigarette Labeling," Public Citizen's Health Research Group (1998), p. 18.

⁷ See *Public Health Cigarette Smoking Act*, Public Law 91-222, 4/1/1970.

⁸ "FCTC Article 11 Tobacco Warning Labels: Evidence and Recommendations from the ITC Project," International Tobacco Control Policy Evaluation Project (2009).

⁹ The rotating warnings were: "Smoking reduces life expectancy"; "Smoking is a major cause of lung cancer"; "Smoking is a major cause of heart disease"; and "Smoking can cause complications during pregnancy." See *Tobacco Products Control Act* and "Tobacco Products Control Regulations," *Canada Gazette* Part I Volume 122 Number 47 (1988), pgs. 4608-4613.

¹⁰ The rotating warnings were: "Cigarettes are addictive"; "Tobacco smoke can harm your children"; "Cigarettes cause fatal lung disease"; "Cigarettes cause fatal lung disease in non-smokers"; "Cigarettes cause cancer"; "Cigarettes cause strokes and heart disease"; "Smoking during pregnancy can harm your baby"; and "Smoking can kill you." See "Tobacco Products Control Regulations – Amendment," *Canada Gazette* Part I Volume 127 Number 12 (1993), pgs. 795-805.

In 2000/2001, Canadian warning labels were modified again by the *Tobacco Products Information Regulations*, which were pursuant to the 1997 *Tobacco Act*. These regulations required that warning labels occupy 50 percent of each of the two principal display surfaces, one in English and one in French. These regulations also increased the number of rotating warning texts from eight to sixteen. In addition to the changes in text, the *Tobacco Products Information Regulations* also introduced color graphics to warning labels in the form of pictures relating to the warning text.¹¹ One common characteristic of the Canadian warning labels throughout the years 1989-2008: they were about 4-10 times larger than the warning labels displayed in U.S. cigarette packs.

A number of studies have hypothesized that larger, graphic cigarette warning labels would reduce smoking rates by making warning labels more noticeable, more memorable, more salient, and by making smokers think more about quitting.¹² However, as noted by Gospodinov and Irvine (2004), these are not studies of actual smoker behavior: consumers might better recall graphic warnings but nonetheless continue smoking. Gospodinov and Irvine did examine smoking behavior shortly before and after Canadian warnings were changed in 2001 and found that “warnings have not had a discernible impact on smoking prevalence.”¹³

¹¹ The rotating warnings were: “CIGARETTES ARE HIGHLY ADDICTIVE”; “CHILDREN SEE CHILDREN DO”; “CIGARETTES HURT BABIES”; “TOBACCO USE CAN MAKE YOU IMPOTENT”; “DON’T POISON US”; “TOBACCO SMOKE HURTS BABIES”; “CIGARETTES CAUSE STROKES”; “CIGARETTES CAUSE MOUTH DISEASES”; “EACH YEAR THE EQUIVALENT OF A SMALL CITY DIES FROM TOBACCO USE”; “CIGARETTES LEAVE YOU BREATHLESS”; “CIGARETTES ARE A HEARTBREAKER”; “CIGARETTES CAUSE LUNG CANCER” (2 versions); “IDLE BUT DEADLY”; “WHERE THERE’S SMOKE THERE’S HYDROGEN CYANIDE”; “YOU’RE NOT THE ONLY ONE SMOKING THIS CIGARETTE.” See “Tobacco Products Information Regulations,” *Canada Gazette* Part I Volume 134 Number (2000), pgs. 972-980 and accompanying source document “Health Warnings and Information for Tobacco Products,” Health Canada (2000).

¹² See FCTC Article 11 Tobacco Warning Labels: Evidence and Recommendations from the ITC Project,” International Tobacco Control Policy Evaluation Project (2009) and D. Hammond, GT Fong, A McNeill et al., “Effectiveness of cigarette warning labels in informing smokers about the risks of smoking: findings from the International Tobacco Control (ITC) Four Country Survey,” *Tobacco Control* 15 (2006).

¹³ Nikolay Gospodinov and Ian J. Irvine, “Global Health Warnings on Tobacco Packaging: Evidence from the Canadian Experiment,” *Topics in Economic Analysis & Policy* (2004). Examining smoking behavior shortly before and after warnings were changed in early 2001, their “findings indicate that the warnings have not had a discernible impact on smoking prevalence. The evidence of their impact on quantity smoked is positive, though only at a relatively low level of confidence.”

Previous studies have also found that some smokers remember warnings less than other smokers do, and that the smokers with less recall are also less likely to quit, or attempt to quit, smoking.¹⁴ Those studies did not look at which warnings create more recall than others, or look at which warnings are associated with more quitting behavior. In addition, people who are quitting may be motivated to remember warnings, as opposed to the other way around, so we cannot conclude that the warnings themselves contribute to quitting.

The purpose of my study is to compare Canadian and U.S. smoking rates to determine whether the much larger size, prominent placement, and different content of Canadian labels since 1989 caused Canadians to be less likely than people in the United States to start smoking and more likely to quit, adjusting for other potential determinants of smoking rates.

V. Smoking Rates have been at Least as High in Canada as in the United States

Because the Canadian labels changed significantly in 1989 and, according to the data examined in Section V.B. below, the average age to start smoking daily is 16-17, I confine my smoking rate analysis to cohorts for whom a large fraction of their potential smoking lives (as of the time of the survey) had occurred since the 1989 change in cigarette warnings: persons aged 11-25 at the time of the 2002-3 surveys. Persons aged 11-25 in 2002-3 would have been no more than 11-12 years old in 1989 and 16-17 years old in 1994, and therefore would have purchased the vast majority of their lifetime cigarettes since 1988.

V.A. Studies Designed for Country Smoking Rate Comparisons

The best data for comparing Canadian and U.S. smoking rates would begin with a uniform cross-national survey methodology and a common questionnaire to obtain responses that could be used to calculate a common prevalence statistic. I identified one such study that interviewed adults, and another that interviewed youth.¹⁵

In late 2002 and early 2003, Statistics Canada and the United States Centers for Disease Control (collectively here and after, JCUSH) conducted a study “designed and conducted to collect the same information in the same manner from both Canadian and U.S. residents so that

¹⁴ D Hammond, GT Fong, PW McDonald, R Cameron, and KS Brown, “Impact of the graphic Canadian warning labels on adult smoking behavior,” *Tobacco Control* 12 (2003): 391-395; Hammond et al., “Graphic Canadian Cigarette Warning Labels and Adverse Outcomes: Evidence from Canadian Smokers,” *American Journal of Public Health* 94:8 (2004): 1442-1445; Borland et al., “How reactions to cigarette packet health warnings influence quitting: findings from the ITC Four-Country survey,” *Addiction* 104 (2009): 669-675.

