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THE “AMAZON TAX”:  
EMPIRICAL EVIDENCE FROM AMAZON AND MAIN STREET RETAILERS

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**ABSTRACT**

Several states have recently implemented laws requiring the collection of sales tax on online purchases. In practice, however, only Amazon.com has been affected. We find that households living in these states reduce Amazon expenditures by 9.5%, implying an elasticity of  $-1.3$ . We find the effect to be more pronounced for large purchases, for which we estimate an elasticity of  $-3.2$ . Further, we find that the decline in Amazon purchases is offset by a 2.0% increase in purchases at local brick-and-mortar retailers and a 19.8% increase in purchases at the online operations of competing retailers.

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## 1 Introduction

Over the past decade, online retail transactions have increased dramatically in volume. Many factors have contributed to this growth in online sales, one of which is that out-of-state online retailers do not charge sales tax, which has generally given them a price advantage over retailers with a presence in the state. This sales tax collection loophole has not gone unnoticed by state governments or by competing retailers. Because the tax-advantaged status of online retailers could reduce the demand for local retailers, state governments are concerned about depressed local employment and eroded income tax revenues. Many states have responded by adopting laws commonly referred to as an “Amazon Tax.” Though the laws are written generally to apply to all online retailers, Amazon is usually the only retailer to have been affected by such laws because it dominates the online retail space. Previous empirical work shows that consumers are sensitive to prices and to sales tax, especially in the online retail arena (e.g., Agarwal, Chomsisengphet, Ho, and Qian 2013, and Einav, Knoepfle, Levin, and Sundaresan 2014), yet little empirical evidence has been gathered about the effects of wide implementation of such a tax on online and brick-and-mortar retail. As more and more states begin to implement Amazon Tax laws, it is important to study their effects on the Internet and local retail landscapes.

In this study, we focus on five states—California, New Jersey, Pennsylvania, Texas, and Virginia—that began a permanent collection of taxes on Amazon purchases between 2012 and 2013. We analyze the impact of the tax on Internet commerce as well as on brick-and-mortar retail activity. Our dataset contains high-frequency household-level transaction data for 3 million households, allowing us to closely examine consumers’ purchase behavior around the introduction of the tax. Our results shed light on the effects of the Amazon Tax on the demand for Amazon products as well as the demand for products sold by local competitors.

State governments have increased their attention to the issue of sales tax collection in light of the Great Recession and the recent growth in online retail volume. General sales taxes represent an important part of state revenue: for example, in 2011, the collection of general sales tax constituted 10.4% of revenues. Figure 1 shows that the importance of this tax varies considerably across states, ranging from 0% of state revenues in states without sales tax (such as Oregon and Alaska) to as high as 21.0% of state revenues for Washington.<sup>1</sup> Recently, the issue has received federal attention. The Marketplace Fairness Act of 2013, which would enable all

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<sup>1</sup> 2011 U.S. Census Annual Survey of State & Local Government Finance: <https://www.census.gov/govs/local/>

states to collect sales tax on purchases made from out-of-state retailers, has been approved by the Senate and is currently being debated in the House of Representatives.<sup>2</sup> The recent recession has added fuel to the debate: proponents of the online sales tax collection bill often tout the elimination of the Internet retailer sales tax advantage as “leveling the playing field” and helping to restore business and jobs to local economies.

Online retailers that are not required to collect sales tax enjoy a price advantage. As a result, we hypothesize that the introduction of the Amazon Tax would lead to a decline in Amazon’s sales and substitution to alternative retailers. With effective sales tax rates as high as 10% in some jurisdictions (after accounting for state, county, and city taxes), this price advantage can be sizable. Gene DeFelice, vice president of Barnes and Noble, the largest book retailer in the United States, summarized the issue succinctly: “We are at a serious competitive disadvantage against out-of-state, online retailers who pay no taxes.”<sup>3</sup> An additional factor that is likely to facilitate customer migration from Amazon to alternative outlets is the low search cost of online shopping.

