

What Price is Right?

Cigarette Demand Has Become More Responsive to Prices

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We provide evidence that demand for cigarettes has become relatively more sensitive to price changes, while other products' demand has become slightly less responsive. This change happened during a time of high cigarette taxes, increased regulation of smoking, and is particularly pronounced in California.



Consumers became more responsive to cigarette price changes from 2001 to 2012, especially during recessions.

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Cigarettes are often given as a prime example of a product whose demand is not affected much by changing prices (i.e., it is not price sensitive). For these types of inelastic goods, based on an economic perspective, a tax is a good idea. If smokers do not change their demand in response to higher prices, the tax base will not decrease with higher tax rates. Underscoring the case for such a tax, even if cigarette demand were to fall, this would be considered beneficial too, since smoking is bad for smokers' health and has negative consequences for society ranging from secondhand smoke to the cost of medical bills when smokers' health deteriorates.

In 1998 four of the largest U.S. tobacco companies and the attorneys general of 16 U.S. states entered into the Tobacco Master Settlement Agreement, the terms of which specified that states were to receive over \$206 billion over 25 years. In the following years, many anti-smoking rules and regulations were enacted. Taxes increased from less than 30% of cigarette prices to about 40%. Additionally, thirty-five states banned smoking in restaurants and bars. DeCicca, Kenkel, and Lovenheim report that over the 20 years since the Settlement Agreement, adult smoking rates declined from 24% to below 15%, and average cigarettes smoked per day, for those aged 18 and over, halved from about four to two. Smoking is highly addictive, so it is likely that the combination of higher prices and smoking bans led to these reduced smoking rates.

How to Set Prices?

Little research exists on how stores have been setting prices in this new era of both higher taxes, reduced opportunity to smoke, and generally lower overall consumption. When considering increasing prices, stores trade off higher margins for each item sold with a reduction in the overall quantity sold and a potential loss of local market share. Stores bank on the fact that consumers generally have a limited set of options if they do not want to drive far or spend a lot of time shopping around for the cheapest product. But what if that is not the case? What if consumers are willing to shop around so that a higher price leads to a large drop in quantity sold?

In effect, even when two stores are selling the same pack of Marlboro cigarettes, the fact that one store is closer

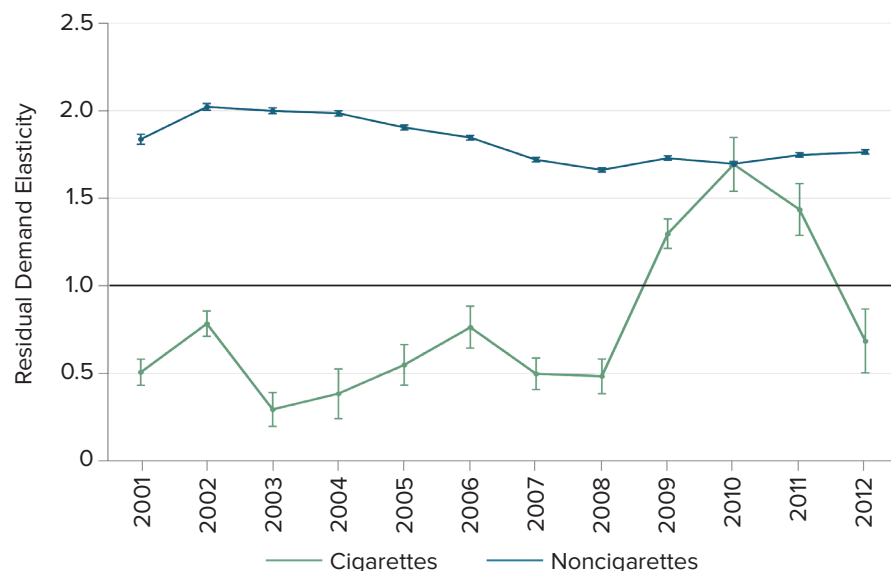
and the other is a bit farther away, and the fact that one is a Walmart and the other a Safeway, mean that the product is not quite the same. As a result, even if Walmart sells its cigarettes at a slightly lower price, the customer may choose to go to Safeway instead, either because it is closer or because the consumer prefers shopping there. Stores therefore have local market power, meaning that Walmart will neither lose all its customers to Safeway when Walmart increases the price of a pack of Marlboro cigarettes, nor will Walmart be able to pull in all the Safeway customers when it reduces the price it charges. Instead, the specific change in the quantity of cigarette packs sold will determine how both stores set their prices.