¹⁵ Throughout the report, I refer to persons aged 11-17 as “youth.”

accurate comparisons between the two populations can be made....” The respondent-level data from which JCUSH made these comparisons are publicly available.¹⁶ I used these data to examine both adult and (based on the smoking histories) youth smoking statistics for the two countries.

The 2002-2003 JCUSH was the only study I found that used a common survey methodology and questionnaire to calculate a common prevalence statistic for persons over age 18 in both the United States and Canada.^{17,18} To my knowledge,¹⁹ with the exception of JCUSH, none of the other Canadian surveys of adult smoking and other health behaviors were designed to collect “the same information in the same manner for residents of both countries during the same time period” as a U.S. survey.²⁰

The Health Behavior in School Aged Children study (HBSC) administers surveys of youth,²¹ and was designed to facilitate cross-country comparisons (as well as changes within a

¹⁶ <http://www.cdc.gov/nchs/nhis/jcush.htm>.

¹⁷ <http://www.cdc.gov/nchs/pressroom/04news/firstjointsurvey.htm>.

¹⁸ However, the Pan American Tobacco Information Online System allows comparisons of smoking statistics across countries, such as “Adult Smoking Prevalence.” (<http://www.paho.org/tobacco/CountriesTopic.asp>). The statistics are based on the WHO InfoBase estimate, which takes statistics from country-specific surveys (with country-specific survey methodologies and country-specific questionnaires) and adjusts them to a prevalence statistic with a common definition in terms of age, year, and smoking status definition (<https://apps.who.int/infobase/help.aspx?typecode=hp.tc.002#217>). Results for 2002 and 2005 show “Adult Smoking Prevalence” to be similar for the two countries.

¹⁹ Other studies of Canadian adult smoking behavior that I reviewed differ from studies of U.S. adult smoking behavior in the smoking status measure studied (e.g., smoking every day versus some days), the manner in which results are summarized by age groups, time period when the data is collected, or the sampling and questionnaire methodology. For these reasons, conclusions about smoking prevalence in Canada and the United States are less precise if one compares distinct U.S. and Canadian surveys that were not designed specifically for such cross-country comparisons. See also the Campaign for Tobacco-Free Kids (<http://www.tobaccofreekids.org/research/factsheets/pdf/0173.pdf>) on the difficulty of comparing smoking rates across surveys, even for the same country.

²⁰ Ken Eng and David Feeny, “Comparing the Health of Low Income and Less Well Educated Groups in the United States and Canada,” *Population Health Metrics* 5:10 (2007). See also <http://www.cdc.gov/nchs/pressroom/04news/firstjointsurvey.htm>: “Because the survey contacted a representative sample of adults in each country and asked for exactly the same information in the same manner in a one-time telephone interview, this [JCUSH] survey achieves a degree of comparability never before attained.”

²¹ Roberts et al., “Methods,” In Currie et al., *Health Behavior in School-aged Children (HBSC) study: international report from the 2001/2002 Survey* World Health Organization (2004), p. 217.

country over time).²² In the 2001/2002 wave of the study, the Canadian and U.S. samples were drawn within two months of January 1, 2002.²³

The JCUSH adult interviews permit examination of adult smoking rates, but those adults also described smoking histories that can be used to examine smoking behavior prior to adulthood because all of the adults interviewed by JCUSH were themselves once youth. The HBSC's youth interviews are my other source of data for comparing youth smoking rates between Canada and the United States.

V.B. Smoking among Persons Aged 11-17

The average age of first daily smoking was 16.6 in Canada and 16.9 in the United States among current and former daily smokers aged 18-30 when surveyed by the JCUSH.²⁴ Among those aged 18-30 when surveyed by the JCUSH who had smoked 100 or more cigarettes in their lifetime, the average age of first smoking a cigarette was 15.1 in Canada and 15.4 in the United States.

Table 1 summarizes the HBSC findings for the prevalence of daily and weekly smoking²⁵ (Tables are attached at the end of this report). It shows that the prevalence of weekly smoking among 11-year-olds, 13-year-olds, and 15-year-olds is similar in Canada and the United States. Among 13- and 15-year-olds, the survey's point estimates for daily smoking rates are somewhat greater in Canada than in the United States.

Thus, two studies designed for country comparisons do not support the hypothesis that youth smoking has been more prevalent in the U.S. than in Canada. If anything, Canadians were somewhat more likely to be daily smokers during their youth.

²² "The questionnaire consists of a set of mandatory items that each country or region must use to facilitate the collection of a common set of data." In Currie et al., *Health Behavior in School-aged Children (HBSC) study: international report from the 2001/2002 Survey* World Health Organization (2004), p. 3. See also http://www.unicef-irc.org/datasets/HBSC_matrix.pdf.

²³ Ibid, p. 219. The timing of this wave is similar to the timing of the 2002/2003 JCUSH.

²⁴ The JCUSH interviewed persons aged 18 and over. Because smoking often starts before adulthood (but with a group of people starting in their late 20s), I restrict the sample to those individuals 30 and younger to minimize recall biases and age-rounding errors.

²⁵ Godeau et al., "Tobacco Smoking," *Health Behavior in School-aged Children (HBSC) study: international report from the 2001/2002 Survey* World Health Organization (2004), pgs. 67-8.

V.C. Smoking Rates Among Persons Aged 18-25

As of 2002-2003, smoking rates for persons aged 18-25 were at least as high in Canada as in the United States. Table 2 displays statistics by smoker status (smoke daily, currently smoke at least occasionally, have ever smoked, and former smoker). As shown in the Table, at the time of the study 20.5 percent of Canadians in the age range 18-25 were daily smokers, as compared to 19.0 percent of people in the United States of that age.

The point estimates show Canadian rates to be higher for all four indicators of smoker status. As shown in the Table, 42.9 percent of Canadians aged 18-25 had smoked more than 100 cigarettes in their lives, compared to 36.7 percent of people in the United States in the same age group.

These results do not support the hypothesis that smoking has been more prevalent in the U.S. than in Canada among persons living most of their smoking lives since Canada's 1988 change in labeling legislation.

VI. The Canadian Smoking Rates are at Least as High as those in the United States after Adjusting for Differences between the Countries in Price, Education, Race, Advertising Restrictions, and Public Smoking Restrictions

Cross-country differences in observed consumption behavior for a product, such as cigarettes, are due to a combination of measured and unmeasured determinants of consumer demand. If we estimate the impact of factors that have been measured – such as differences in consumers' education and price differences across countries – and use these estimated impacts to project consumption rates as if these factors were identical in the two countries, then the remaining differences in the projected consumption rates are attributable to unmeasured factors that differ between the two countries. Here, the factor of interest – whose smoking rate effect has not yet been estimated – is the difference in warning labels for cigarettes in Canada and the United States between 1989 and 2002.