Our results show that the introduction of the Amazon Tax resulted in a large decline across all states of 9.5% in the value of products (net of sales tax) purchased on Amazon. Given that sales tax rates in the affected states vary from 5.0% (Virginia) to 8.2% (California), we calculate that the elasticity is  $-1.3$ . The magnitude of the elasticity is similar to that documented by Einav, Knoepfle, Levin, and Sundaresan (2014) of  $-1.7$ . We rule out the possibility that this result is due to an anticipation effect (i.e., buyers temporarily increase purchases just before the implementation of the tax). In fact, the magnitude of the effect increases as we increase the window around the tax implementation date, suggesting that the decrease in Amazon sales is not driven by a temporary acceleration of purchases prior to the implementation of the law.

We next investigate whether consumers decreased their gross spending (including taxes) on Amazon. Our results show that the total dollar amount spent on Amazon, including taxes, decreased by 2.8% in the wake of the law’s implementation.

We also look at whether the reduction in Amazon purchases is driven by larger purchases, as consumers would garner the greatest savings by avoiding tax on such purchases. We find strong evidence that the effect of the Amazon Tax increases with the size of the

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<sup>2</sup> The text and status of the bill are found here: <https://www.govtrack.us/congress/bills/113/s743>

<sup>3</sup> <http://articles.latimes.com/2011/jan/20/business/la-fi-internet-tax-20110120>

purchase, suggesting that households are particularly likely to utilize Internet shopping to avoid sales tax for large purchases. Consumers decrease their spending by 15.5% on purchases larger than \$150, and by 23.8% on purchases equal to or larger than \$300. These figures imply elasticities of  $-2.1$  and  $-3.2$ , respectively.

We next examine whether the decline in demand for Amazon products extends beyond average spending to the likelihood of shopping at Amazon during any particular week. We find that the likelihood of doing so in any given week declined by 0.7 percentage points, representing a relative decline of 3.7%. Similarly, we look at the frequency of purchases and find that the number of transactions per week declined by 4.2% following implementation of the tax.

Finally, we explore whether households substitute away from Amazon to competing retailers, whether brick-and-mortar or online. We document a 19.8% increase in purchases at the online operations of competing retailers. We also find a 2.0% increase in local brick-and-mortar expenditures at these retailers. When we look at large purchases, the substitution effect is more pronounced. For purchases over \$300, we find a 23.7% increase in purchases at other online retailers and a 6.5% increase in purchases at local brick-and-mortar retailers. When we look at the sales of Amazon Marketplace merchants, who are generally not subject to the Amazon Tax, the large sales ( $\geq \$300$ ) of these retailers increase by 60.5% after the tax goes into effect. We conclude that to a small degree, the tax legislation achieved its objective of restoring retail activity to local communities, though most of the gains in “leveling the playing field” are garnered by the online operations of retailers.

Overall, our study shows that Amazon experiences a decline in sales following the implementation of an Amazon Tax. Households substitute Amazon with other retailers: either online retailers who are exempt from collecting sales tax, or in-state retailers (online and brick-and-mortar).

Our work is related to two recent strands of the literature. First, several empirical studies have documented that consumers are price and tax sensitive, and thus attempt to avoid sales taxes. Poterba (1996) and Besely and Rosen (1999) find that price levels in locations with high sales tax are lower than those in locations with lower sales tax. Agarwal, Chomsisengphet, Ho, and Qian (2013) find that consumers who live near state borders often shop in the neighboring state when there are positive sales tax differences. Agarwal, Marwell, and McGranahan (2013) show that consumers increase their purchases during sales tax holidays. Chetty, Looney, and

Kroft (2009) use an experimental setting to show that sales tax that is salient to consumers reduces the demand for the product.

Second, several studies explore the sensitivity to sales tax in the specific context of online retail. Goolsbee (2000a, 2000b) uses survey data to estimate that the number of online shoppers would drop by 24% if the tax-advantaged status of Internet retailers were removed. Alm and Melnik (2005), Ballard and Lee (2007), and Scanlan (2007) address the question as well, though they find smaller magnitudes for the effect. Goolsbee, Lovenheim, and Slemrod (2010) ascertain that the penetration of the Internet is correlated with lower sensitivity of cigarette sales to local taxes, suggesting that smokers use the Internet to purchase tax-free cigarettes. Ellison and Ellison (2009) explore the price elasticity of memory modules sold by a particular retailer and determine that consumers are price sensitive both to net prices and to state taxes. Einav, Knoepfle, Levin, and Sundaresan (2014) document a strong preference among eBay customers for out-of-state sellers, for whom sales taxes do not apply. Anderson, Fong, Simester, and Tucker (2010) show that when retail chains open their first store in a new state, they experience a decline in their Internet sales shipped to that state because of the sales tax, but the researchers find no similar effect on catalog sales.

