CONSUMER RESPONSE TO CIGARETTE EXCISE TAX CHANGES

Lesley Chiou and Erich Muehlegger

MODEL APPENDIX

A. Model Derivation

In this section, we derive the stit order conditions for the analysolution to the Bellman model presented in (1), where the consumer does not solve for a closed form solution of the more generaldel with adjustment sots, the intuition from the model without adjustment costs to the more general case.

Absent adjustment costs, consumers choose purchases and consumption,

Lesley Chiou: Department of Economics, Occidental College, Los Angeles, CA, USA demailu@oxy.edu

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defines the optimal path of consumption. Constium pfalls with prices and follows a declining (rising) trend if the discount trea is greater (less) than et linterest rate on savings.

The third equation defines the subset **onisc** who will purches the low-quality tier in a particular period. If a consumer's reletioreference for the low-quality good, \$\eta\$, is greater than the relative marginal $c_{ps}^{t}t/p_{t}^{H}$, the consumer purchases the low-quality good in a given period and the Kuhn-tucker condition for H binds (0, $\mu_{t}^{L}=0$). Similarly, if $<p_{t}^{L}/p_{t}^{H}$, the consumer chooses to purchase the high-ground d. If per-unit taxes increase the level of both the high-quality and low-quality good μ_{t} ($^{H} = p_{t}^{H} + 2$ and $p_{t+1}^{L} = p_{t}^{L} + 2$, consumers with in $(p_{t}^{L}/p_{t}^{H}, p_{t+1}^{L}/p_{t+1}^{H})$ will strictly prefer the low-quality good efore the tax change and strictly prefer the high-quality good after the tax change substitution from low- to high-quality goods, along with the per-unit taxes causing a bigger telle price increase for lowquality goods drives the familiar "flight-to-quality esult documented in the previous literature.

B. Sensitivity Analyses

In this section, we examine the sensitivity the low-quality tier quality to changes in our simulation parameters. To restate, our base specification assumes the following:

The starting price of the high-quality and would use the starting price of the high-quality and would use the starting price of the high-quality and would use the starting price of the high-quality and would use the starting price of the high-quality and would use the starting price of the high-quality and would use the starting price of the high-quality and would use the starting price of the high-quality and would use the starting price of the high-quality and would use the starting price of the high-quality and would use the starting price of the high-quality and would use the starting price of the high-quality and would use the starting price of the high-quality and would use the starting price of the high-quality and would use the starting price of the high-quality and would use the starting price of the high-quality and would use the starting price of the high-quality and would use the starting price of the starting price of the high-quality and would use the starting price of the high-quality and would use the starting price of the s

Consumers discount future utility at 10 comment. Assets (or liabity) appreciate at 10 percent.

A consumer's relative preferee for low-quality cigarettes (is uniformly distributed from [0.7, 0.9]. Absent adjustment costs, consumers with always prefer high-quality cigarettes. Consumers with [0.8, 0.833] switch from low to high-quality

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cigarettes following the tax change. Consumer with 0.833\$ always purchase low-

quality cigarettes.

In this appendix, we focus on two parameters: (i

Figure A-2 graphs the quantity of the lost/requality tier for four discount rates (the reference case = 0.1 is omitted). As before, the disconsente is correlated with stockpiling as well as the long-term trend, butethshort-term flight from qualities robust to the changes.

Figure A-2: Sensitivity Analysis: Discount Rate

C. Quantity Decomposition

In this section, we decompose the quantity of the quality tier into consumption of the high and low-quality tiers. In particular, we septent examine consumption for each of three consumer "classes": (1) consumers who alwa We first present the quantity decompositfon the reference case, the model without

adjustment costs, we no longer see a sharp **discrity** in consumptionat the time of the tax increase. Rather, we see allette groups gradually taper theonsumption to lower levels. Group 1, the consumers who always consume hightypragarettes absent adjustment costs, now smooth their transition path by consuming **lowe**lity cigarettes for five periods after the tax change. Group 2, the consumers who switch **idiantely** from low-quality to high-quality cigarettes absent adjustment costs, now **delays**witch substantially to mitigate adjustment costs. Group 3, which cannot substitute **todo** quality cigarettes responds by borrowing against future periods to smooth **theo** the tax change.

Finally, we present the quantity decomposition model 2 in figure 3. In this case, consumers can partially mitigate adjustment **scosy**tstockpiling goods prior to the tax change at t=10. Although stockpiling does not change the generate of the transition path, it does allow consumers to maintain a higher level of ariette consumption in the post-tax period.

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Figure A-4: Cigarette Consurtion by Tier and Consumer Group: Adjustment Costs, No

Stockpiling

Figure A-5: Cigarette Consumention by Tier and Consument

Stockpiling