I use this methodology to estimate how the difference in tobacco warnings for cigarettes in the two countries affects smoking rates, using data on the 2002-2003 differences in smoking rates between Canada and the United States. To do so, I estimate how smoking rates would have differed between the United States and Canada in 2002-2003 if there were no difference in

education, race, and price, and consider how smoking rates would differ between the two countries if they had the same restrictions on advertising and public smoking.²⁶

After adjusting for differences in real prices, demographics, and restrictions on advertising and public smoking, I estimate that the United States smoking rate for persons aged 18-25 is no greater than the smoking rate for Canadian persons of the same age.

VI.A. Potential Determinants of Smoking Rates

The theoretical and empirical economics literature has identified a number of determinants of smoking rates and aggregate cigarette demand. Many studies claim that real retail cigarette prices are an important determinant, and that smoking rates are lower when cigarettes are more expensive. Living standards, as captured by income, education, or other variables, are also said to affect smoking rates. Ethnic and cultural factors may also be correlated with smoking behavior. Some studies also include tobacco control measures, such as the prohibition of smoking in public places, based on the hypothesis that tobacco control measures can raise the cost of smoking at a given retail price, and thereby discourage smoking.^{27,28} In addition, studies have found education and smoking rates to be significantly correlated.²⁹

I use several measures of these price and demographic factors: the log of the real price of cigarettes, educational attainment of persons in the country, whether the country prohibits

²⁶ Cigarette blend (Virginia-blend is the predominant blend in Canada and American-blend predominates in the United States) may be another factor, and has no explicit measure of impact. However, even if Health Canada were correct that American-blend cigarettes would make it easier for people to start smoking, then adjusting smoking rates for the effects of cigarette blend would only strengthen my conclusion that adjusted Canadian smoking rates are not lower than adjusted U.S. rates. See Proceedings of the Standing Senate Committee on Social Affairs, Science and Technology, Issue Number 6, First and second(final) meetings on Bill C-32, *An Act to amend the Tobacco Act*, p. 6:28.

²⁷ See Frank J. Chaloupka and Kenneth E. Warner, "The Economics of Smoking," in Culyer and Newhouse *Handbook of Health Economics* 1 (2000): 1546-1562, and the studies cited therein for analysis of the effect of price on smoking behavior; p. 1547 and the literature cited therein for a discussion of income effects on smoking; and p. 1546 for an explanation of how certain tobacco control measures may serve to raise the effective price of cigarettes.

²⁸ On the relevance of various demographic variables, see "Preventing Tobacco Use Among Young People: a report of the Surgeon General," Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health (1994), Executive Summary p. 9, and William W. Davis, Anne M. Hartman, and James T. Gibson, "Trends in Smoking Prevalence by Race based on the Tobacco Use Supplement to the Current Population Survey," Manuscript National Cancer Institute (2007).

²⁹ See William Sander, "Schooling and Smoking," *Economics of Education Review* 14:1 (1995): 23-33, for some of these findings, and references to other studies.

smoking in some areas (as coded by the World Health Organization), and a vector of indicators of race and ethnicity. To the degree that these variables differ between Canada and the United States, and they are correlated with smoking, Canada and the United States are expected to have different smoking rates.³⁰ Moreover, the difference in the Canadian and U.S. smoking rates can be decomposed into differences in the various factors that determine demand in the two countries.

The cigarette demand literature shows that increases in price, education, and tobacco control may be associated with a lower smoking prevalence among adults, and fewer total cigarettes purchased. Studies have estimated the size of these correlations, often by making regional comparisons.³¹

Using reported estimates of the values for each country's real prices, education, restrictions on advertising and public smoking, and reported estimates of the magnitude of their relationship with cigarette smoking rates, I estimate the U.S. smoking rate that would prevail if its real price, education, the distribution of races, and restrictions on advertising and public smoking were as they are in Canada. I refer to this estimated rate as the "adjusted U.S. smoking rate." The difference between the actual Canadian smoking rate and the adjusted U.S. smoking rate is the "adjusted smoking rate gap" – the difference in smoking rates that would exist even if these proxies for the determinants of smoking rates (price, education, etc.) were identical in the two countries, and equal to what they actually are in Canada.

I calculate adjusted smoking rate gaps for young adults. There is no consensus in the literature whether youth and young adult smoking is more or less price sensitive than overall smoking. I consider a price-sensitivity range, which is consistent with both hypotheses from the literature (that is, youth and young adults are more, or less, price sensitive than the rest of the population) as long as both sensitivities fall within the assumed range.

VI.B. Real Cigarette Prices in Canada and the United States

In order to calculate the adjusted smoking rate gap, I must determine real cigarette prices in the two countries. According to Statistics Canada, the price per 200 cigarettes in November

³⁰ This discussion is formalized algebraically in the attached Appendix.

³¹ When the coefficients are estimated by regional comparisons, they are the same across regions. Regional studies include William Sander, "Schooling and Smoking," *Economics of Education Review* 14:1 (1995), p. 30f; William N. Evans and Lynn Huang, "Cigarette Taxes and Teen Smoking: New Evidence from Panels of Repeated Cross-Sections," University of Maryland Manuscript (1998). Studies of the effects of cigarette excise taxes such as the models 3 and 4 in Frank J. Chaloupka and Henry Wechsler, "Price, tobacco control policies and smoking among young adults," *Journal of Health Economics* 16:3 (1997) are necessarily regional, even if they use individual data, because cigarette excise taxes are set regionally.

2002 – during the time of the JCUSH survey – was \$61.34 (in Canadian dollars), or \$6.134 per 20 cigarettes.³² The average retail price of a pack of 20 cigarettes sold in the United States was \$3.72 (in U.S. dollars).³³

In order to compare prices in U.S. dollars with those in Canadian dollars, a conversion must be made. I used the three alternative conversion methods that are shown in Table 3. The first method uses the market exchange rate between United States and Canadian dollars. The second conversion method uses the purchasing power exchange rate. The third method expresses cigarette prices as a ratio to average daily disposable income in the respective country. All three methods show that Canadian retail cigarette prices are higher than those in the United States.^{34,35}

VI.C. Other Potential Demand Determinants for Canada and the United States

The World Health Organization (“WHO”) has compared tobacco control measures across countries, and finds that Canada’s tobacco control measures were at least as strict as those in the United States. For example, WHO finds that Canada had a more comprehensive advertising ban in about the year 2000.³⁶

In order to be conservative with respect to the hypothesis that adjusted smoking rates in Canada are no lower than in the United States, I have assumed that, with possibly the exception of health warnings displayed on cigarette packs, the United States and Canada have equally effective tobacco control measures.