## **2 Background and Empirical Setting**

Sales tax is not collected on purchases from online retailers due to the Commerce Clause in the U.S. Constitution. Current interpretation of the law, which has been consistently upheld by the U.S. Supreme Court, is that online retailers must only collect sales tax on out-of-state purchases if the retailer has a nexus (or a substantial physical presence) in the state. Due to the nature of their business structure, online retailers have a physical presence in very few states. Ten years ago, Amazon would have been required only to collect sales taxes in states in which it had a nexus (for example, its headquarters and fulfillment centers).

In recent years, states have attempted to collect sales taxes by broadening the definition of a nexus. Legislation by these states has defined the presence of affiliate programs to constitute a nexus.<sup>4</sup> Though this legislation has proven to be constitutional, the effectiveness of this method

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<sup>4</sup> Online retailers such as Amazon and Overstock will often advertise on websites such as blogs. If a blog reader clicks on the advertisement and subsequently purchases the Amazon product, the website owner will receive a commission on the sale. These website owners who allow Amazon to advertise on their websites are referred to as affiliates.

of tax collection has been mixed. Overstock.com, for example, has responded to these laws by simply dropping its affiliates in these states. Amazon has acted similarly in some states, but has chosen to accede to the Amazon Tax laws due to various political and operational issues in other states. As of January 2014, Amazon collects sales tax for 19 states, comprising more than half of the U.S. population. Over our sample period, five states implemented “Amazon Tax” laws, resulting in the beginning of sales tax collection at well-defined dates for each of these states. (Subsequently, many more states have already or are scheduled to follow suit.) Our difference-in-differences study relies on this change in tax policy over time for these five states, relative to the control group of the 45 states that did not change tax policy over this time period.

Our study investigates the impact of the Amazon Tax in five states in which Amazon started collecting sales taxes during 2012 and 2013. These states are Texas, Pennsylvania, California, New Jersey, and Virginia, which began implementation on 7/1/2012, 9/2/2012, 9/16/2012, 7/1/2013, and 9/1/2013, respectively. Our sample consists of 2.8 million households living throughout the United States. We employ a simple difference-in-differences empirical design to estimate the effects of the tax on Amazon purchases. We also use a matching procedure to investigate how the law affects substitution to other retailers.

Our estimation could be biased due to the violation of the parallel trends assumption if Amazon charges different prices to different states in reaction to the introduction of sales taxes. Though some online retailers are known to engage in price discrimination, we doubt that this is the case for Amazon during our sample period. After a controversy regarding price discrimination in 2000, Amazon has declared that it has not and will not use demographic information to differentiate prices.<sup>5</sup>

Another concern with our setting is that many states require that households pay sales taxes that are not collected at the time of purchase. These taxes are referred to as “use taxes” and are collected by states annually at the time of tax filing. However, compliance with this use tax has been abysmal. Manzi (2012) finds that only 22 states have “use tax” provisions in their state income tax forms and that the vast majority of households residing in these states do not report any “use tax” liability. For example, only 0.2% of households in Rhode Island report any use

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<sup>5</sup> In 2000, there was a controversy surrounding Amazon when a user found that the prices for DVDs dropped after deleting cookies on his web browser. Jeff Bezos, the CEO of Amazon, responded to the incident by confirming that the company would not utilize demographic information to differentiate prices. Following the incident, Amazon refunded an average of \$3 to the 6,896 customers involved in the experiment, and the company announced a new policy that if it ever again tests differential pricing, it will subsequently charge all buyers the lowest price.

taxes, and only 0.3% of households in California and New Jersey report use taxes. However, some states have higher participation rates, such as Vermont and Maine, with 7.9% and 9.8% of households in each state reporting use taxes, respectively. Unlike income tax reporting, there are weak systems in place to track and enforce collection of these sales taxes.<sup>6</sup> It is also worth noting, that these figures do not necessarily represent the percentage of compliance with the law. The quoted numbers do not account for underreporting of use taxes conditional on reporting a use tax liability.

