

**Estimating Consequences of a Ban  
on the Legal Sale of Menthol Cigarettes**

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## EXECUTIVE SUMMARY

### General Conclusions

This report investigates the likely economic effects of an attempt to ban the sale of menthol cigarettes in the United States. Our objective is to provide a broad sense of how the market would initially respond to a ban on the legal sale of menthol cigarettes, rather than to make precise predictions on market outcomes. The key point is that it is wrong to assume that a ban on the legal sale of menthol cigarettes (henceforth “the ban”) would eliminate all sales of menthol cigarettes. Instead, the black market for cigarettes would likely expand, leading to the provision of additional menthol cigarettes in the black market. What one assumes about that supply availability is critical in making any predictions about the consequences of the ban. Moreover, some smokers of menthol cigarettes will switch from menthol to non-menthol cigarettes in response to the ban, and that mechanism must be accounted for in any estimation of the consequences of the ban.

After studying the economics of black markets and the demand for cigarettes, we conclude that banning menthol cigarettes is not likely to lead to a decline in smoking of anywhere near 30%, the approximate share of menthol cigarettes. Instead, following a ban, menthol smokers are likely to turn to the black market and to non-menthol cigarettes, thereby substantially mitigating the decline in cigarette smoking. Following a ban, a sizable black market would likely quickly emerge to satisfy the demand for menthol cigarettes. The precise size of a black market will depend on the effective price of illegal cigarettes (the effective black market price reflects both the actual money paid and any additional costs associated with engaging in an illegal activity). Based on our estimates, a 10 percent increase in the effective price of illegal menthol cigarettes would lead to an initial decline in overall smoking of only about 1 percent,

with unit sales of black market menthol cigarettes amounting to about 87% of current legal menthol volumes. Alternatively, a 50 percent increase in the effective price would result in an initial overall decrease in smoking of about 3.5 percent and black market menthol sales amounting to about 56% of current legal menthol sales. Further, the growth of the black market could lead to a growth in criminal activities and to greater youth access to unregulated cigarettes. In short, our conclusions are as follows:

- The ban will not eliminate cigarette consumption by menthol smokers in the U.S.
- Most current menthol smokers will turn either to black markets for menthol cigarettes or to non-menthol cigarettes in response to the ban.
- Black markets currently exist and are likely to expand quickly in response to a ban.
- The ban may have the unintended consequences of increasing criminal activity and allowing greater youth access to unregulated cigarettes.

Our report arrives at these conclusions through an investigation of cigarette black markets that have developed previously in the U.S. and Canada, a review of the economics literature on demand for cigarettes, and an empirical investigation of data that Lorillard has provided us. We stress that while black market activity in the US and Canada is well-documented, prices and quantities sold in the black market are not observed precisely. Further, as we describe more fully in the report, our estimates are based in part on estimates of cigarette demand behavior using data primarily limited to Newport and could be refined with more comprehensive data. As a result, if better information becomes available, we may revise our estimates. Finally, we do not address the specific questions of the ban's effect on youth smoking initiation, or on the cumulative effect of the ban after several years. Such questions would require separate study.

## **Outline of Report**

After an introduction and summary of findings, the report begins by explaining how forces affecting supply and demand can be analyzed so as to understand the likely effect of the ban on the sale of menthol cigarettes. Then, we review some of the history of cigarette black markets that have developed in the United States and Canada following tax-driven increases in cigarette prices. We document that black markets were established very quickly following tax-driven increases in prices for legal cigarettes, and were supplied by a number of sources, including legally manufactured cigarettes smuggled from elsewhere and counterfeit cigarettes produced abroad. We find that some of the black markets were sufficiently large (e.g., perhaps as much as half of all cigarettes sold in Quebec at the black market's peak) to force government authorities to reduce tax rates subsequently. These observations lead us to conclude that the ban on legal sales of menthol cigarettes in the United States is likely to lead to an expansion of the black market for menthol cigarettes in the United States.

The report next describes our estimation of demand for menthol cigarettes, using available industry data on menthol cigarette sales. We estimate consumer responses to an increase in the price of menthol cigarettes. The final step in the analysis is to use the demand estimates, together with assumptions on the difference between the black market price for menthol cigarettes and the current legal price for menthol cigarettes, to estimate the effect of the ban. Our analysis specifically assumes that the effect of a ban would be to produce a difference between the price of black market menthol cigarettes and the current legal menthol cigarette price. For example, if the black market price of menthol cigarettes is, say, 25 percent higher than the current legal menthol price, we estimate that there would be an overall decrease in smoking of about 2 percent, and black market sales that are about 72 percent of current menthol cigarette

sales in units. If one wanted to make alternative assumptions about either the expected difference between the black market price of menthol cigarettes and the current legal price, or about the structure of demand, one can easily do so using our methodology.

Lastly, we review the possible unintended consequences of a ban on legal sales of menthol cigarettes. Based on black market experiences in Canada and the U.S., we identify two potential negative consequences. First, the expansion of the black market likely will lead to a growth in organized criminal activity. The control of expanded black market menthol sales by organized criminal syndicates likely increases violence (as groups fight for control of distribution) and lawlessness generally. Second, expanded black markets may increase youth access to cigarettes, because underage smokers may find it easier to obtain cigarettes on the now expanded black market than through legal channels.

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## **I. OVERVIEW AND SUMMARY OF CONCLUSIONS**

This report investigates some likely economic effects arising from a ban on the legal sale of menthol cigarettes in the United States. Our analysis relies on certain key observations on the cigarette industry, which we build on to develop empirically-based approximations of the ban's effects. Our estimates are based in part on information about cigarette black markets that have emerged in various parts of North America in recent years. We stress that prices and quantities that emerge on these black markets are not precisely observed because black market participants (of course) do not report information in conformance with the regulatory requirements that are standard for legal cigarette sales. As a result, the predictions we develop represent our best estimates given the available information we have reviewed to date, and may be refined as additional information becomes available. Moreover, as we describe more fully in the report, our estimates are based in part on estimates of cigarette demand behavior using data limited to Newport and could be refined with more comprehensive data. Finally, we do not address the specific questions of the ban's effect on youth smoking initiation, or on the cumulative effect of the ban after several years. Such questions would require separate study.

### **a. Specific Task and Key Findings**

We have been asked by Lorillard Tobacco Company ("Lorillard") to assess the likely effects of a ban on the legal sale of menthol cigarettes in the United States. Our analysis is based on the premise that a ban would prohibit legal sales of all menthol-flavored cigarettes, and would be implemented over a short period of time (as opposed to being phased in over a number of

years). We focus our investigation on three key questions: 1) What would be the likely effect on the black market that would result from the ban? 2) What would be the likely effect on U.S. cigarette consumption? 3) What potential unintended consequences could emerge from the ban?

Based on our investigation of past black market experiences, review of the economics literature, and empirical analysis, our best estimate is that a ban on the legal sale of menthol cigarettes would not initially lead to a large drop in overall annual cigarette consumption in the U.S, and certainly nothing like the current menthol share of about 30 percent.<sup>1</sup> Instead, our analysis suggests that the prohibition of legal menthol sales would serve primarily to divert current legal sales of menthol cigarettes to black market and non-menthol cigarettes. Estimates of the consequences of the ban depend heavily on the assumed impact of the ban on the effective price of black market menthol cigarettes. If black market prices are about 25 percent higher than current (legal) menthol cigarette prices,<sup>2</sup> our estimates indicate that black market menthol cigarette sales would be about 72 percent of current menthol cigarette volumes (for the U.S. regions we have studied), and that aggregate dollar revenues from menthol cigarette sales could

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<sup>1</sup> We understand from Lorillard that the current share of menthol cigarettes is about 30 percent of total cigarette consumption in the United States. Based on our rough calculations, total smoking would be reduced by 1 percent to 4 percent if the price that emerged on the black market is 10 percent to 50 percent higher than current legal menthol cigarette price. See Section V for details.

<sup>2</sup> The “effective price” (sometimes called the “full price”) to consumers of acquiring cigarettes via a black market includes not just the money paid (the “monetary price”), but also the efforts required, and the reluctance consumers must overcome to purchase on the black market. In this report, when we discuss the price of black market menthol cigarettes relative to legal menthol cigarettes, we are referring to all consumer costs (monetary price, effort, etc.).



be even higher as a percentage of current levels.<sup>3</sup> Of course, if the black market price of menthol cigarettes differs little from the current legal price, there would likely be little, if any, effect from the ban. In addition, our analysis suggests that the ban may lead to important unintended consequences, ranging from obvious outcomes such as significant growth in organized crime, to other types of effects, such as greater youth access to cigarettes (especially in urban areas).

### **b. Evidentiary Basis For Our Conclusions**

Our conclusions are based on several key empirical observations, drawn from the history of cigarette black markets, from the academic literature on the cigarette industry, and from our own analysis. Below, we detail these observations and how they relate to our central findings.

#### *The Ban Will Likely Result In a Large Black Market for Menthol Cigarettes*

Supporting our conclusion that the black market for menthol cigarettes would be large are the black market experiences of the U.S. and Canada. These experiences indicate that an attractively-priced supply of black market menthol cigarettes likely would emerge in response to a ban. In particular, the growth of large black market supplies of cigarettes in both Canada and New York in recent years, in response to increased cigarette taxes, indicates that black markets of attractively priced cigarettes (including smuggled and counterfeit cigarettes) develop quickly

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<sup>3</sup> Based on our rough calculations, the black market for menthol cigarettes could comprise from 87 percent to 56 percent of current volumes (in units) if the price that emerged on the black market was 10 percent to 50 percent higher than the current legal menthol cigarette price. See Section V for details.

and can be sizeable. For example, in Canada, recent estimates of the size of the black market include nearly 50% of all cigarette sales in Ontario and over 40% in Quebec.<sup>4</sup> At its peak in 1993, smuggled cigarettes alone were estimated to hold 31% of the *entire* Canadian market, including about 60% of the market in Quebec.<sup>5</sup> A menthol cigarette ban is unlikely to reduce menthol cigarette consumption if the black market that emerges provides consumers with access to an abundant supply of attractively-priced menthol cigarettes.

*The Ban Is Not Likely to Have a Large Initial Impact on Total Cigarette Consumption*

The own-price elasticity of demand is a measure of how consumption responds to changes in price. The consensus estimate in the economics literature indicates that the overall demand for cigarettes is very inelastic.<sup>6</sup> Demand is inelastic if, when price rises by a certain proportion, consumption falls by a smaller proportion. That is one way of saying that consumption is not very sensitive to price.

To illustrate the implication of the inelasticity of demand for cigarettes estimated in the literature, even in an extreme case where smokers hypothetically face both 1) a ban on the legal

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<sup>4</sup> See National Study for the Canadian Manufacturers' Council, "Illegal Tobacco Sales: A Crisis for Canadians," (September 2008). For a discussion, see Canadian Convenience Store Association, *Contraband Tobacco in Canada: Time for Action*, Toronto, 2009, and [http://www.hughsegal.ca/index.php?option=com\\_content&view=article&id=65%3Acontraband-tobacco-in-canada&catid=15%3A2009&Itemid=23&lang=en](http://www.hughsegal.ca/index.php?option=com_content&view=article&id=65%3Acontraband-tobacco-in-canada&catid=15%3A2009&Itemid=23&lang=en) .

<sup>5</sup> Source: "The Size of the Underground Economy in Canada," (1994), Statistics Canada. Table 6., Ruth Jamieson, "'Contested jurisdiction border communities' and cross-border crime – the case of Akwesasne," *Crime, Law & Social Change*, 30 (1999), p 259-272.