³² CANSIM, Statistics Canada, series P219187, http://cansim2.statcan.gc.ca/cgiwin/CNSMCGI.EXE?LANG=Eng&Dir-Rep=CII/&CNSM-Fi=CII/CII_1-eng.htm. The CANSIM price likely includes both carton and pack sales, whereas the Tax Burden on Tobacco (TBT) price represents pack sales alone. Given that cartons are on average cheaper on a per pack-basis, the Canadian price for pack sales alone is likely higher than the 6.134 CAD I have used here. This leads to an underestimate of the price gap and thereby understates the amount by which Canadian smoking rates adjusted for real prices would exceed U.S. rates.

³³ Tax Burden on Tobacco, Table 13B, inclusive of generics. Both U.S. and Canadian prices are sales-weighted averages of various brands and purchase locations.

³⁴ Of the three methods, the latter two are more relevant for consumer demand analysis because they compare cigarette prices to other prices and incomes commonly encountered by the consumer, whereas the market exchange rate conversion reveals the relative price of cigarettes purchased in the neighboring country, rather than at home.

³⁵ For 2006, the World Health Organization found cigarettes “of the most widely consumed brand” to be 90 percent more expensive in Canada when converting currencies at market exchange rates, and 72 percent more expensive when converting currencies at purchasing power parity (WHO Report on the Global Tobacco Epidemic, 2008).

³⁶ WHO Report on the Global Tobacco Epidemic, 2008: *The MPOWER Package*, World Health Organization, (2008).

The relationship between cigarette demand and education has been studied in the literature. Holding constant other demographic variables, Davis *et al* (2007) find that more education is associated with lower smoking rates.³⁷ Among their other demographic variables, they estimate smoking rates for Whites, Blacks, Asians, and North American Indians (all relative to the rate for Hispanics). I use the education and race coefficients estimated in their smoking equations as part of the smoking rate adjustments.

VI.D. Estimates of the Adjusted Smoking Rate Gap

I use the middle price gap from Table 3, 34.8 percent (equivalently, the log price gap is 0.3), and assume smoking rate elasticities (with respect to price) of -0.25 and -0.75 to infer the effect of equalizing prices.³⁸

Table 4 shows the log smoking rate adjustments that would occur if the United States had Canadian market conditions on eleven different variables: log real price; the fraction of the adult population with less than high school, high school degree, some college, and college degree (or more); the fraction of the population that is White, Black, Asian, Aboriginal or Native American,³⁹ Hispanic; and prohibition of smoking in some areas.⁴⁰ The first step in making the adjustments is to calculate the degree to which the United States differs from Canada on each variable. This is shown in the first three columns of Table 4. For example, the third column of the top row of Table 4 reports that the log real cigarette price is 0.30 greater in Canada than in

³⁷ William W. Davis, Anne M. Hartman, and James T. Gibson, "Trends in Smoking Prevalence by Race based on the Tobacco Use Supplement to the Current Population Survey," National Cancer Institute Manuscript (2007), Table 5.

³⁸ A number of studies have estimated the price elasticities of various smoking outcomes. The relevant elasticity here is the elasticity of the smoking rate with respect to price (sometimes described as the "participation elasticity"), which is less in magnitude than the elasticity of aggregate cigarette purchases, assuming that cigarettes per smoker are price elastic. Lisa M. Powell and Frank J. Chaloupka, "Parents, Public Policy, and Youth Smoking," *Journal of Policy Analysis and Management* 24:1 (2005), p. 107 find youth participation elasticities of -0.27 and -0.34, which they describe as being at the "low end" of those in the literature. Frank J. Chaloupka and Henry Wechsler, "Price, tobacco control policies and smoking among young adults," *Journal of Health Economics* 16:3 (1997), Table 4 found participation elasticities for young adults ranging from -0.48 to -0.59. Eugene M. Lewit and Douglas Coate, "The potential for using excise taxes to reduce smoking," *Journal of Health Economics*. 1:2 (1982), found a participation elasticity of -0.74 for young adults (Table 4), and -0.26 for all adults (p. 136).

³⁹ The U.S. Census Bureau has a "Native American" race category, whereas Statistics Canada has an "Aboriginal" category.

⁴⁰ I specify the adjustments in logs because several of the coefficients I draw from the literature are effects of price and demographics on the natural logarithm (i.e., "log") of smoking rates or the log odds of the smoking rate (that is, the log of the ratio of the smoking rate to the non-smoking rate), rather than the smoking rate itself. For example, an elasticity of the smoking rate with respect to price equal to -0.25 means that each unit added to log price reduces the log smoking rate by -0.25.

the United States, which is equivalent to a gap of 34.8 percent (recall the middle row from Table 3).

The right hand side of the table transforms each Canadian-U.S. difference into a log smoking rate adjustment. For example, raising the U.S. log real cigarette price by the 0.30 that would be required to make it equal to the Canadian real cigarette price would, together with a coefficient of -0.25,⁴¹ reduce the U.S. log smoking rate by 0.07, which is equivalent to a seven percent reduction in the smoking rate. The right hand side of the table has two versions of the log smoking rate adjustment, one for a smoking rate elasticity with respect to price of -0.25, and another version for a smoking rate elasticity with respect to price of -0.75.

Each of the other rows (before the final row) calculates a smoking rate adjustment for each of the other independent variables.⁴² For each variable, the adjustment is the product of the coefficient and the Canadian-U.S. difference. The adjustment in the last row turns out to be zero because I assume for the moment that Canada and the United States are the same in terms of their prohibition of smoking in some areas.⁴³

The final row (in bold) accumulates all eleven adjustments. Assuming a price elasticity of -0.25, the combined adjustment of the log U.S. smoking rate is 0.07, which means that the U.S. smoking rate would be seven percent higher if Canadian conditions (as quantified by these eleven variables) had prevailed there. Assuming a price elasticity of -0.75, the combined adjustment to the log smoking rate is -0.08 (see the entry in the last row of the last column), which is equivalent to an eight percent reduction in the smoking rate.⁴⁴

⁴¹ Because the coefficient of -0.25 pertains to the relationship between log real price and log smoking rate, the -0.25 can also be referred to as the “the elasticity of the smoking rate with respect to price.”

⁴² Assuming that none of the demographic variables are price variables, their adjustments do not depend on the assumed price elasticity (-0.25 and -0.75) and are therefore the same in both “Adjustment” columns.

⁴³ The World Health Organization (*The Tobacco Atlas*, first edition, 2002) classified countries in terms of legislation in place (as of 2000) regarding smoke-free areas and cigarette advertising bans, putting Canada and the United States in the same smoke-free areas category and in different advertising ban categories (Canada, but not the U.S., was coded as “comprehensive advertising ban”).