Responsiveness or Elasticity: A Big Data Approach

Economists call the sensitivity of the quantity sold of a given good to its price the elasticity (or price elasticity of demand). When the item's price goes up by one percent, if the quantity sold goes down by less than one percent the good is said to be inelastic (not very responsive to price changes). If the quantity sold decreases by more than one percent, the good is said to be elastic (or quite responsive to price changes).

It is not that straightforward to estimate elasticities. The classic and well-known difficulty in estimating price elasticities is that one can only observe the market price of a good and the quantity sold. One cannot observe the reason for the change in quantity. When the quantity of cigarettes sold increases, there are two main reasons why this can happen. It is possible that demand for cigarettes

Figure 1. Estimates of Store-Residual-Demand Elasticities for Groceries: Cigarettes and Other Products (Noncigarettes)



Notes: We plot point estimates and 95% confidence interval bands. Elasticities above one are referred to as elastic (more responsive to price changes); elasticities below one are referred to as inelastic (less responsive to price changes). Each store's residual demand elasticity is weighted by the reciprocal of its estimated standard error.

has increased because people have decided that they would like to smoke more (demand has increased). But it is also possible that the cost of producing cigarettes has decreased, so stores can sell them at a lower price (supply has increased). In short, there may be shocks either to demand or to supply, and thus to costs.

Famously, Jerry Hausman came up with an ingenious trick to effectively deal with this issue when estimating price responsiveness. His idea was to pair two markets, for example Sacramento and San Francisco, and exploit the fact that supply shocks will affect both markets. Demand for cigarettes may vary week to week, and we can capture that in our empirical estimation strategy. At the same time, demand may depend on the specific type of store—e.g., Walmart or Safeway—that is selling cigarettes; we can capture that, too. Also, we can capture that smokers in a given region like some brands more than others. All that is left is to find some way to identify changes in cost to specific types of cigarettes. For that, we can use the price in the other market. That is, we

can use Marlboro and Camel cigarette prices in Sacramento to measure (what economists call “instrument for”) cost shocks that have hit the entire market and therefore will also affect San Francisco. Using this technique, we can estimate elasticities for cigarettes and for all other goods. And using those estimated elasticities, we can spot trends as well as cyclical variation.

Importantly, what we estimate here is how responsive the demand is to price changes at a particular store. This elasticity is called the “residual demand elasticity” to emphasize that it captures whether or not a consumer will purchase the pack of Marlboro cigarettes at Safeway, not whether or not the customer will buy cigarettes at all. But it is this elasticity that is relevant when Safeway is setting its prices. After all, for Safeway, losing a customer to Walmart is the same as the customer not buying any cigarettes.

Elasticities Have Increased for Cigarettes and Decreased for Other Goods

For many years now, price responsiveness has generally decreased, though

it started as highly responsive. Based on stores' weekly sales data from 2000–2012, for 31 goods in 26 markets (including New York, Atlanta, Chicago, and Los Angeles), price elasticities have declined. The noncigarette goods include a variety of standard items, such as paper towels, shampoo, toothpaste, hot dogs, soup, milk, coffee, beer, and yogurt. The relative weights are determined by how precisely we can estimate price sensitivity. We confirmed that the pattern in elasticity over time is not driven by changes in which goods receive more or less weight. In fact, weights across goods are quite similar; they range from 1.8–5.1%, and one half of the noncigarette goods have average weights between 2.7% and 3.8%. There is also quite little variation in the weights of each good over time (the average standard deviation over the sample period is 0.3%). Figure 1 plots noncigarette elasticities (the top line), which shows a small but pronounced decline over time.

What might be causing this declining residual elasticity? One possibility is that consumers have less ability to shop around for the best price, perhaps because they have less time or because there are fewer stores to choose from. In effect, stores appear to have increased their local market power and per-unit raw profit (what is generally referred to as the markup).