<sup>6</sup> See the review of the literature in Chaloupka, FJ and Kenneth Warner "The Economics of Smoking", *Handbook of Health Economics*, Volume 1, Part 2 (2000), p1539-1627.

sale of menthol cigarettes leading to black market menthol cigarette prices 50 percent higher than current legal menthol cigarette price levels; and 2) a simultaneous 50 percent price increase for non-menthol cigarettes; aggregate consumption of cigarettes in the U.S. likely would drop by about 15 percent.<sup>7</sup> Since the price of non-menthol cigarettes is not expected to rise by 50 percent as a result of the menthol cigarette ban, the ban will be likely to have a smaller impact than even this 15 percent reduction in total smoking.<sup>8</sup>

In response to being faced with a higher (black market) price for menthol cigarettes, aside from reducing smoking, some menthol smokers will continue to consume menthol cigarettes in the black market, while others may switch to non-menthol cigarettes. For example, if the black market price of menthol cigarettes is 25 percent higher than the current legal price of menthol cigarettes, our estimates indicate that the result would be an overall decrease in smoking of about 2 percent and black market sales that are about 72 percent of current menthol cigarette sales in units. Later in the report, we estimate how much of each type of response might occur as a result of the ban under various assumptions.

### *The Ban Will Result In Unintended Consequences*

Several important observations support the conclusion that a ban would produce important unintended consequences. The first involves the increase in organized criminal

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<sup>7</sup> We use a constant elasticity of -.4 to make this calculation. Alternatively, if an elasticity of -.3 is employed, the decline in smoking would be 11.5 percent. See Chaloupka and Warner (2000) for estimates of industry elasticities.

<sup>8</sup> As this example illustrates, central to the nature of the changes in consumption that will follow a ban on menthol cigarettes (and thus central to our calculations) is the difference between the current legal price for menthol cigarettes and the effective black market price for menthol cigarettes.

activities that emerged in Canada as a result of tax increases. The growth in the cigarette black market, along with the organized criminal activities that the black market inspired and funded, eventually led to a roll-back in some of the Canadian cigarette taxes; nonetheless, black market trade persists in Canada (see Section III of this report for detail). Because profits from selling black market menthol cigarettes are likely to be large, the black market that would emerge in the U.S. in response to a ban on menthol cigarettes (and the crime that it would inspire) could be substantial. To put the size of the potential black market in perspective, one might consider that menthol sales today represent about 30 percent of all U.S. cigarette sales. If, following a ban, the price of black market menthol cigarettes is not much higher than the current legal menthol cigarette price, a black market in menthol cigarettes of nearly the same magnitude as the existing legal market is not out of the question.<sup>9</sup>

Our analysis also suggests that other unintended consequences might result. For example, we examine youth smoking in Canada in provinces that experienced the largest amount of black market trade. For these provinces, Quebec and Ontario in particular, we find evidence that during periods of high black market trade, youth smoking increased relative to those of the rest of Canada. This result is to be expected if black market distribution allows greater youth access to cigarettes.

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<sup>9</sup> Based on our rough calculations, the black market for menthol cigarettes could comprise from 87 percent to 56 percent of current volumes if the black market price is 10 to 50 percent higher than the current legal menthol cigarette price following the ban. See Section V.

The remainder of the paper is organized as follows. In Section II, we describe the analytic framework on which we rely to develop our estimates. Section III discusses the black market activity that developed rapidly in New York and Canada in response to tax increases. We examine what these experiences imply about the degree of substitution between legal and black market cigarettes, and also explore the recent growth in counterfeit cigarette sales. Section IV focuses on our empirical analyses, and details both our methodology and results. In Section V we develop estimates of the reduction in aggregate smoking and the size of the U.S. black market that could follow a menthol cigarette ban. Section VI discusses the economic implications of a ban on the legal sale of menthol cigarettes, and assesses potential unintended consequences.

## **II. ANALYTIC METHODOLOGY**

Our analysis focuses on evaluating the demand and supply of menthol cigarettes subsequent to a ban on the legal sale of menthol cigarettes in the United States. The degree of reduction in smoking and the size of the U.S. black market that would develop following a ban on menthol cigarettes will depend on the availability and price of black market menthol cigarettes, as well as on the willingness of consumers to purchase black market cigarettes and on their willingness to switch to legal non-menthol cigarettes (or to stop smoking).

### **a. Supply-Side Analysis**

To evaluate the supply side of a menthol cigarette ban, we examine the historical experiences of Canada and the U.S., both of which saw black markets expand substantially following increases in cigarette taxes. These experiences also provide insight into the potential

unintended consequences that may result from a ban. Furthermore, the Canadian experience provides a basis from which to identify the U.S. regions in which the supply of black market menthol cigarettes likely would be most prevalent.

Black markets distribute both cigarettes manufactured by legitimate firms (such as Lorillard) – black market sales are outside of legal channels, of course – and outright counterfeit cigarettes.<sup>10</sup> Recent trends in cigarette smuggling suggest that the counterfeit market potentially could supply the majority of black market menthol cigarettes sold in the United States.

Counterfeit cigarettes typically cost much less than legally-sourced cigarettes to distribute, because counterfeiters pay no taxes (legally manufactured cigarettes presumably have excise taxes paid on them somewhere).<sup>11</sup> Counterfeit black market cigarettes, therefore, could be sourced at much lower cost than legally-manufactured black market cigarettes.

If the emergence of a robust black market for menthol cigarettes facilitates the distribution of low-cost counterfeit menthol (and non-menthol) cigarettes, a menthol ban might lead to little or no reduction in aggregate cigarette consumption. Key factors in assessing

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<sup>10</sup> Legally-manufactured cigarettes are produced by (or under license to) a legally-established manufacturer, who owns (or licenses) the brand name under which the cigarette is sold. Legally-manufactured cigarettes become part of the black market when smugglers move them illegally, typically from low-tax locales to high-tax locales. Counterfeit cigarettes, by contrast, are produced by unlicensed manufacturers and sold falsely under brand names.

<sup>11</sup> For example, Canadian taxes induced the export of Canadian-manufactured cigarettes to the U.S., and the subsequent (illegal) re-import of these same cigarettes to Canada. “A substantial tax increase in 1991 induced a surge in exports to the United States. Canadian cigarettes instantly became an export-success story even though only Canadians liked them. . . . The exported cigarettes were illegally brought back in Quebec and Ontario. At their peak, taxes made up roughly 75 percent of the retail price of cigarettes sold in these provinces.” (Source: “Exports to Smuggle and Smuggling Technologies,” Bruno Larue, Sebastien Pouliot, and Christos Constantatos, *Review of International Economics*, 476-493, 2009.)

whether a menthol ban would substantially expand counterfeit cigarette sales are: 1) the extent to which menthol cigarette producers (like Lorillard) provide current assistance to the authorities that limit counterfeit distribution (since a ban would eliminate much of this assistance); and 2) the extent to which a robust black market for legally-manufactured but smuggled menthol cigarettes facilitates distribution of counterfeit cigarettes.

### **b. Demand-Side Analysis**

The demand side of our analysis is intended to estimate the consumer response to a menthol ban. To do this, we will employ measures of demand elasticity, both provided by the economics literature at the aggregate level and estimated ourselves for menthol and non-menthol cigarettes. Two measures of demand elasticity are important to our analysis: own-price elasticity and cross-price elasticity.

The own-price elasticity of demand measures how consumption of a good (e.g., menthol cigarettes smoked) changes when the price of the good (e.g., the price of menthol cigarettes) changes. Many economic studies have calculated the own-price elasticity of demand for cigarettes; consequently there is a reliable body of evidence from which to draw conclusions. We employ this literature in our analysis. We also conduct our own analysis, which allows us to focus more precisely on menthol and non-menthol cigarettes.

The other important elasticity measure is the cross-price elasticity of demand, which we calculate in order to capture the willingness of smokers to switch between menthol and non-menthol cigarettes in response to relative price changes. The cross-price elasticity between the

quantity of non-menthol cigarettes and the price of menthol cigarettes is central to predicting the effect of the ban.

The importance of these measures of demand is perhaps best illustrated by considering the choices smokers would face after implementation of a ban on the legal sale of menthol cigarettes. Facing a ban, menthol smokers could respond in one of three ways: They could stop smoking, they could switch to non-menthol cigarettes, or they could find other ways to acquire menthol cigarettes to smoke, such as purchases on the black market.<sup>12</sup>

We estimate how current menthol smokers would react to a ban by estimating how much of current menthol cigarette consumption would fall into each of the three categories of response. Our approach is to estimate the overall reduction in menthol cigarette consumption that would follow from smokers being faced with a price for black market menthol cigarettes that is higher than the current legal price for menthol cigarettes, and then to calculate how much of that reduced consumption of menthol comes from stopping smoking and from increasing non-menthol cigarette consumption. The inelastic demand for all cigarettes means that relatively few menthol smokers will stop smoking entirely even in the face of large differences between the black market price and the current legal menthol price. Therefore, a key question becomes whether most menthol smokers remain with menthol cigarettes (purchased on the black market)

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<sup>12</sup> Acquiring menthol cigarettes could be done via the U.S. black market, or perhaps through other means, such as adding menthol flavor to regular flavored cigarettes. We understand that non-menthol cigarettes can be given a menthol flavor by placing them in a bag filled with menthol and leaving them there for a period of time. However, for the purposes of our analysis, we assume menthol cigarettes (post ban) would be acquired via the black market.



or shift to non-menthol cigarettes. A ban might not result in a large black market if most menthol smokers are willing to switch to non-menthol cigarettes.<sup>13</sup>

To estimate own-price and cross-price elasticity measures, we employ wholesale transaction data for several key Newport markets. For these selected markets, we analyze the effects of changes in Newport prices brought about in large part by Newport promotional campaigns. These campaigns are of short duration – a month or so – and vary across cities.

Examining how consumption of Newport cigarettes changes when the price of Newport cigarettes changes (due to short duration promotions) allows us to calculate own-price elasticity for Newport cigarettes. Examining how the flow of consumption between Newport cigarettes and non-menthol cigarettes changes when Newport's price changes allows us to calculate the cross price elasticity between non-menthol cigarettes and Newport's price. We then use these estimates of Newport elasticities to calculate elasticities for menthol cigarettes.<sup>14</sup>

### **III. RECENT EVIDENCE ON BLACK MARKET CIGARETTE TRADE**

This section examines how the supply of black market cigarettes is likely to respond to a ban on the legal sale of menthol cigarettes. While we cannot precisely measure the elasticity of

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<sup>13</sup> For example, overall smoking rates would not change if current menthol cigarette consumption would simply be switched to non-menthol alternatives as a result of the ban.

<sup>14</sup> We do not have retail price data for menthol cigarettes or for non-menthol cigarettes. Instead, Lorillard has provided us with wholesale price data for Newport. We will use these data to estimate the relevant own-price elasticity and cross-price elasticity for menthol and non-menthol cigarettes by making some assumptions. However, we note that a more refined estimation of the demand system for menthol and non-menthol cigarettes would be possible with better data. For that reason, we regard our demand estimates as subject to improvement.

supply of black market cigarettes, we can observe the response of the black market generally to past documented changes in the relative price between legal and black market cigarettes. The recent emergence of significant black markets in cigarette trade, and specifically growth in the U.S. of counterfeit cigarettes sales, provides evidence of the cost and availability of alternative sources, and thus can provide information on the likely supply of black market menthol cigarettes that would arise in response to a ban on the legal sale of menthol cigarettes. These black market experiences indicate that a robust supply of black market cigarettes (both menthol and non-menthol) would be smuggled into the U.S. given the right economic incentives. In fact, as we will see below, the rise in U.S. federal, state, and local cigarette taxes in recent years has already created the incentive to smuggle cigarettes, because of the relative cost advantages of avoiding taxes.