⁴⁴ As compared to the log smoking rate adjustments shown in Table 4 of -0.08 and +0.07, I have considered alternative adjustments ranging from -0.18 to +0.09 by leaving out the race adjustments or leaving out education adjustments, and considered the full range of price elasticities. A log smoking rate adjustment of 0.09 is found by leaving out the race adjustments and replacing the schooling coefficients from Davis et al (2007) with coefficients based on Sander (1995), who estimates that each year of schooling reduces log smoking rates by about 0.39 (the ratio of the years of schooling coefficient, -11.6, in the smoking rate equation shown in Sander’s Table 11 to the average smoking prevalence based on the data used for Sander’s study, 29.5) without holding race constant (William Sander, “Schooling and Smoking,” *Economics of Education Review* 14:1 (1995): pgs. 23-33). A log smoking rate

Table 5 shows the resulting U.S. smoking rates, and gaps in smoking rates between Canada and the United States when the U.S. rate is adjusted for price, demographics, and restrictions on public smoking between the two countries. The table begins in row [1] with actual smoking rates for persons aged 18-25: 20.5 and 19.0 for Canada and the U.S. respectively. The top row also shows the actual Canadian-U.S. smoking rate gap, which is 1.5 percentage points. Row [2] transforms the actual smoking rates into logarithms in order to apply the adjustments from the literature that are summarized in Table 4.

Assuming a price elasticity of -0.25 (-0.75), respectively, the log smoking rate that would prevail in the United States if it had the Canadian values for real price, prohibitions on public smoking, and the demographic variables is determined by adding 0.07 to (subtracting 0.08 from) the log U.S. smoking rate (see Table 4 for the adjustment amounts). This adjustment is shown in row [3] of each panel of Table 5.⁴⁵ Row [4] of each panel has the adjusted log smoking rates found by adding the adjustment to the actual log smoking rates. Row [5] of each panel shows the adjusted smoking rates.

The adjusted U.S. smoking rates for persons aged 18-25 range from 17.6 percent to 20.4 percent, or 0.1 to 2.9 percentage points less than the Canadian rates for persons the same age.

The results shown in Table 5 can be used in a way that recognizes the possibility that the price sensitivity of smoking for young adults is different than the price sensitivity for adults in general. If, for example, young adults were more price sensitive, it might be appropriate to use the adjusted gap of 2.9 from the right half of the table for young adults, because more price sensitivity is assumed for constructing the right half than is assumed for constructing the left half. In this case, adjusted smoking rates in the U.S. are not higher than the corresponding rates in Canada.

VI.E. Conclusions Regarding Adjusted Smoking Rates

After adjusting for differences in real prices, demographics, and restrictions on public smoking, I estimate that the United States adult smoking rate for persons aged 18-25 is no greater than the smoking rate for Canadians the same age.

These statements assume that Canada and the United States have comparable bans on cigarette advertising. In fact, I understand that the Canadian ban was more comprehensive as of

adjustment of -0.18 is based on a specification that leaves out education adjustments and obtains race-specific coefficients from the 2003 column of Davis et al.'s (2007) Table 3.

⁴⁵ No adjustment of the actual log smoking rate is needed to calculate the log Canadian smoking under Canadian conditions, because Canada already has Canadian conditions. This is why zeros are entered in the Canadian columns of each panel's row [3].

the year 2000. Any adjustment for that would cause me to estimate a somewhat lower adjusted U.S. smoking rate, and only strengthen my conclusion that the U.S. smoking rate is no greater than Canada's after the appropriate adjustments are made.

Based on the World Health Organization's report, I have also assumed that Canada and the United States have similar prohibitions on smoking in public areas. If instead Canada has more prohibitions, any adjustment for that would cause me to estimate a somewhat lower adjusted U.S. smoking rate, and only strengthen my conclusion that the U.S. adult smoking rate is no greater than Canada's after the appropriate adjustments are made.

VII. Conclusion: Canadian-U.S. Comparisons do not Support the Hypothesis that Warning Labels displayed on cigarette packs in Canada Reduce Smoking Rates More than Do Warning Labels displayed on U.S. cigarette Packs

If the warnings displayed on cigarette packs sold in the United States did less to prevent people from smoking and less to encourage them to quit than the warnings displayed on packs sold in Canada, then, adjusting for other determinants of cigarette demand, smoking rates should be greater in the United States than in Canada, especially among people who lived most of their smoking lives since 1989 when Canada began requiring "stronger" warning labels.

In fact, the reverse is true: I find that the 2002-2003 smoking rates for young adults adjusted for real prices, demographics, and restrictions on advertising and public smoking are no greater in the United States than they are in Canada. My point estimates of the adjusted smoking rates for persons aged 18-25 are 0.1 to 2.9 percentage points **lower** in the United States than in Canada. The gaps between adjusted smoking rates in the United States and Canada might be even greater if a further adjustment were made for Canada's more comprehensive regulation of advertising and smoking in public areas. As estimated, the gaps between adjusted smoking rates in the United States and Canada are roughly 10 percent of overall prevalence and typically smaller than the within-country variation in smoking rates.⁴⁶

Estimates from HBSC studies suggest that smoking rates for the 11-15 age group are no higher in the United States than they are in Canada. The point estimate from the JCUSH data of the average age of starting smoking for Canadians is slightly less than the average age that United States smokers start.


⁴⁶ A cross-country smoking rate gap of 10 percent of the overall prevalence is small, as regional comparisons go: The cross-U.S.-state standard deviation of smoking prevalence in 2002 was 3.3 (that is, more than 14 percent of overall prevalence). (Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System Survey Data. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, Table 1).

I have adjusted the measured gap between Canadian and U.S. smoking rates for several possible determinants of that gap: real cigarette prices, demographics, and restrictions on advertising and public smoking. It is possible that, aside from warnings on cigarette packs, other determinants of the gap have gone unmeasured. However, because the two countries are geographically proximate, similar in many ways,⁴⁷ and have been surveyed in the same manner, it is not surprising that I find the adjusted smoking rate gap between the two countries to be smaller than the typical smoking rate gap among various states of the U.S., where cigarette packs have the same warnings.

Without unmeasured determinants of smoking rates to significantly reduce the U.S. smoking rate relative to Canada's, the best explanation for my findings is that the warnings displayed on cigarette packs sold in the U.S. do not result in a higher smoking rate for youth or young adults.

Canadian-U.S. smoking rate comparisons do not support the hypothesis that the warnings displayed on cigarette packs sold in the United States discourage smoking less than the warnings displayed on packs sold in Canada.

December 9, 2010.



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⁴⁷ The many similarities between the United States and Canada are a primary reason for directly comparing outcomes in the two countries (Ken Eng and David Feeny, "Comparing the Health of Low Income and Less Well Educated Groups in the United States and Canada," *Population Health Metrics*. 5:10 (2007).