However, this same trend is not present for cigarettes, which are also shown in Figure 1. Instead, cigarettes have become relatively more price sensitive, though they started from a much lower base level. Even more noticeable than the overall increase in price sensitivity of cigarettes is the very large increase in 2009 and 2010, during and after what many refer to as the Great Recession. In the aftermath of the 2008 housing market mortgage and financial crisis, consumers of cigarettes became much more price sensitive. There was also a strong increase,

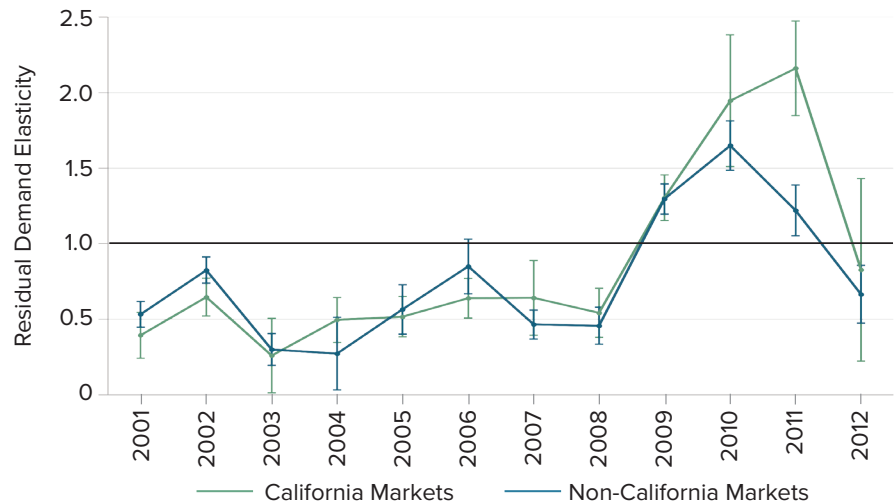
though smaller, in 2001–2002 when there was also a recession after the burst of the dot-com bubble. Elasticity increased from 0.5 in 2001 to 0.8 in 2002 and flipped from being inelastic at 0.5 in 2008 to elastic at 1.7 in 2010. After the end of the 2008/09 recession the estimate then declined, nearly reaching its pre-recession level.

It is striking how much more volatile the elasticity is for cigarettes compared to other goods. One reason is that the elasticity for all other goods is an average across the remaining 30 categories. But it is also the case that out of all 31 goods, cigarette elasticities vary the most over time. The standard deviation is 0.45, which is much higher than the mean standard deviation across goods of 0.24.

One interpretation of our findings is that consumers, when purchasing cigarettes, stick to their local store during normal times, when unemployment is low and there is little uncertainty. During those times (2003–2008) we find that demand for cigarettes is quite inelastic (the average is close to 0.5), consistent with the general view of little price sensitivity and perhaps measuring overall demand elasticity. However, when a shock hits the economy, unemployment is elevated, and there is increased uncertainty and a resulting desire to save, consumers start shopping around more and may switch where they buy cigarettes. Demand then becomes temporarily much more sensitive to price. Indeed, we notice a small increase in the non-cigarette (all other product) elasticity during the 2001–2002 and 2008–2009 recessions, though the effect for cigarettes is much stronger.

Unfortunately, these results are based on a data set that ends in 2012, though it is one that includes two recessions. It is likely that our results extend to the recent pandemic experience and the associated 2020 recession. Consumers most likely became much

Figure 2. Estimates of Store-Residual-Demand Elasticity of Cigarettes: California Versus Non-California Markets



Notes: We plot point estimates and 95% confidence interval bands. Methodology is the same as for Figure 1.

more price sensitive when unemployment, uncertainty, and desired savings increased in 2020.

In California, the increase in elasticity is even more pronounced and follows a slightly different path. Figure 2 shows the cigarette price sensitivity for California and the rest of the country. From 2010–2011 there was an increase in price sensitivity in California, while the sensitivity decreased in the rest of the country.

Implications

Estimates of residual demand elasticities are relevant for store managers, state officials, and regulators. More responsiveness to prices means that stores need to think carefully about their price-setting strategy: small changes in price may result in large changes in demand. We show that, while other products became slightly less sensitive to prices, cigarettes became much more sensitive and that sensitivity increased during recessions. When setting prices, stores should therefore pay close attention both to the specific good, as well as to overall market conditions, keeping in mind that if a lot of consumers are eager to save, demand may become more responsive to price.

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For additional information, the authors recommend:

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