Below we describe the emergence of black market cigarette trade that occurred in both Canada and the U.S., and try to understand the key economic forces that led to that trade. Understanding the economics of black market cigarette trade provides an important basis from which to develop estimates of the black market trade that would be likely to emerge in response to a ban on the legal sale of menthol cigarettes. The black market experiences discussed below were precipitated by price increases that resulted from increases in taxes. The tax increases created nominal price discrepancies between legally supplied cigarettes and those sourced from the black market, which provided strong economic incentives for the sale of black market cigarettes.

The Canadian and New York experiences are informative on the likely black market

supply that will follow a ban on legal menthol cigarettes. Specifically, the ban will not eliminate the demand for menthol cigarettes, but will eliminate the legal supply, and consequently will create a huge void in the market. The examples of tax-driven price rises in Canada and the U.S., discussed below, along with expected continued growth in counterfeit supply, suggest that a black market will expand quickly to fill this void.

#### **a. Black Market Experiences in Canada and New York**

##### *Review of Canadian Experience*

Tobacco tax increases have been used as a part of a public health strategy to reduce smoking in Canada, as well as to raise tax revenues. Between 1986 and 1993, the federal excise tax on a carton of cigarette was increased from \$ CDN 9.35 per carton to \$19.14 per carton (in real 2002 Canadian dollars) – a tax rise of approximately 105 percent.<sup>15</sup> Many provinces also increased taxes on tobacco products that rivaled or exceeded the federal tax burden on cigarette sales.<sup>16</sup> In Quebec, for example, the share of taxes in the average retail price grew to 77.2 percent, while the retail cost increased by 215 percent.<sup>17</sup> This large change in relative prices between Canada and the U.S. provides a natural experiment with which we can observe the supply response of both legal and black market cigarettes.

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<sup>15</sup> Source: “Contraband Tobacco in Canada – Tax Policies and Black Market Incentive,” by Nachum Gabler and Diane Katz, *Studies on Risk & Regulation*, Fraser Institute, July 2010, p. 12.

<sup>16</sup> “Table: Carton of 200 Manufactured Cigarettes, 1986 – 1996” National Clearinghouse on Tobacco and Health.

<sup>17</sup> Estimates based on: “Table: Carton of 200 Manufactured Cigarettes, 1986 – 1996” National Clearinghouse on Tobacco and Health.

The combination of federal and provincial tax increases served to create substantial price differentials between various Canadian provinces and U.S. border states.<sup>18</sup> These differentials provided strong incentives for opportunistic trade with neighboring U.S. border states – with a particular focus on Ontario, Quebec and New York State, where Native American lands straddle the U.S./Canadian border.<sup>19</sup> According to a Statistics Canada report on the size of the underground economy, the black market’s share of Canadian cigarette consumption increased from one percent of total market share in 1987 to about 31 percent by end of 1993, coinciding with increased tobacco taxation.<sup>20</sup> This large black market supply response to relatively modest (as compared to an outright ban) changes in cigarette pricing indicates that the black market cigarette market in the U.S. (post-ban) would be significant, and likely larger than the response experienced in Canada.

Following Canada’s targeted attempts at enforcement, what began as an early increase in cross-border shopping by Canadian consumers inspired by the Canadian tax increases quickly developed into significant amounts of cross-border smuggling by professional criminal enterprises. Initially, the main method of bringing untaxed (and thus less expensive) cigarettes into Canada was to export the popular Canadian brands to the U.S., and then for consumers to

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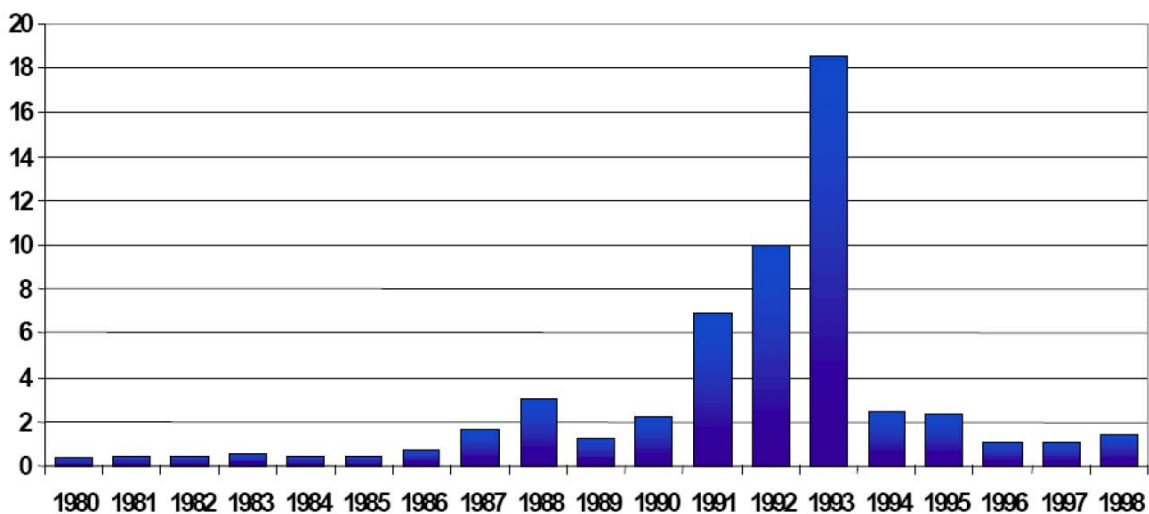
<sup>18</sup> Goel, Rajeev. “Cigarette demand in Canada and the US-Canadian cigarette smuggling,” (2004) Applied Economics Letters, 11, pp537-540.

<sup>19</sup> Sources: “Contraband Tobacco,” (2009) Non-Smokers Rights Association and Smoking and Health Action Foundation. [http://www.nsra-adnf.ca/cms/file/pdf/Contraband\\_Spring2009.pdf](http://www.nsra-adnf.ca/cms/file/pdf/Contraband_Spring2009.pdf), p.3. “Contraband Tobacco in Canada – Tax Policies and Black Market Incentive,” by Nachum Gabler and Diane Katz, Studies on Risk & Regulation, Fraser Institute, July 2010, p. 8-9.

<sup>20</sup> Source: “The Size of the Underground Economy in Canada,” (1994), Statistics Canada. Table 6.

purchase them in the U.S. and bring them back to Canada.<sup>21</sup> As seen in the chart below, exports to the U.S. more than doubled between 1990 to 1991, and by 1993 had increased more than nine-fold.

## Canadian Cigarette Exports (in billions) to the United States, 1980-1998



Surveying the Damage Cut-Rate Tobacco Products and Public Health in the 1990s.

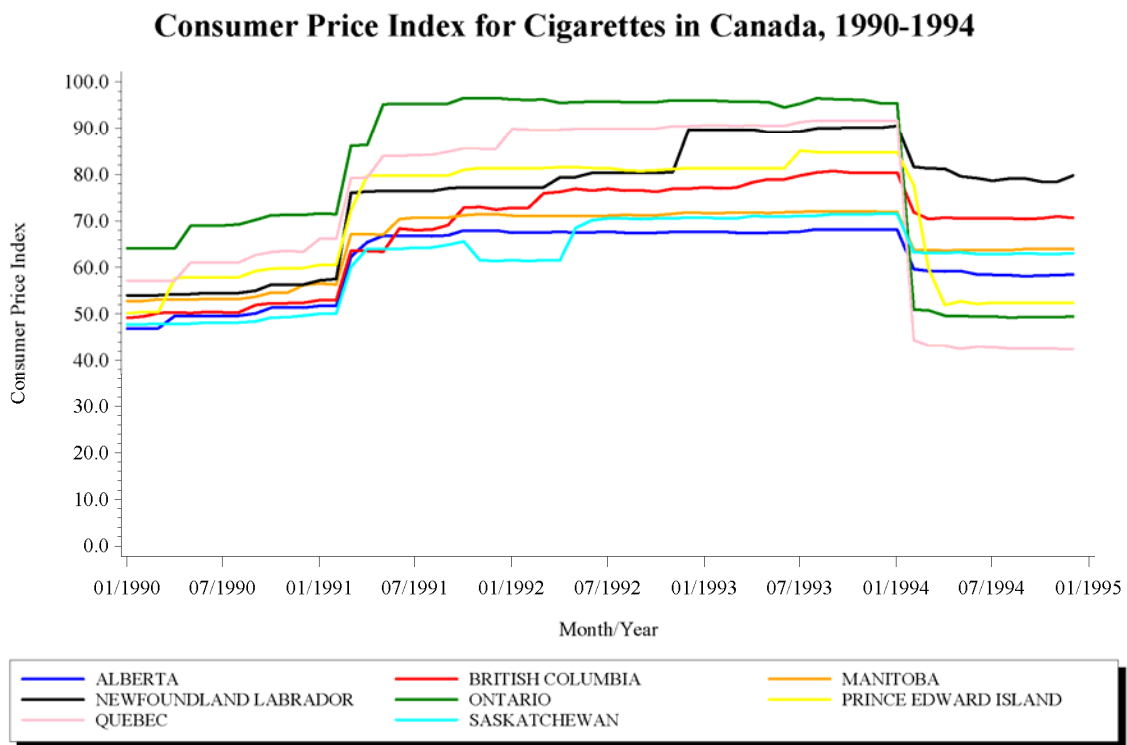
Original Source: Statistics Canada, Exports by Commodity, Catalogue 65-004, December issues, 1980-1998. See Appendix A, Table J.

Not only does this evidence demonstrate the likelihood that black market cigarette suppliers will penetrate the U.S. market in response to a ban on the legal sales of menthol cigarettes, but it also indicates that the required infrastructure for such penetration already exists.

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<sup>21</sup> Source: "Exports to Smuggle and Smuggling Technologies," Bruno Larue, Sebastien Pouliot, and Christos Constantatos, *Review of International Economics*, 476-493, 2009.

In an attempt to reduce incentives to engage in black market sales, and most explicitly in “export-to-smuggle” schemes, the Canadian federal (and various provincial governments) implemented rollbacks in taxation of tobacco products in 1994, as well as targeted export duties, along with other anti-smuggling measures.<sup>22</sup> The Consumer Price Index for Cigarettes in Canada, shown below, illustrates the dramatic increase in 1991 and decrease in 1994 in prices paid across the various provinces. The various measures appeared successful in reducing export-to-smuggle schemes – as the export volume chart above shows, exports to the U.S. from Canada dropped by a huge amount almost immediately, to pre-1991 levels.



Source: Statistics Canada, Table 326-0020.