VIII. Appendix: Smoking Rate Adjustment Arithmetic

The discussion of smoking rate determinants developed in the text can be formalized in a simple model of the smoking rate in country j :

$$\ln r_j = \alpha + \beta_p \ln p_j + \beta_c c_j + \beta_s' S_j + \beta_g' G_j + \Gamma' Z_j.$$

Here, r_j denotes the percentage of the population aged 18-25 who are daily smokers in country j and p_j is the real price of cigarettes (\ln denotes natural logarithm) in that country. c_j denotes tobacco control measures. S_j represents measures of education of persons in country j . G_j denotes a vector of indicators of race and ethnicity. Z_j denotes a vector of unmeasured determinants of smoking rates. The coefficients on these determinants are β_p , β_c , β_s , β_g and Γ , respectively (the first two are scalars, and the last three are coefficient vectors).

I use this basic model of the determinants of a country's smoking rate to understand how price, education and other differences between Canada and the United States influence the smoking rate gap between the two countries. Let Δr represent the difference between the Canadian smoking rate and the U.S. smoking rate. The equation above implies that the difference in the Canadian and U.S. smoking rates can be decomposed into differences in the various factors that determine demand in the two countries:

$$\Delta \ln r = \beta_p \Delta \ln p + \beta_c' \Delta c + \beta_s' \Delta S + \beta_g' \Delta G + \Gamma' \Delta Z$$

The cigarette demand literature shows that increases in each of the variables $\ln p$, s , and c are associated with less smoking among adults – that is, the coefficients β_p , and β_c are negative, and the education coefficients decline with the amount of education. As explained in the text, I use these coefficients as estimated in the literature to calculate the log smoking rate adjustments in Table 4.

Table 1: Daily and Weekly Smoking Rates for 11-, 13-, and 15-year-olds
from Health Behavior in School Aged Children, 2001/2002

	Percentages Who Smoke, at Age:		
	11	13	15
Weekly Smoker			
Canada	1.4	6.5	14.5
<u>U.S.</u>	<u>1.1</u>	<u>6.0</u>	<u>14.9</u>
Canada-U.S.	0.3	0.6	-0.4
Daily Smoker			
Canada	0.6	4.2	11.9
<u>U.S.</u>	<u>0.6</u>	<u>2.6</u>	<u>9.9</u>
Canada-U.S.	0.0	1.6	2.1

Source: Simple average of prevalence for boys and girls from Godeau, HBSC study, 2004, pp. 67-8.

Note: Some columns may not add due to rounding error

Table 2: Adult Smoker Status in the United States and Canada, 2002/2003

	Percentages Who Smoke:			
	Currently, Daily ¹	Currently, at least occasionally ²	Currently or Formerly ³	Formerly ⁴
Ages 18-25				
Canada	20.5	32.8	42.9	10.0
<u>U.S.</u>	<u>19.0</u>	<u>27.8</u>	<u>36.7</u>	<u>9.0</u>
Canada-U.S.	1.5	5.1	6.2	1.1

Sources:

Statistics Canada and United States CDC. Joint Canada United States Survey of Health, 2002-03.

Joint Canada United States Survey of Health Microdata File

Notes:

Some columns and rows may not add due to rounding error

Missing data ("I don't know", "not stated", "refusal") have been excluded from the analysis.

1. "Currently Daily" lists the weighted proportion of the sample that responded "Every Day" to the following question "Do you now smoke cigarettes every day, some days or not at all?"

2. "Currently, at least occasionally" lists the weighted proportion of the sample that responded "Every Day" or "Some Days" to the following question "Do you now smoke cigarettes every day, some days or not at all?"

3. "Currently or Formerly Smokers" lists the weighted proportion of the sample that answered "yes" to "Have you smoked at least 100 cigarettes in your entire life?"

4. Computed as the difference between "Currently or Formerly" and "Currently, at least occasionally" smokers.

Table 3. Canadian and U.S. Retail Cigarette Prices, 2002

per 20 cigarettes

	Purchase Location		
	Canada	U.S.	Canadian premium
expressed as USD at market exchange rate	3.90	3.72	4.9%
USD at PPP exchange rate (consumption)	5.02	3.72	34.8%
% of daily average disposable income	7.3%	4.3%	70.9%

Sources: TBT (U.S. price for pack sales, average of various brands and locations)

Statistics Canada (Canadian price for pack and carton sales, average of various brands and locations; disposable income)

OECD (PPP exchange rate; disposable income)

Table 4. Log Smoking Rate Adjustments
for Price, Demographic, and Tobacco Control Differences between Canada and the U.S., 2002-2003
(price elasticity = -0.25 or -0.75)

Independent Variable	actual values for prices and demographics			calculation of log smoking rate adjustment			
	Canada	Canada - U.S.		elas. = -0.25		elas. = -0.75	
		U.S.	U.S.	Coeff	Adjustment	Coeff	Adjustment
Log real price	1.61	1.31	0.30	-0.25	-0.07	-0.75	-0.22
Less than High School	0.28	0.17	0.10	1.08	0.11	1.08	0.11
High School graduate	0.25	0.33	-0.08	0.89	-0.07	0.89	-0.07
Some College or Trade School	0.28	0.27	0.01	0.64	0.01	0.64	0.01
College graduate	0.20	0.23	-0.04	0.00	0.00	0.00	0.00
White	0.86	0.74	0.12	0.84	0.10	0.84	0.10
Black	0.02	0.11	-0.09	0.48	-0.04	0.48	-0.04
Asian	0.08	0.04	0.04	0.26	0.01	0.26	0.01
Aboriginal/Native American	0.03	0.01	0.03	1.06	0.03	1.06	0.03
Hispanic	0.01	0.10	-0.09	0.00	0.00	0	0.00
<u>Smoking prohibited in some areas</u>	1	1	0.00	<u>0.00</u>		<u>0.00</u>	
Combined Adjustment to U.S. log smoking rate				0.07		-0.08	

Notes: Adjustment = (Coeff)*(Canada - U.S.). Race (schooling) coefficients are relative to the Hispanic (college) group, respectively.

Some columns and rows may not add due to rounding error

Sources:

US Data: Davis *et al* (2007)

Canadian Data from Statistics Canada:

Visible Minority Groups, 2001 Counts, for Canada, Provinces and Territories - 20% Sample Data

Aboriginal Identity Population, 2001 Counts, for Canada, Provinces and Territories - 20% Sample Data

Visible minority groups, 2006 counts, for Canada and census divisions - 20% sample data

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Table 5. Adjusted U.S. Daily Smoking Rates, 2002-2003, Ages 18-25

	elas. = -0.25			elas. = -0.75		
	Canada	U.S.	Canada - U.S.	Canada	U.S.	Canada - U.S.
[1] Smoking Rate (%), Actual Conditions	20.5	19.0	1.5	20.5	19.0	1.5
[2] Actual conditions, log = LN([1])	3.02	2.94	0.07	3.02	2.94	0.07
[3] Adjustment from actual to Canadian conditions	0	0.07	-0.07	0	-0.08	0.08
[4] <u>Canadian conditions, log = [2] + [3]</u>	<u>3.02</u>	<u>3.01</u>	<u>0.00</u>	<u>3.02</u>	<u>2.87</u>	<u>0.15</u>
[5] Adjusted Smoking Rate (%) = EXP([4])	20.5	20.4	0.1	20.5	17.6	2.9

Sources: Tables 2 and 4

Note: Some columns and rows may not add due to rounding error

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Books

- *Parental Priorities and Economic Inequality*. University of Chicago Press, 1997.