<sup>22</sup> *Surveying the Damage, Cut-Rate Tobacco Products and Public Health in the 1990s*, (1999). Canadian Cancer Society. <http://www.nsra-adnf.ca/cms/file/pdf/oct99taxrep.pdf>

## *Review of New York Experience*

In addition to the Canadian experience, another natural experiment through which we can examine the elasticity of supply of black market cigarettes is when New York State and New York City both raised cigarette tax rates significantly in the early 2000s. These tax hikes led to large price differentials between New York and neighboring states, which – fed by sales of cigarettes through the Internet and from Native American reservations – produced an explosion in black market trade in cigarettes in New York.<sup>23</sup> Specifically, between 1999 and 2002, the cigarette tax rate increased from 56 cents per pack to 150 cents per pack – a tax increase of approximately 167 percent.<sup>24</sup> The combined state and city cigarette taxes placed New York City in the top position in the country for tobacco tax levels at \$30 per carton of cigarettes by 2003.<sup>25</sup>

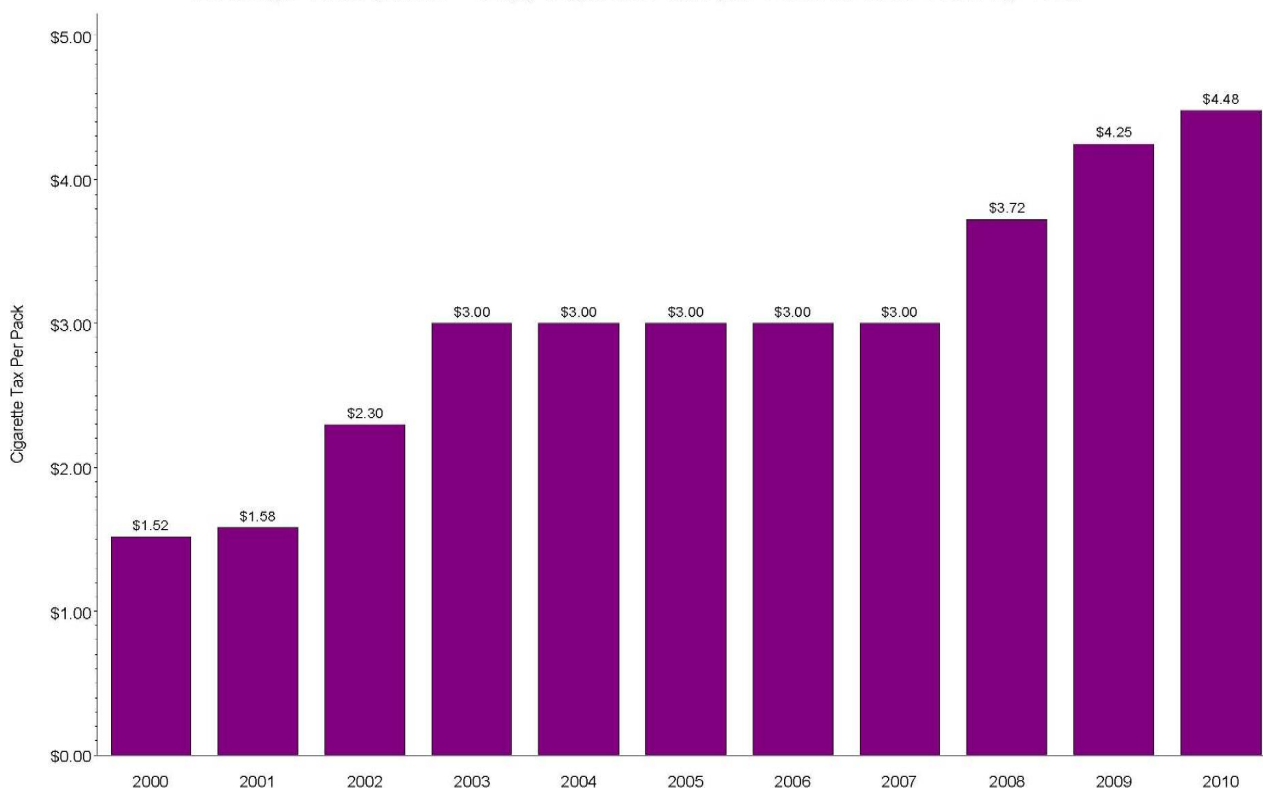
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<sup>23</sup> We understand that present litigation addresses the legality of these sales and, hence, our discussion of this experience does not opine on this issue. For purposes of this report, the key issue is not legality, but rather the observation that attempts by government authorities to raise effective cigarette prices trigger supply responses that allow consumers to avoid paying these higher prices.

<sup>24</sup> Source: “The Tax Burden on Tobacco, 2007.”

<sup>25</sup> Source: “Cigarette Taxes, Black Markets, and Crime Lessons from New York’s 50-Year Losing Battle,” Patrick Fleenor, Policy Analysis, February 6, 2003.

**Average Total (State + City) Cigarette Tax per Pack in New York by Year**



The impact of the tax increases on the sale of cigarettes subject to these taxes was dramatic. “During the four months following the recent tax hikes, sales of taxed cigarettes in the city fell by more than 50 percent compared to the same period the prior year.”<sup>26</sup> This large reduction in legal sales of cigarettes has been attributed primarily to a diversion toward black market cigarettes and *not* to a reduction in cigarette smoking by New Yorkers of anything close to that magnitude. Indeed, the Center for Public Integrity’s Tobacco Underground Project reported that the 70-year-old black market exploded after 2002, reaching a peak in 2007 with an estimated “one in three cigarettes sold in NY having been channeled untaxed through Indian

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<sup>26</sup> Source: “Cigarette Taxes, Black Markets, and Crime Lessons from New York’s 50-Year Losing Battle,” Patrick Fleenor, Policy Analysis, February 6, 2003.



smoke shops, robbing the state and NYC of nearly \$1 billion in tax revenue.”<sup>27</sup> As a result, New York State and New York City are estimated to have lost more than \$850 million in cigarette tax revenue in 2007, according to an analysis by the International Consortium of Investigative Journalists (“ICIJ”) for the Center for Public Integrity.<sup>28</sup>

All this provides further evidence that the responsiveness of the supply of black market cigarettes to a rise in the price of “legal” cigarettes is very high. Therefore, the likely outcome of a ban on the legal sale of menthol cigarettes in the United States is the emergence of a significant black market.

#### **b. The Black Markets Developed Quickly**

An important aspect of the black market experience in Canada and the U.S. is the speed and extent to which the black market supply responded to what might be viewed as relatively modest economic incentives. In other words, a supply of black market cigarettes that served 40 percent of the market in Quebec and 49% of the market in Ontario resulted from cigarette tax increases of approximately a dollar or two per pack.<sup>29</sup> Furthermore, the black markets emerged rapidly, as consumers quickly shifted their purchasing patterns to take advantage of these relatively small price differentials (compared to a ban where the price of the legal menthol can be

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<sup>27</sup> December 19, 2008 article Big Tobacco’s New York Black Market ([www.publicintegrity.org/articles/entry/1098/](http://www.publicintegrity.org/articles/entry/1098/))

<sup>28</sup> December 19, 2008 article Big Tobacco’s New York Black Market ([www.publicintegrity.org/articles/entry/1098/](http://www.publicintegrity.org/articles/entry/1098/))

<sup>29</sup> See National Study for the Canadian Manufacturers’ Council, “Illegal Tobacco Sales: A Crisis for Canadians,” (September 2008). For a discussion, see Canadian Convenience Store Association, *Contraband Tobacco in Canada: Time for Action*, Toronto, 2009.

thought of as infinite compared to the price of black market menthol cigarettes) . Thus, the evidence suggests that a robust black market in menthol cigarettes would arise if more severe restrictions on cigarette sales – such as a ban on the legal sale of menthol cigarettes – were enacted, and that consumers would be willing to shift to black market supply to obtain their menthol cigarettes.

The rapid formation of these black markets in Canada and the U.S. also suggests that black market smuggling networks are already in place, and can grow further in response to future market opportunities. Further, the fact that the black market cigarette supply in Canada was most prevalent in areas close to the U.S. border (most specifically Ontario and Quebec) suggests that U.S. black markets in menthol cigarettes will be largest in certain areas.<sup>30</sup> Namely, the Canadian experience implies that the supply of black market cigarettes is likely to be greatest in metropolitan areas close to either the Canadian or Mexican border, or near major international transportation hubs.

The willingness of consumers to shift from legal to black market cigarette supplies in response to relatively small pricing differentials, and for a black market supply to emerge quickly, is also well documented in the economics literature. This literature has estimated how black market sales respond to changes in the prices of legal cigarettes. A central finding of this

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<sup>30</sup> In Canada, these elasticities were substantially higher for the border population, as the size of the black market was very large in both Quebec and Ontario. “Ontario and Quebec have the lowest tobacco taxes in Canada, but the highest rate of contraband. So contraband is not caused by taxes, it is caused by the proximity to the sources of supply....The major source of that supply is the Akwesasne native reserve that straddles Ontario, Quebec and the State of New York.” Source: “\$2 billion in tax revenue up in smoke,” November 15, 2009, <http://www.thestar.com/news/investigations/article/726038---2-billion-in-tax-revenue-up-in-smoke>.

research is that the supply of black market cigarettes is responsive to differential between black market prices and legal prices, implying that black market cigarettes are close economic substitutes for legal supply.<sup>31</sup> As a result, raising the prices or decreasing the availability of legal cigarettes will merely shift a significant portion of market transactions to black market supply.

### **c. Expansion of Counterfeit Cigarette Distribution in Recent Years**

Black market trade in cigarettes is now recognized as a significant global problem. The problem has grown in magnitude in recent years. According to Havocscope Black Market Products Ranking, cigarette smuggling is in the global top 10 of black market products, by value, with an estimated \$50 billion in annual tax revenues lost.<sup>32</sup> In the U.S. alone, cigarette smuggling is estimated to cost \$5 billion in lost tax revenues.<sup>33</sup> Various government agencies in the U.S. and Canada have been involved in black market investigations and prosecutions. These activities provide some evidence of the size of an inherently difficult-to-measure marketplace. In addition, international investigations by journalists and public health officials have attempted to examine the size and flows of black market cigarette trade. In this section, we focus specifically

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<sup>31</sup> Source: “Cigarette Tax Avoidance and Evasion,” Mark Stehr, *Journal of Health Economics*, 2005; “Horizontal and Vertical Indirect Tax Competition: Theory and Some Evidence From the USA,” Devereux, Lockwood, and Redoano, *Journal of Public Economics*, 2007.

<sup>32</sup> Havocscope <http://www.havocscope.com/ranking/products/alphabetical/> cites a Feb. 11, 2008 Bloomberg article reporting the estimated \$50 billion from Framework Convention Alliance estimates, along with a \$20 billion estimate by British American Tobacco, Plc. [http://www.bloomberg.com/apps/news?pid=21070001&sid=aj\\_diBAyv3vs](http://www.bloomberg.com/apps/news?pid=21070001&sid=aj_diBAyv3vs)

<sup>33</sup> Havocscope, <http://www.havocscope.com/regions-main/united-states/united-states/> citing a January 22, 2010 AP article reporting U.S. DOJ’s estimate of lost tax revenue. <http://www.timesnews.net/article.php?id=9020017>

on the growth in trade in *counterfeit* cigarettes, and the implications of this trade for the supply of post-ban menthol cigarettes.<sup>34</sup>

The Center for Public Integrity has investigated the global trade in black market cigarettes, and attempted to gather estimates of the size of the counterfeit cigarette trade and the origin and trade flows of many counterfeit cigarettes. They found that “underground factories in China, Paraguay and Eastern Europe manufacture literally billions of “fake cigarettes.”<sup>35</sup> Of particular interest is China’s leading role in global cigarette counterfeiting – with a reported eight-fold increase in counterfeit cigarette production over the past ten years, up to 400 billion cigarettes per year.

Anecdotal evidence also suggests a significant counterfeit cigarette trade in the United States. It is reported that over a six-year period ending in 2005, a single smuggling ring brought a billion counterfeit cigarettes into the country through New Jersey and Los Angeles.<sup>36</sup> The U.S. Customs and Border Protection (CBP) and U.S. Immigration and Customs Enforcement (ICE) track and report seizures of products that are in violation of laws protecting Intellectual Property Rights (IPR). According to their data, over 90 percent of cigarettes seized

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<sup>34</sup> As we noted above, we distinguish between “legally manufactured” cigarettes that are smuggled across borders and “counterfeit” cigarettes, which purport to be brand name cigarettes (e.g., Marlboro) but are produced illicitly.

<sup>35</sup> Guevara, Marina Walker. “Overview,” October 20, 2008. Center for Public Integrity, Tobacco Underground Project <http://www.publicintegrity.org/investigations/tobacco/pages/introduction/>

<sup>36</sup> Chen, Te-Ping. “China’s Marlboro Country,” June 28, 2009. Center for Public Integrity, Tobacco Underground Project. <http://www.publicintegrity.org/investigations/tobacco/articles/entry/1437/>

in the U.S. for IPR violations originate in China.<sup>37</sup> The Government Accounting Office in 2004, relying on data from CPB, estimated the number of seized counterfeit cigarette cartons increased from 19,926 in 1999 to 1,797,431 in 2003.<sup>38</sup>

The sophistication of counterfeit cigarettes also has increased. For example, whereas ten years ago there were perhaps a few versions of counterfeit Marlboro packs, now details down to region-specific tax stamps and warning labels are being reproduced for as many as sixty different countries.<sup>39</sup> Tests of counterfeit cigarettes have raised serious health concerns – counterfeit cigarettes often contain low quality ingredients, high levels of nicotine, and various contaminants.<sup>40</sup> But it is estimated that a pack of counterfeit Marlboros costs approximately 20 cents to make in China – a fraction of the U.S. price and an indication of the potential profit available to black market traders.<sup>41</sup>

More sophisticated methods of preventing counterfeit cigarette trade have been deployed by cigarette manufacturers and state enforcement agencies. For example, California

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<sup>37</sup> We understand that IPR violations are only one of several reasons cigarettes may be seized. Estimates of total cigarette seizures we understand are not available. Source: Intellectual Property Rights Seizure Statistics, Annual FY data, CBP and ICE.

<sup>38</sup> Source: “Cigarette Smuggling: Federal Law Enforcement Efforts and Seizures Increasing,” GAO, May 2004, p.21.

<sup>39</sup> Chen, Te-Ping. “China’s Marlboro Country,” June 28, 2009. Center for Public Integrity, Tobacco Underground Project. <http://www.publicintegrity.org/investigations/tobacco/articles/entry/1437/>

<sup>40</sup> Guevara, Marina Walker. “Overview,” October 20, 2008. Center for Public Integrity, Tobacco Underground Project <http://www.publicintegrity.org/investigations/tobacco/pages/introduction/>

<sup>41</sup> Chen, Te-Ping. “China’s Marlboro Country,” June 28, 2009. Center for Public Integrity, Tobacco Underground Project. <http://www.publicintegrity.org/investigations/tobacco/articles/entry/1437/>

passed the “Cigarette and Tobacco Licensing Act of 2003” to improve tracking of cigarettes sold in the state, implemented an encrypted cigarette tax stamping system in 2005, and increased enforcement efforts.<sup>42</sup> It is reported that in California, “Legal cigarette sales jumped by more than 42 million packs in California the year after a law tracking sales was passed there.”<sup>43</sup> California’s anti-counterfeit measures are claimed to have recovered over \$150 million in annual revenues.<sup>44</sup> Other states are exploring anti-counterfeit measures as well, as according to a Philip Morris spokesperson they have “confirmed counterfeit in 19 states and have reasons to suspect it in 23 more.”<sup>45</sup>

These examples indicate that counterfeit cigarette supplies are already widespread, and are growing. This growth signifies that even under the current regulatory and tax regime, a sophisticated counterfeit supply aggressively threatens current legal distribution. Hence, a ban on the legal sale of menthol cigarettes, because it eliminates a huge portion of legally supplied cigarettes, could shift many more transactions to low-cost counterfeit supplies.

#### **d. Effective Enforcement will be Difficult**

The Canadian and New York experiences indicate that substantial additional expenditures on enforcement will be required to limit the development of large black markets

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<sup>42</sup> Business Wire, Oct. 1, 2010, “SICPA Awarded California Contract to Implement Counterfeit-resistant Cigarette Tax Stamp-Based Tracking Solution.

<sup>43</sup> Source: “Counterfeit Cigarettes Targeted,” Orlando Sentinel, 2 April 2005.

<sup>44</sup> Business Wire, Oct. 1, 2010, “SICPA Awarded California Contract to Implement Counterfeit-resistant Cigarette Tax Stamp-Based Tracking Solution.

<sup>45</sup> Source: “Counterfeit Cigarettes Targeted,” Orlando Sentinel, 2 April 2005.

following a menthol cigarette ban. Merely relying on current enforcement infrastructures likely will do little to stem the likely black market trade, as evidenced by efforts in Canada that nevertheless failed to forestall a 45 percent drop in legal cigarette sales,<sup>46</sup> or a 50 percent drop in New York.<sup>47</sup> Yet given the current budget environment, it may be difficult to implement the increases in expenditures on enforcement that would be required to enforce a menthol cigarette ban. The budget crises facing both local and federal governments are well documented. Given these crises, expecting to be able to allocate substantial incremental resources to restricting consumption of a particular flavor of cigarette (especially given the wide and legal availability of other cigarette flavors) could be politically unrealistic. Further, even with substantial increases in enforcement expenditures and significant expansion of enforcement infrastructures, many practical enforcement problems would remain.

First, smoking menthol cigarettes might not be regarded as a truly “criminal” activity. Both a large number of law enforcement personnel (across multiple agencies) and U.S. residents currently smoke (and have smoked for years). Menthol cigarettes make up about 30 percent of the market, and thus have many consumers across varied occupations and geographic areas. As a consequence, law enforcement personnel may be hesitant to actively restrict usage, because they may not view smoking menthol cigarettes as a serious crime. Similarly, current menthol smokers might not see strong reasons to avoid menthol cigarettes, especially given the wide and

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<sup>46</sup> Source: “The Size of the Underground Economy in Canada,” (1994), Statistics Canada. Table 6.

<sup>47</sup> Source: “Cigarette Taxes, Black Markets, and Crime Lessons from New York’s 50-Year Losing Battle,” Patrick Fleenor, Policy Analysis, February 6, 2003.

legal availability of other cigarettes. Without a strong commitment to adhere to the ban on the part of both law enforcement and consumers, its success likely will be muted, even if substantial enforcement expenditures are engaged in.

Secondly, enforcement may be difficult because of where many current menthol smokers live. Many current menthol smokers are located in urban areas near borders and major transportation hubs, where (as we discussed above) the cost of supplying black market cigarettes is relatively low. Furthermore, many of these consumers live in inner city areas where black markets in many products already may be well-developed. In short, much of a black market distribution infrastructure likely is already in place near the core areas of demand for menthol cigarettes.

These enforcement hurdles present additional problems for attempts to combat the large expansion of black market cigarette sales likely to follow a ban on menthol cigarettes. These problems are substantial, especially given the widespread acceptance of cigarette smoking in general, and the potential for the many unintended consequences associated with the ban, as we will discuss in Section VI.

#### **IV. ESTIMATING DEMAND FOR MENTHOL CIGARETTES**

In this section, we present our analysis of the likely consumer response to a ban on menthol cigarettes. How big a black market will follow from a ban on menthol cigarettes largely depends on how consumption of menthol and non-menthol cigarettes changes in response to differences between the price of black market menthol cigarettes and the current legal menthol



cigarette price. As noted above, the own-price elasticity of demand for menthol cigarettes and the cross-price elasticity between non-menthol cigarettes and the price of menthol cigarettes are measures of how smokers will respond to the higher menthol cigarette prices that they will face in the black market (as compared to the current legal price). The own-price elasticity of demand for menthol cigarettes measures how overall menthol cigarette consumption is likely to decrease when the price rises (as it would were menthol cigarettes to be banned). The cross-price elasticity of demand between non-menthol cigarettes and the price of menthol cigarettes allows us to calculate the proportion of menthol smokers who would switch to non-menthol cigarettes if faced by higher menthol cigarette prices, holding non-menthol prices constant.<sup>48</sup>

Our demand analysis is based largely on data for Newport cigarettes. As described below, we need to translate these estimates for Newport into estimates for menthol cigarettes.<sup>49</sup> Our reliance on Newport data to estimate demand elasticities for all menthol cigarettes stems from practical limitations – we have price data only for Newport transactions. We first employ a margin analysis to obtain an estimate of the own-price elasticities for Newport. A similar margin analysis is not possible for other menthol brands, because the leading other menthol brands are part of larger brand families, such as Marlboro, and therefore do not publicly report margin data

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<sup>48</sup> Our reliance on the economics literature is detailed in Section IV.

<sup>49</sup> As explained previously, we only have price data for Newport cigarettes, and thus cannot directly estimate the elasticity for other menthol cigarettes.

separately for menthol and non-menthol flavors. Elasticities inferred from margin analysis would be less meaningful, accordingly.<sup>50</sup> Then, we present a statistical analysis.

### **a. Margin Analysis**

Economists can use profit margins to infer demand characteristics of a product. Profit margins that are higher (in percentage terms) suggest more inelastic demand, because the profit margin equals the inverse of the demand elasticity under certain assumptions. Conversely, low profit margins suggest more elastic demand. Thus, the first part of our analysis on Newport's own-price elasticity involves examining profit margins, although we recognize that accurate measures of such margins can be difficult, and the assumption that the margin equals the reciprocal of the demand elasticity can be subject to error. We look at the most recent data reported.

For the third quarter in 2010, Lorillard reported profit margins on net sales of 53 percent.<sup>51</sup> This profit margin translates into an elasticity of demand for Lorillard cigarettes of -1.89, calculated using the Lerner index (in which the reciprocal of the margin equals the absolute value of the own-price elasticity of demand).<sup>52</sup> The margin used in the Lerner Index calculation

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<sup>50</sup> A limitation of our analysis (which affects the projection of the size of the black market presented in the subsequent section) is that the demand characteristics for other menthol cigarettes may differ from those of Newport. The importance of this limitation depends how different these other demand characteristics are.

<sup>51</sup> See Lorillard, Inc. 10-Q filed on 10/27/2010. Profit margin defined as Gross Profit divided by Net Sales excluding collected excise taxes.

<sup>52</sup> See Carlton, Dennis W., and Jeffrey M. Perloff, *Modern Industrial Organization*, Boston: Pearson Addison Wesley (2005), pp 89-93.

excludes fixed costs. To the extent fixed costs are included in the Lorillard margin data, the demand elasticity is overstated (i.e., too large in absolute value). Therefore, we regard this estimate of own-price elasticity to be an upper bound on this value. This elasticity estimate implies that Newport smokers have preferences for Newport cigarettes such that a price increase of 1 percent would reduce consumption by about 1.9 percent.

We turn next to an analysis of transactions data, which will allow us to estimate econometrically a demand curve for Newport.

#### **b. Demand Estimation**

We use monthly data on Newport cigarettes across cities over a several year period to estimate the own-price elasticity of demand for Newport cigarettes and the cross-price elasticity of demand between non-menthol cigarettes and the price of Newport.<sup>53</sup> We choose to obtain data for major cities where Newport has significant sales. We examine monthly changes in average Newport prices by city, and then observe how consumption shifts in response to those short-term changes. From an estimation perspective, the most important price changes occur in periods in which Newport implements (or ends) price promotions to retailers. The benefits to statistical estimation of having such sharp, short-term price changes is to mitigate potential biases associated with both demand shifts and competitive responses by other suppliers. This

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<sup>53</sup> A more detailed description of this analysis is contained in the Technical Appendix.

allows us to identify a demand curve for Newport cigarettes.<sup>54</sup> These short duration price changes last for only a month (as promotional activity changes), and we look at several different periods, as we explain below.