Published or Forthcoming Academic Papers

- “Social Security and Democracy.” *Contributions to Economic Analysis & Policy*. 10(1), 2010:

Article 18. (with Ricard Gil and Xavier Sala-i-Martin).

- “Is Macroeconomics Off Track?” *Economists’ Voice*. 2009.
- “Is the Treasury Impotent?” *Economists’ Voice*. 5(7), 2008: Article 4.
- “Selection, Investment, and Women’s Relative Wages over Time.” *Quarterly Journal of Economics*. 123(3), August 2008: 1061-1110. (with Yona Rubinstein).
- “Inflation and the Size of Government.” *Federal Reserve Bank of St. Louis Review*. 90(3, Part 2), May/June 2008. (with Song Han).
- “Gary S. Becker (born 1930): Economics’ Iron Man.” *New Palgrave Dictionary of Economics*, 2nd edition, 2008.
- “The Extent of the Market and the Supply of Regulation.” *Quarterly Journal of Economics*. 120(4), November 2005: 1445-73. (with Andrei Shleifer).
- “Conscription as Regulation.” *American Law and Economics Review*. 7(1), Spring 2005: 85-111. (with Andrei Shleifer).
- “Political and Economic Perspectives on Taxes’ Excess Burden.” In Alan J. Auerbach and Kevin Hassett, eds. *Toward Fundamental Tax Reform*. Washington, DC: AEI Press, 2005: 95-105.
- “Public Policies as Specification Errors.” *The Review of Economic Dynamics*. 8(4), October 2005: 902-926.
- “Non-response and Population Representation in the Sloan Study of Adolescent Time Use.” *Electronic International Journal of Time Use Research*. 2(1), 2005: 33-53. (with Barbara Schneider and Rustin Wolfe).
- “Estimating and Imputing Incomes for Middle-Class Families.” in Barbara Schneider and L. J. Waite, eds. *Being Together, Working Apart*. Cambridge: Cambridge University Press, 2005: 491-503. (with Yona Rubinstein)
- “What do Aggregate Consumption Euler Equations Say about the Capital Income Tax Burden?” *AEA Papers and Proceedings*, May 2004: 166-70.
- “Do Democracies have Different Public Policies than Nondemocracies?” *Journal of Economic Perspectives*. 18(1), Winter 2004: 51-74. (with Ricard Gil and Xavier Sala-i-Martin)
- “Labor Market Search and Optimal Retirement Policy.” *Economic Inquiry*, 42(4), October 2004: 560-71. (with Joydeep Bhattacharya and Robert R. Reed III). Winner of the 2005 Best Article Award.
- “Internationally Common Features of Public Old-Age Pensions, and Their Implications for Models of the Public Sector.” *Advances in Economic Analysis and Policy*. 4(1), 2004: Article 4. (with Xavier Sala-i-Martin)
- “Political and Economic Forces Sustaining Social Security.” *Advanced in Economic Analysis & Policy*. 4(1), 2004: Article 5.
- “Deadweight Costs and the Size of Government.” *Journal of Law and Economics*. 46(2), October 2003: 293-340. (with Gary S. Becker).
- “The Empirical Frequency of a Pivotal Vote.” *Public Choice*. 116(1-2), July 2003: 31-54. (with Charles G. Hunter).
- “Social Spending and Democracy: Some Evidence from South America.” *Estudios de Economica*. 29(1), June 2002: 5-33. (with Ricard Gil)

- “Economic Interpretations of Intergenerational Correlations.” *Journal of Economic Perspectives*. 16(3), Summer 2002: 45-58. (with Nathan D. Grawe)
- “Aggregate Implications of Indivisible Labor.” *Advances in Macroeconomics*. 1(1), 2001: Article 4.
- “Human Capital, Heterogeneity, and Estimated Degrees of Intergenerational Mobility.” *The Economic Journal*. 111, April 2001: 207-43 (with Song Han). Winner of the 2001 *Royal Economic Society Prize* for the “best (non-solicited) article in The Economic Journal.”
- “Extensive Margins and the Demand for Money at Low Interest Rates.” *Journal of Political Economy*. 108(5), October 2000: 961-91 (with Xavier Sala-i-Martin).
- “Measuring Aggregate Human Capital.” *Journal of Economic Growth*. 5(3), September 2000: 215-52 (with Xavier Sala-i-Martin).
- “Galton vs. the Human Capital Approach to Inheritance.” *Journal of Political Economy*. 107(6), Part 2, December 1999: S184-S224.
- “Substitution over Time: Another Look at Life Cycle Labor Supply.” *NBER Macroeconomics Annual 1998*. Volume 13. Cambridge, MA: MIT Press, 1999: 75-134.
- “Pecuniary Incentives to Work in the United States during World War II.” *Journal of Political Economy*. 106(5), October 1998: 1033-77.
- “The Optimum Quantity of Money: Theory and Evidence.” *Journal of Money, Credit and Banking*, November 1997, Part 2: 687-715. (with Xavier Sala-i-Martin)
- “Scale Economies, the Value of Time, and the Demand for Money: Longitudinal Evidence from Firms.” *Journal of Political Economy*. 105(5), October 1997: 1061-79.
- “The Endogenous Determination of Time Preference.” *Quarterly Journal of Economics*. 112(3), August 1997: 729-58. (with Gary S. Becker)
- “A Labor-Income-Based Measure of the Value of Human Capital: An Application to the States of the United States.” *Japan and the World Economy*, 9(2), May 1997: 159-91. (with Xavier Sala-i-Martin).
- “A Structural Analysis of Money Demand with Cross-Section Evidence from Japan.” *Monetary and Economic Studies*, 14(2), December 1996: 53-78 (with Hiroshi Fujiki).
- “Production, Financial Sophistication, and the Demand for Money by Households and Firms.” *Monetary and Economic Studies*. 14(1), July 1996: 65-103 (with Hiroshi Fujiki).
- “Transitional Dynamics in Two-Sector Models of Endogenous Growth.” *Quarterly Journal of Economics*, 108(3), August 1993: 739-73. (with Xavier Sala-i-Martin)
- “U.S. Money Demand: Surprising Cross-Sectional Estimates.” *Brookings Papers on Economic Activity*, 2:1992, 285-343 (with Xavier Sala-i-Martin).