As we stated before, we do not observe pricing for all cigarette brands. Instead, we observe only Newport's pricing. Therefore, to control in our regression model for pricing of alternative brands, we include excise taxes (both federal and local). We also include area-based measures that are related to overall consumption of Newport cigarettes; specifically, total population and the portion of the population that is African American. We detail our analysis in the following section.<sup>55</sup>

#### **i. Data**

Data used in our empirical analysis comes from four primary sources: Lorillard, the U.S. Census Bureau, Centers for Disease Control and Prevention, and State/Local tax data. From this information, we are able to calculate wholesale prices of Newport cigarettes; cigarette taxes at the state, county and local level; and other demographic data. A more detailed discussion of these data is presented in the technical appendix.

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<sup>54</sup> In economic terms, we assume these promotion campaigns are exogenous to broader changes in cigarette demand and to rival responses. If Newport price changes occur during periods of general demand shifts, the observed relationship between price and quantity will not trace out a demand curve, while if Newport's price changes are independent of shifts in demand, they will trace out a demand curve and can thus be used to estimate an elasticity of demand. We understand that many of the Newport price changes are not announced and are not a response to competitor's pricing.

<sup>55</sup> A more detailed description of this analysis is contained in the Technical Appendix.

## ii. Results

Based on a log-log empirical specification (see the technical appendix for a detailed description of our specification), we estimate two sets of regressions. The first set examines the sensitivity of Newport's sales of cigarettes to its price – the own-price elasticity of demand. The second set of regressions examines the sensitivity of overall non-menthol cigarette consumption to the price of Newport cigarettes – the cross-price elasticity of demand. We have data on non-menthol consumption for only 8 cities, but observe Newport sales for 21 cities; we present our estimates for each of these two groups.<sup>56</sup> Further, our monthly data spans from September of 2007 to July of 2010. We estimate our regressions on three separate periods of time. For the first set, we estimate the regression using every month of data in our sample. For the second set of regressions, we include only the months in which there was a promotion campaign change for Newport, and include the previous and following months as well. For our third set, we only include the month of the campaign and the month after the change. The results of our regression, analyses, along with all the other independent variables included (except for year fixed effects which also are included as control variables) are presented in Tables 1-A through 1-C and Table 2.<sup>57</sup>

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<sup>56</sup> The list of 21 cities and the subset of 8 cities are presented in the Appendix Table.

<sup>57</sup> Besides the specifications shown in Tables 1-A through 1-C, we also have estimated alternative specifications, including specifications with city fixed effects. The Newport own-price elasticity estimates that result from the inclusion of city fixed effects are smaller than the ones reported above. Less elastic demand would increase our estimates of the black market menthol cigarettes, and hence to be conservative, we rely on the larger own-price elasticities in Tables 1-A through 1-C.

### *Own-Price Elasticity Estimates*

As can be seen in Tables 1A-1C, the coefficient estimates on the Newport price variable range in value from -1.2 to -1.6, and are all statistically significant at the 5 percent level or better. The point estimates (which are elasticities – see the appendix) imply that for a 1 percent increase in wholesale price of Newport cigarettes, holding all else equal, there will be anywhere from a 1.2 percent to 1.6 percent decrease in Newport wholesale volumes.

The elasticity measures implied by the coefficient estimates are based on the price Newport charges wholesalers, which is lower than the retail price that consumers face. The implied own-price elasticity of consumer (i.e., retail) demand would therefore be higher than the regression coefficients. In other words, the demand response we measure from a percentage change in the wholesale price is actually a response to the smaller (by definition) percentage change in the retail price. Although we cannot measure retail elasticities directly (because we have only wholesale data), we can use our wholesale elasticities to approximate the retail elasticities (see the Technical Appendix for details). These approximate retail elasticities are listed in Table 3, and range from -1.5 to -2.1 in value.

As we noted previously, we have explicit wholesale pricing only for Newport cigarettes, and hence cannot be certain that other brands' pricing remains unchanged during the periods in which we observe changes in Newport's pricing. Our coefficient estimates could be biased towards zero if competitors tend to match the Newport price changes by moving their own brands' prices in the same direction. We do not believe this creates a serious bias because, as we noted above, we rely on many price changes that emerge from Newport's "consumer

spend” promotions that target retailers directly. These changes are not announced to competitors and can vary across retailers, making observation and price matching more difficult.

A potential bias arises from the nature of the price changes. Specifically, a price promotion typically lasts about a month, and hence represents a short-term disruption in pricing. That is, the relative price changes that occur may be viewed as temporary, and consumer responses may be different than if consumers viewed the changes as permanent. For example, if consumers view a sale as temporary, they may “stock up” on the item, and thus the demand reaction that is observed empirically may overstate the underlying price sensitivity to long-run price changes.

We make two observations regarding this potential bias toward overstating the own-price elasticity. The first observation is that the greatest demand for Newport is in low-income urban areas, where individual budget constraints may restrict stocking-up behavior. Stocking up requires spending today for consumption tomorrow (i.e., it’s a form of saving). For lower income consumers, budget constraints are likely to limit the amount of stocking up that occurs. The second observation is that the higher the own-price elasticity for cigarettes, the smaller will be the estimated size of the black market. Consequently, if consumers are indeed stocking up, we will underestimate the size of the black market that will emerge from the ban on menthol cigarettes. From this perspective, our black market estimate should be considered a conservative lower bound.

### *Cross-Price Elasticity Estimates*

To calculate cross-price elasticities, we estimate specifications in which the dependent variable is the log of non-menthol sales, while the independent variables include the log of federal and state excise taxes, along with Newport's price.<sup>58</sup> Again, we include other control variables in the regression, namely city population, percent of the population that is African American, and smoking population. As mentioned before, we only have data on non-menthol consumption for 8 cities (listed in the Appendix Table), and hence must base our estimates on this limited sample.

Table 2 reports these cross-price elasticities estimates. The coefficients from these specifications are less precisely estimated than those in the own-price regressions. We use these cross-price elasticity estimates to evaluate how much consumption would shift towards non-menthol cigarette purchases in the event of an increase in the price of Newport cigarettes.

As already mentioned, we need to transform our demand elasticities for Newport wholesale prices into retail elasticities and then into retail demand elasticities for all menthol cigarettes. We explain how we do this in the Technical Appendix. We estimate that for a 1 percent increase in the menthol cigarette price, menthol cigarette consumption would fall by about 1.45 percent. Of that fall, .3 percent would be explained by menthol smokers who stop smoking, and 1.15 percent would be explained by menthol smokers who switch to non-menthol

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<sup>58</sup> This cross-price elasticity equals the percentage change in quantity consumed of non-menthol cigarettes for a percentage change in the wholesale price of Newport cigarettes. Mathematically, we can express the cross-price elasticity we estimate in our regressions as:  $\partial \log(Q_{n-m}) / \partial \log(P_m)$ , where  $Q_{n-m}$  is the quantity of non-menthol cigarettes and  $P_m$  is the wholesale price of Newport cigarettes.



cigarettes. Our precise methodology for estimating the size of the black market from these elasticity estimates is explained in the next section.

## **V. DEVELOPING OUR BEST ESTIMATES OF OVERALL REDUCTION IN SMOKING AND BLACK MARKET MENTHOL SALES**

As noted, a ban on the legal sale of menthol cigarettes in the U.S. would result in one or more of the following three changes in menthol cigarette consumption: 1) menthol (and total) cigarette consumption could fall, as current menthol smokers stop smoking; 2) menthol consumption could switch to legal non-menthol cigarettes; or 3) menthol consumption could remain with menthol cigarettes, obtained from the black market. Those who choose to continue to smoke menthol cigarettes after a ban would purchase their cigarettes through the black market (or obtain them through other means such as converting “regular” flavor cigarettes to menthol ones). For the purpose of our analysis, we assume that smokers who choose menthol cigarettes after a ban would source the cigarettes from the black market. To the extent that alternative legal means are employed (e.g., immersing cigarettes in menthol), our estimates could overstate the amount of black market activity.

### *Implied Reduction in Smoking and Size of the Black Market*

Based on the above estimates, the effect of a ban on the legal sale of menthol cigarettes depends on the price that would emerge on the black market relative to the current legal price for menthol cigarettes – call this the “price increase”. Under various assumptions for such a price increase, we find:

A 10 percent increase in the price of menthol cigarettes would result in an overall decrease in smoking of about 1 percent, and in black market sales that are about 87 percent of current menthol cigarette sales in units.<sup>59</sup>

A 25 percent increase in the price of menthol cigarettes would result in an overall decrease in smoking of about 2 percent, and black market sales that are about 72 percent of current menthol cigarette sales in units.

A 50 percent increase in the price of menthol cigarettes would result in an overall decrease in smoking of about 3.5 percent, and black market sales that are about 56 percent of current menthol cigarette sales in units.

The implication for total expenditures on menthol cigarettes (i.e., revenues from black market sales) depends on the monetary price in the black market.<sup>60</sup> If, using the second example above, the monetary price in the black market price is 20 percent above the current legal price, the black market for menthol cigarettes in revenue terms will be about 86 percent the size of the current legal market (1.2 x 72 percent).

We should emphasize that these estimates apply to the cities in our data set; other cities (located in other parts of the country) may experience different effects from the ban on menthol cigarettes. However, the above estimates indicate that the resulting black market may represent a significant portion of the current legal menthol sales. Furthermore, based on these estimates, the ban is likely to have only a modest initial impact on aggregate cigarette consumption.

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<sup>59</sup> In calculating the effect of the price increase on quantity, we assume constant elasticities.

<sup>60</sup> As noted above, when we refer to the black market price, we mean the effective price, which is the price paid in money (the “monetary price”) plus costs of engaging in black market activity (e.g., increased risk of harm).

The predicted revenue figure indicates that the potential profits from supplying this black market would be very large. Hence, there would be substantial financial incentives to enter and supply the black market.

## **VI. RISKS OF UNINTENDED CONSEQUENCES**

### **a. Organized Crime**

A final aspect of our analysis is to try to anticipate some of the likely unintended consequences that could result from a ban on the legal sale of menthol cigarettes. In Canada, as enforcement efforts against smuggling heightened, “mom and pop” smugglers stopped supplying the market. In their place emerged sophisticated crime rings that were more equipped to circumvent detection than were the small carriers of smuggled and counterfeit products.<sup>61</sup> As mentioned previously, the quandary for U.S. policymakers (in the event of a ban) will be whether to heighten enforcement, which likely would lead to higher street prices that could reduce menthol consumption, but also would make organized criminal activity more lucrative.

Raising enforcement efforts against the smuggling and distribution of black market cigarettes likely would raise the street price of these cigarettes. In other words, greater intensity by legal enforcement to stop black market supply flows across borders and through local distribution channels likely would increase efforts by organized criminal groups to get black market cigarettes into the hands of consumers. This would translate into overall lower levels of

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<sup>61</sup> Source: “Exports to Smuggle and Smuggling Technologies,” Bruno Larue, Sebastien Pouliot, and Christos Constantatos, *Review of International Economics*, 476-493, 2009.

supply and a greater dependence on organized criminal syndicates to supply the market. Further, the higher prices that would result from reducing competing alternative supplies could have the perverse effect of incentivizing organized criminal syndicates to fight for territory, by making that territory more valuable. That is, with high profits at stake and fewer potential suppliers, the profit incentive to “eliminate” competition and become the sole supplier to an area could be large. Territorial fights over distribution areas was a chief source of the violence associated with the prohibition of alcohol, and of the more recent drug wars.

In short, under what seem like reasonable assumptions, a black market in the U.S. likely would be substantial and could thereby inspire a significant increase in organized criminal activity. The sophistication and size of black market trade has already increased globally. Put simply, the incentives to supply black market cigarettes currently exist, and an additional, sizeable source of demand would provide further incentive.

#### **b. Youth Smoking**

Another potential unintended consequence would be increased youth access to cigarettes. Specifically, moving distribution from well-regulated retail channels to underground black market channels can be expected to reduce effective selling restrictions to youths. To the extent that black market distributors would be more willing than legal distributors to sell to youths or to sell cheap counterfeit cigarettes to youths, teen access to unregulated cigarettes might increase if the black market grows. The Canadian experience with black market cigarettes is consistent with this possibility. Provinces that suffered the greatest increase in black market

sales – specifically Ontario and Quebec – saw teen smoking increase relative to the rest of Canada. Between 1991 and 1994 – the period during which black market sales peaked, as discussed above – smoking prevalence among 15 to 19 year olds rose by 35 percent in Ontario and by 14 percent in Quebec. By contrast, in the rest of Canada, smoking prevalence among 15 to 19 year olds rose by only 10 percent between 1991 and 1994.<sup>62</sup> This result suggests that substantial growth in black market sales can affect youth smoking.

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<sup>62</sup> Gilmore, Jason. Report on Smoking Prevalence in Canada, 1985 to 1999 (2000), Statistics Canada, Health Statistics Division. We include only provinces with data reported for both 1991 and 1994 in the “rest of Canada” group.

## TECHNICAL APPENDIX

In this Appendix, we proceed as follows. We begin by estimating the demand for Newport cigarettes, using transaction data provided to us by Lorillard. From this estimation, we obtain an own-price elasticity. We then estimate the effect of Newport price changes on consumption of non-menthol cigarettes, in order to obtain a cross-price elasticity (namely the change in the consumption of non-menthol cigarettes in response to a change in the price of Newport). We will employ these estimates to calculate current menthol smokers' consumption responses to various assumed differences between black market menthol cigarette prices and current legal menthol cigarette prices.<sup>63</sup>

### 1. Estimating Demand for Menthol Cigarettes

#### *Data*

Lorillard has provided us with sales data for Newport menthol cigarettes for 21 U.S. cities from September 2007 through September 2010. These data include volumes (total cartons shipped to retail outlets), net sales revenues (to Lorillard), discounts (paid by Lorillard to retailers and identified as “Actual Consumer Spend”) and Federal excise taxes (paid by Lorillard) for Newport menthol cigarettes. For a subset of eight cities, we gathered additional data on the overall size of the city's menthol and non-menthol cigarette market – specifically, monthly total menthol and non-menthol carton volumes. We use these data to calculate a wholesale price series for Newport cigarettes. We calculate a monthly Newport price as net

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<sup>63</sup> For the remainder of this appendix, we refer to this differential as the “price rise”.

revenues divided by total cartons sold in that month. Net revenues are calculated by subtracting discounts to retailers and federal excise tax paid from Newport's reported net sales amount.

Various demographic data for each of the 21 cities were also collected. Total population and African American population were collected from the U.S. Census Bureau 2009 American Community Survey. Current smoking prevalence for each city was obtained from the Centers for Disease Control and Prevention Behavioral Risk Factor Surveillance System ("BRFSS") survey data for 2008. In the BRFSS survey, current smoking prevalence is defined as the percentage of adults who reported having smoked at least 100 cigarettes in their lifetimes, and who currently smoke.

A time series of state, county and local taxes per pack was also collected for the each of 21 cities. These tax amounts were obtained from the Tax Burden on Tobacco, Tobacco Free Kids.org fact sheets and the various State Tax Department websites.

Finally, several variables were constructed using the collected data. From demographic data from the U.S. Census Bureau, the percentage of the population in each city that is African American was calculated. An estimate of the total population of smokers was also calculated (as the product of the current smoking prevalence and the total population in the city).

### *Econometric Estimation*

Our goal is to estimate how a price rise in menthol cigarettes would change the consumption decisions of current menthol smokers. As we explained above, a ban on legal menthol cigarette sales can be viewed as increasing the price of obtaining menthol cigarettes (which is the differential between the black market menthol cigarette price after the ban and the current legal menthol cigarette price). After a ban, current consumers of legal menthol cigarette can respond in three ways: 1) they can stop smoking, 2) they can switch to legal non-menthol cigarettes, or 3) they can smoke (the higher priced) black market menthol cigarettes. Our strategy is to estimate the demand structure for menthol cigarettes, and from that to calculate how current menthol smokers would respond to the price increases associated with a ban.<sup>64</sup>

Our approach to measure what happens to menthol consumption when menthol cigarette prices rise hinges on understanding the demand structure for Newport. As discussed previously, we observe only pricing for Newport, and thus must draw inferences on the demand structure for other menthol brands based on what we observe only for Newport. We begin our estimation procedure by measuring how much Newport consumption declines in response to a price increase for Newport cigarettes (i.e., we estimate the own-price elasticity for Newport). Then, we attempt to track where these lost sales go.

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<sup>64</sup> Namely, when faced with higher black market prices, do current menthol smokers stop smoking, switch to non-menthols, or continue to smoke menthols (despite the higher prices).



To measure the Newport sales lost to alternative non-menthol brands, we estimate the cross-price elasticity of demand for non-menthol cigarettes with respect to Newport pricing. To calculate the portion of Newport sales lost to smokers who stop smoking, we rely on industry elasticity of demand estimates from the economics literature on cigarette demand. Finally, the residual portion of Newport sales lost in response to a Newport price increase (after tracking the amount attributable to stopping smoking and switching to non-menthols) is assigned to other menthol brands, whose prices presumably have not increased.

However, in a world in which a ban is imposed on all menthol cigarettes, this last category (other menthol brands) is an unlikely alternative for current Newport smokers. Specifically, these other menthol brands also would have to be purchased on the black market, and hence would experience a price increase similar to Newport's price rise. This fact means that we need to put the smokers who switch from Newport to other menthol brands in response to a Newport-only price increase into another category. This requires us to make simplifying assumptions on how to reallocate this group of Newport switchers; we describe those assumptions below. Based on our demand estimates and reallocation of this last category, we derive a demand structure that informs us how Newport smokers would respond to price rises in all menthol cigarettes (not just a rise in the Newport price). We then apply this demand structure for Newport to all other menthol cigarettes.

## 2. Own price elasticity

We would like to estimate directly the overall effect on menthol cigarette consumption of a rise in menthol cigarette prices. Because we do not have data on all menthol brands, we cannot do this. Instead, we conduct our econometric analysis by focusing on demand responses that result from changes in Newport prices. The data consist of wholesale prices and quantities. We initially estimate the following equation:

$$\log q_{it} = \alpha + \beta \log p_{it} + e \log x_{it} + u_{it}$$

Where  $q$  is quantity of Newport cigarettes,  $p$  is the Newport price,  $x$  is a vector of control variables, and  $u$  is an error term. The subscript  $i$  refers to location and  $t$  to the time period.

The results are shown in Tables 1A-1C. Because we run a “log-log” specification (i.e., the left-hand side and right-hand side variables are both in log form), the estimated coefficients are elasticities. Thus, each coefficient measures the percentage change in the dependent variable (quantity) that will result for a given percentage change in an independent variable. Of most interest is the coefficient on price – the elasticity of demand (or “own price” elasticity). As shown in Tables 1A-1C, the (wholesale) own-price elasticity ranges in value from -1.2 to -1.6.

### *Converting wholesale elasticities to retail elasticities*

As noted, the above equations were estimated on wholesale data, so that the coefficients are wholesale elasticities. Because we are interested in how consumers will respond to a price

change, we need to translate these wholesale elasticities into retail elasticities (consumers make retail purchases). To do this, we adjust the wholesale price elasticities based on the ratio of average retail price to average wholesale price.<sup>65</sup> Namely, we divide the retail price by the wholesale price, and then multiply the wholesale elasticity by this ratio. Specifically, based on a small sample of stores in the Chicago area, we found that the retail price markup was approximately 33 percent. Thus, we use a ratio of retail to wholesale prices of 1.33. This means that the following conversion  $\epsilon_w * 1.33$  would produce the estimated retail own-price elasticity of demand for Newport cigarettes, where  $\epsilon_w$  is the estimated wholesale elasticity. Using the above conversion, our wholesale elasticity estimates translate into retail elasticity estimates that range from a low of about -1.5 to a high of about -2.1, as illustrated in Table 3.

### 3. Cross-price elasticity

The cross-price elasticity of demand between non-menthol cigarettes and the price of Newport cigarettes tells us how consumption of non-menthol cigarettes will respond to a change in the price of Newport. To calculate this cross-price elasticity, we estimate the following equation:

$$\log Q_{it} = \hat{\alpha} + \hat{\beta}_1 p_{it} + \hat{\beta}_2 t_{it} + \hat{\epsilon} \log x_{it} + \hat{u}_{it}$$

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<sup>65</sup> We observe typical price differentials between wholesale and retail prices in Chicago, and then use this ratio to convert the wholesale elasticities estimated on our sample of cities. This is a rough approximation, since different cities likely will have different ratios.

Where  $Q$  is the quantity of non-menthol cigarettes,  $p$  is Newport's price,  $t$  is taxes,  $x$  is the same vector of control variables, and  $u$  is an error term. The subscript  $i$  again refers to location and  $t$  to the time period. We estimate the equation on the eight cities in our sample for which we have data on non-menthol quantities (see Appendix Table).

The results are shown in Table 2. Because we run a "log-log" specification, the coefficients are again elasticities. Once more, of most interest is the coefficient on Newport's price – the cross-price elasticity of demand for non-menthol cigarettes with respect to Newport prices.

As with the own-price elasticity, we must adjust these regression estimates to take into account the fact that the regressions were run on wholesale data. We adjust the cross-price elasticities in the same manner we adjusted the own-price elasticities, described above. Table 4 lists our estimated retail cross-price elasticities.

#### **4. Calculating switching and the effects of an increase in menthol pricing**

First, to calculate the portion of Newport smokers who will switch to non-menthol cigarettes in response to a rise in Newport prices, we make use of the cross-price elasticity between Newport and non-menthol cigarettes (Table 4). As discussed previously, the cross-price elasticity indicates the change in the consumption of non-menthol cigarettes resulting from a Newport price change. If the cross-elasticity has a value of 0.4, non-menthol consumption will increase by 0.4 percent for each 1.0 percent increase in Newport's price. What does this imply for Newport sales? To illustrate, in a number of markets Newport accounts for close to 30

percent of all cigarette sales, and non-menthol sales are about 60 percent of all cigarette sales.<sup>66</sup>

A cross-price elasticity of .4 would mean that following a 1 percent rise in Newport's price, the consumption of non-menthol cigarettes would rise by .4 percent, or from 60.00 to 60.24 percent of the market. Newport consumption would shrink by a corresponding amount, from 30.00 to 29.76 percent of the market. That change represents a decrease of about 0.8 percent in Newport sales. Thus, these estimates indicate that a 1 percent increase in the Newport price will result in 0.8 percent of Newport consumption switching to non-menthol cigarettes.