Newspaper Editorials

- “Stop the Stimulus!” *New York Post*. August 9, 2009.
- “Don’t Forgive that Way!” *Chicago Tribune*. December 5, 2008.
- “Fundamental Origins of the Housing Boom and Bust.” *Cato Unbound*. December 5, 2008.
- “An Economy You Can Bank On.” *New York Times*. October 10, 2008. Opinion page.
- “Vote Republican if You Want Equal Pay.” *Wall Street Journal*. September 12, 2008. Opinion

page.

- “Trust or Antitrust the AMA?” *Chicago Tribune*. June 15, 2000. Page 29 (with Tomas J. Philipson).
- “Let's Revamp the Tax Code - But How?” *Wall Street Journal*. April 15, 1998. Page A22 (with Gary S. Becker).
- “Government Gets Fat on the Flat Tax.” *Chicago Sun Times*. May 4, 1996. Page 14.
- “Pornography, Profits, and the Internet.” *Chicago Tribune*. Wednesday, June 28, 1995. Section 1, page 19, column 4.
- “Daley, Bears Sack U.S. Treasury.” *Chicago Tribune*. December 13, 1995. Section 1, page 27, columns 2 and 3.
- a weekly column at economix.blogs.nytimes.com since December 2008.

Book Reviews and Published Comments

- Discussion of Gruber and Rauh's “How Elastic is the Corporate Income Tax Base?” forthcoming in Alan Auerbach, James Hines and Joel Slemrod, eds., *Taxing Corporate Income in the 21st Century*. Cambridge: Cambridge University Press, 2006.
- Review of Laurence S. Seidman's “Funding Social Security.” *Journal of Economic Literature*. 38(3), September 2000: 659-60.
- Review of Manfred Neumann's “The Rise and Fall of the Wealth of Nations.” *Journal of Economic Literature*. 36(2), June 1998: 953-54.
- Review of Robert E. Hall and Alvin Rabushka's “The Flat Tax,” 2nd edition. *The Money Review*. November 1996: 22-24.

Litigation Expert Testimony and Reports

- Expert Report of Casey B. Mulligan, Ph. D. In RE Proceedings of the Standing Senate Committee on Social Affairs, Science and Technology, meetings on Bill C-32, An Act to amend the Tobacco Act. September 30, 2009.
- Expert Testimony of Casey B. Mulligan, Ph. D. In RE Enbridge Pipeline Illinois LLC. Illinois Commerce Commission Docket no. 07-0446. July 10, 2008.
- Expert Testimony of Casey B. Mulligan, Ph. D. In RE Enbridge Pipeline Illinois LLC. Illinois Commerce Commission Docket no. 07-0446. April 7, 2008.
- Expert Testimony of Casey B. Mulligan, Ph. D. In RE Enbridge Pipeline Illinois LLC. Illinois Commerce Commission Docket no. 07-0446. January 7, 2008.
- Expert Report of Casey B. Mulligan, Ph. D. In the class action Matter of *Shirley “Rae” Ellis et al. v. Costco Wholesale Corp.* United States District Court, Northern District of California, June 22, 2006.

Non-testifying Expert Consulting

- Modeling of the competitive compensation of creative inputs in the cable television and radio industries for Paul, Weiss, Rifkind, Wharton & Garrison LLP as their counsel to American Society of Composers, Authors and Publishers.
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- Expert report of Professor Kevin M. Murphy in the Mechanical and Digital Phonorecord Delivery Rate Adjustment Proceeding. United States Library of Congress, Copyright Royalty Judges, Docket No. 2006-3 CRB DPRA. I was a consultant to Professor Murphy on the economics of the music recording industry, for the purpose of preparing his report.
- Expert reports of Professors Kevin M. Murphy and Robert Topel in the *Dynamic Random Access Memory Antitrust Litigation*. United States District Court, Northern District of California. I was a consultant to Professors Murphy and Topel on the economics of the digital memory chip market, for the purpose of preparing their reports.
- Expert reports of Professor Kevin M. Murphy in the matter of *Novelis Corp. v. Anheuser-Busch, Inc.* United States District Court, Northern District of Ohio. I was a consultant to Professor Murphy on the economics of the aluminum market, for the purpose of preparing his series of reports in this matter.
- Expert reports of Professor Kevin M. Murphy in the in the class action *In Re New Motor Vehicles Canadian Export Antitrust Litigation*. United States District Court, Northern District of Maine. I was a consultant to Professor Murphy on the economics of the automobile market, for the purpose of preparing his series of reports in this matter.
- Expert reports of Professor Kevin M. Murphy in the 2006 NPM Adjustment Proceeding Pursuant to Section IX(d)(1)(C) of the Master Settlement Agreement. I was a consultant to Professor Murphy on the economics of the cigarette market and excise taxes, for the purpose of preparing his series of reports in this matter.
- Expert reports of Professor Kevin M. Murphy in the 2005 NPM Adjustment Proceeding Pursuant to Section IX(d)(1)(C) of the Master Settlement Agreement. I was a consultant to Professor Murphy on the economics of the cigarette market and excise taxes, for the purpose of preparing his series of reports in this matter.
- Expert reports of Professor Kevin M. Murphy in the 2004 NPM Adjustment Proceeding Pursuant to Section IX(d)(1)(C) of the Master Settlement Agreement. I was a consultant to Professor Murphy on the economics of the cigarette market and excise taxes, for the purpose of preparing his series of reports in this matter.
- Expert reports of Professor Kevin M. Murphy in the 2003 NPM Adjustment Proceeding Pursuant to Section IX(d)(1)(C) of the Master Settlement Agreement. I was a consultant to Professor Murphy on the economics of the cigarette market and excise taxes, for the purpose of preparing his series of reports in this matter.
- Declarations of Kevin M. Murphy in the class action *Barbara Schwab et al v. Philip Morris USA, Inc., et al.* I was a consultant to Professor Murphy on the economics of the cigarette market and excise taxes, for the purpose of preparing his series of declarations and reports in this matter.
- *Work Ethic and Family Background*. A Report prepared for the Employment Policies Institute. April, 1997.

- Other confidential litigation matters related to the automobile, health care, consumer packaged goods, finance, petroleum, and tobacco industries.
- Other confidential matters related to the labor market, computer software industry, and the finance industry.

Other Public Sector Consulting

- *Central Bank of the Dominican Republic.* A series of public lectures on public policy reform. A series of training lectures for Central Bank economists on modern macroeconomic theory. September 2001.
- *Congressional Budget Office.* Lecture on the “Capital Income Tax Incidence” and consulting on CBO modeling of the economics effects of corporate taxes. November 2004.