Based on the above approximation, and a Newport own-price elasticity estimate of -1.8, we draw the following inference: for a 1 percent price increase in Newports, 1.8 percent of Newport sales are lost, with .8 percent of Newport sales switching to non-menthol brands. These measures indicate that 1 percent of Newport sales (which are lost from the price increase) are still unaccounted for, as -1.8 percent (lost in total) less .8 percent (lost to non-menthols) leaves 1 percent. To analyze this 1 percent of lost Newport sales, we must make some assumptions, as our empirical estimates do not allow us to directly track where these lost sales end up. However, there are only two places where these lost sales can go. Namely, these lost sales could fall into the stop smoking category or these lost sales could end up as sales of other menthol brands.

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<sup>66</sup> We examine cities such as Philadelphia, Baltimore and Detroit, in which Newport share is substantially higher than its national average.

To calculate the portion of this 1 percent that ends up in the stop smoking category, we employ industry estimates reported in the economics literature. In a survey article, Chaloupka and Warner (2000) state:

The price elasticity estimates for overall cigarette demand from recent studies fall within the relatively wide range from -0.14 to -1.23, but most fall in the narrower range from -0.3 to -0.5.

Since most estimates on the elasticity of demand for cigarettes fall into a relatively narrow range, we assume that menthol smokers are no different than the average smoker in terms of response to higher prices. Further, we use the lower end of the -0.3 to -0.5 range (-0.3 specifically) as a measure of lost demand, since the literature's estimate is based on all prices rising, not just Newport's.<sup>67</sup> Thus, we estimate that current Newport smokers who respond to higher Newport prices by stopping to smoke will account for a 0.3 percent reduction in Newport consumption (induced by the 1 percent price rise in Newport cigarettes).

Finally, this leaves 0.7 percent of the lost Newport sales unaccounted for 1.8 percent (lost in total) less 0.8 percent (lost to non-menthols) less 0.3 percent (lost to stopping smoking) equals 0.7 percent. However, given that there is only one category left, other menthols, we infer that these lost sales go to other (non-Newport) menthol brands. This completes our estimates of the demand structure for Newport cigarettes, as we now can track where the lost Newport sales go in

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<sup>67</sup> If the reader wanted to use a different industry elasticity or different own-price or cross-price elasticities, our methodology is easily adaptable to alternative assumptions.

response to an increase in only the Newport price (i.e., the price of other menthol cigarettes is held constant).

The above information on the demand structure for Newport sales is still not sufficient to calculate a response to an increase in all menthol cigarettes, as this last category (other menthol brands) is an unlikely alternative to be chosen by current Newport smokers in response to an overall menthol price increase (since there would be no relative change between Newport's price and the price of other menthol cigarettes). This means that the 0.7 percent calculated above, under the assumption of no price change in other menthols, must be allocated back to Newport and to non-menthol cigarettes (given these other menthols also would have to be purchased on the black market at higher prices). Thus, we make simplifying assumptions on how to reallocate this last portion. Specifically, we assume that the 0.7 percent accounted for by other menthol would be evenly distributed between Newport and non-menthol cigarettes.<sup>68</sup> That is, we reallocate 0.35 percent to non-menthol cigarettes and 0.35 percent back to Newport in order to approximate how Newport demand would behave in response to an increase in all menthol prices.<sup>69</sup>

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<sup>68</sup> We note that we have already accounted for Newport smokers who stop smoking, with the .3 percent industry elasticity estimate. In other words, if we allocated more to the stop smoking portion, we would be predicting that a partial price increase (namely for menthol cigarettes only) would result in a greater overall reduction in smoking (for menthol smokers) than would result from the same price increase on all cigarettes (based on the industry elasticity). That is, the stop smoking portion is full, and hence the remaining 0.7 percent needs to be reallocated between Newport and non-menthol cigarettes.

<sup>69</sup> We make two observations on this percentage. First, we have used alternative approaches to reallocate this 0.7 percent of switchers (from Newport to other menthol brands) and find that our results do not change significantly. Second, based on the fact that switchers out of Newport go in roughly equal proportions to other menthol brands and non-menthol cigarettes, this approximation appears reasonable. In fact, we may be allocating too little back to

The above rough approximations now allow us to track Newport lost sales that would result if prices for Newport and all other menthol cigarettes increased simultaneously by 1 percent. In particular, 1.15 percent would flow to non-menthols (i.e., the 0.8 percent we estimate from the cross-price elasticity and the additional 0.35 percent reallocated above), and 0.3 percent would end up in the stop smoking category. These approximations imply that for a 1 percent increase in menthol prices, Newport consumption would drop by 1.45 percent (1.15 percent flowing to non-menthols and .3 percent stopping to smoke). As a final approximation, we assume that all other menthol cigarettes have the same demand structure as Newport, specifically with respect to changes in menthol prices.

We use the above demand structure to calculate the size of black market sales (in units) and the reduction in smoking for different assumed price increases that might emerge on the black market. For example, to calculate the effects of a 25 percent increase in menthol cigarette prices (that might result after a ban), we rely on 0.3 percent reduction in smoking (for each 1 percent increase in menthol prices), and a shift towards non-menthols equaling 1.15 percent of menthol consumption (for each 1 percent increase in menthol prices). The different estimates we report for the effect of the ban then depend on differences in magnitude of the assumed price increases (resulting in the black market).<sup>70</sup>

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Newport, since these switchers may have stronger preferences for menthol cigarettes, as revealed by their switching to other menthol brands.

<sup>70</sup> Note that for our estimates, we use a constant elasticity of demand model.



**Table 1-A**

**Newport Own-Price Regression Results  
All Data**

|                      | <b>8-City</b> | <b>21-City</b> |
|----------------------|---------------|----------------|
| Newport Price        | -1.30         | -1.26          |
| (t-statistic)        | -5.12         | -6.66          |
| Federal & State Tax  | -0.30         | 0.11           |
| (t-statistic)        | -3.05         | 2.34           |
| African Amer Pct     | 4.38          | 5.72           |
| (t-statistic)        | 8.00          | 17.93          |
| Total Population     | -0.12         | 0.02           |
| (t-statistic)        | -2.37         | 0.99           |
| Number observations  | 280           | 735            |
| R <sup>2</sup> (adj) | 0.3391        | 0.4158         |

Note: Regression analysis includes all data from September 2007 through July 2010.

Year fixed effects are included in all specifications.

Sources: Lorillard Wholesale Transaction Data; The Tax Burden on Tobacco; US Census Bureau.

**Table 1-B**

**Newport Own-Price Regression Results  
Promotion Change Month and Both Month Before  
and Month After**

|                      | <b>8-City</b> | <b>21-City</b> |
|----------------------|---------------|----------------|
| Newport Price        | -1.57         | -1.41          |
| (t-statistic)        | -5.40         | -5.93          |
| Federal & State Tax  | -0.23         | 0.13           |
| (t-statistic)        | -1.76         | 1.94           |
| African Amer Pct     | 4.22          | 5.58           |
| (t-statistic)        | 5.52          | 12.36          |
| Total Population     | -0.12         | 0.03           |
| (t-statistic)        | -1.63         | 0.83           |
| Number observations  | 136           | 357            |
| R <sup>2</sup> (adj) | 0.4016        | 0.4348         |

Note: Regression analysis includes data from September 2007 through July 2010. Months without a promotion change or not immediately preceding or following such a change are excluded.

Year fixed effects are included in all specifications.

Sources: Lorillard Wholesale Transaction Data; The Tax Burden on Tobacco; US Census Bureau.

**Table 1-C**

**Newport Own-Price Regression Results  
Promotion Change Month and Month After**

|                      | <b>8-City</b> | <b>21 City</b> |
|----------------------|---------------|----------------|
| Newport Price        | -1.39         | -1.16          |
| (t-statistic)        | -4.32         | -4.34          |
| Federal & State Tax  | -0.23         | 0.12           |
| (t-statistic)        | -1.47         | 1.61           |
| African Amer Pct     | 4.27          | 5.69           |
| (t-statistic)        | 4.61          | 10.61          |
| Total Population     | -0.12         | 0.02           |
| (t-statistic)        | -1.32         | 0.55           |
| Number observations  | 96            | 252            |
| R <sup>2</sup> (adj) | 0.3753        | 0.4135         |

Note: Regression analysis includes all data from September 2007 through July 2010. Months without a promotion change, or not immediately following such a change are excluded.

Year fixed effects are included in all specifications.

Sources: Lorillard Wholesale Transaction Data; The Tax Burden on Tobacco; US Census Bureau.

**Table 2**

**Newport Cross-Price Regression Results**

|                      | <b>Specification</b> |          |          |
|----------------------|----------------------|----------|----------|
|                      | <b>1</b>             | <b>2</b> | <b>3</b> |
| Newport Price        | 0.31                 | 0.23     | 0.21     |
| (t-statistic)        | 0.89                 | 0.54     | 0.44     |
| Federal & State Tax  | -0.98                | -0.96    | -0.96    |
| (t-statistic)        | -7.20                | -4.92    | -4.14    |
| African Amer Pct     | -6.93                | -7.00    | -7.00    |
| (t-statistic)        | -9.08                | -6.22    | -5.16    |
| Total Population     | 0.44                 | 0.47     | 0.48     |
| (t-statistic)        | 6.09                 | 4.36     | 3.67     |
| Number observations  | 280                  | 136      | 96       |
| R <sup>2</sup> (adj) | 0.4106               | 0.3911   | 0.3807   |

Sources: Lorillard Wholesale Transaction Data; The Tax Burden on Tobacco; US Census Bureau.

Specification 1 includes all months.

Specification 2 includes promotion change month and month before and month after.

Specification 3 includes promotion change month and month after

Year fixed effects are included in all specifications.

**Table 3**  
**Estimated Retail Own-Price Elasticity**

|         | <b>Specification</b> |          |          |
|---------|----------------------|----------|----------|
|         | <b>1</b>             | <b>2</b> | <b>3</b> |
| 8 City  | -1.73                | -2.07    | -1.85    |
| 21 City | -1.67                | -1.87    | -1.54    |

Specification: All specifications include Newport Price, Federal/State Taxes, African American Percentage, and year fixed effects.

Specification 1 includes all months.

Specification 2 includes promotion change month and month before and month after.

Specification 3 includes promotion change month and month after.

**Table 4**  
**Estimated Retail Cross-Price Elasticity**

|               | <b>Specification</b> |          |          |
|---------------|----------------------|----------|----------|
|               | <b>1</b>             | <b>2</b> | <b>3</b> |
| <b>8 City</b> | 0.42                 | 0.31     | 0.28     |

Specification: All specifications include Newport Price, Federal/State Taxes, African American Percentage, and year fixed effects.

Specification 1 includes all months.

Specification 2 includes promotion change month and month before and month after.

Specification 3 includes promotion change month and month after.

## Appendix Table

### Cities Including in Regression Analyses

| <b>8 Cities</b>  | <b>21 Cities</b>  |
|------------------|-------------------|
| Baltimore, MD    | Atlanta, GA       |
| Chicago, IL      | Baltimore, MD     |
| Dallas, TX       | Buffalo, NY       |
| Detroit, MI      | Charlotte, NC     |
| Houston, TX      | Chicago, IL       |
| Milwaukee, WI    | Cleveland, OH     |
| Philadelphia, PA | Dallas, TX        |
| Washington, DC   | Detroit, MI       |
|                  | Houston, TX       |
|                  | Indianapolis, IN  |
|                  | Los Angeles, CA   |
|                  | Miami, FL         |
|                  | Milwaukee, WI     |
|                  | New York, NY      |
|                  | Newark, NJ        |
|                  | Philadelphia, PA  |
|                  | Phoenix, AZ       |
|                  | Pittsburgh, PA    |
|                  | San Francisco, CA |
|                  | Toledo, OH        |
|                  | Washington, DC    |