Anecdotal evidence presented in Figure 2 shows several Amazon reviews in which buyers specifically mention the sales tax savings as one of the primary drivers to purchase online. Further, several websites exist that allow users to search for the total price of a product, including any shipping or tax charges in addition to the base price. Figure 3 shows a screenshot of one such tools, Google Products, which allows users to sort on total price so they can take into consideration whether the retailer collects sales tax.

### **3 Data**

Our data consist of daily transactions for 2,807,476 households from January 1, 2012 to December 31, 2013, and include both banking (i.e., checking, savings, and debit card) and credit card transactions. We observe the date, amount, and description of each transaction. Thus, our dataset contains transaction-level data similar to those typically found on monthly bank or credit card statements. Because each household is assigned a unique identifier, we are able to follow each household through time.

To keep our sample balanced, we require households to have at least 10 transactions each month from January 2012 to December 2013. After applying this requirement, our sample consists of 1,680,242 households.

Identifying the city of residence of the household is integral to our analysis, because this allows us to determine whether the household lived in one of the five treatment states that was affected by an Amazon Tax. To estimate the city and state of residence for each household, we count the number of gas, grocery, restaurant, and retail transactions for which the city and state

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<sup>6</sup> For example, Colorado's version of the Amazon Tax legislation tried to force online retailers to report to both customers and the state tax authority summaries of use tax incurred, but it was later declared unconstitutional by the District Court. However, Amazon makes annual spending reports available to residents of South Carolina and Tennessee to aid households in tax filing, though this information is not reported to state tax authorities by Amazon.



information can be identified. For each expenditure category, we count the city and state that occurs most often. We then assign the residence of the household to the most frequently found residence among all of the categories. If we do not find a residence for a household, we eliminate it from our sample. After applying this filter, our sample consists of 1,390,018 households, 515,088 of which live in one of the five states that implemented an Amazon Tax over our sample period (146,038 in Texas, 17,732 in Pennsylvania, 251,261 in California, 36,400 in New Jersey, and 63,657 in Virginia).

The majority of our analysis focuses on Amazon transactions, which we identify by querying for the word “Amazon” in the transaction descriptions.<sup>7</sup> We conclude our study by investigating how competing retail sales are affected by the Amazon Tax. To address the issue of substitution, we first need to identify an appropriate comparison group of retailers that are reasonable substitutes for Amazon. Amazon is frequently referred to as “The Everything Store” because of its reputation for selling a wide variety of products; thus, finding comparable retailers as substitutes is somewhat challenging. To overcome this problem, we use the top 25 retailers provided by *Stores Magazine* and remove grocery stores and drug stores, neither of which are currently viable substitutes for Amazon. Further, we perform keyword searches on the description of each transaction to identify the relevant retailers of interest and whether the transaction occurred through a brick-and-mortar store or online.<sup>8</sup> To reduce the effect of outliers and miscategorization, we remove transactions over \$5,000 in value (for example, several of the transactions over \$5,000 were stock purchases for the given retailer).

The unit of observation in our analyses is the household-week. For each household-week, we sum all expenditures for each of the retailers. To mitigate the effect of outliers, we winsorize weekly transaction totals at the 99% level. Further, we create an indicator of whether there was any purchase on Amazon, and a count variable that measures the number of transactions via Amazon per week.

For households living in the five treatment states, we are interested in the how the value of the Amazon purchases changes after implementation of the Amazon Tax, so we net adjust the

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<sup>7</sup> Additional rules are specified in Appendix A.

<sup>8</sup> Many of these retailers also are providers of credit cards. To avoid falsely identifying credit card payments as retail purchases in our data, we throw out transactions containing the words PMT, PAYMENT, PYMT, PMTS, or BILL PAY. The one exception to this rule is Amazon Marketplace transactions (which show up as AMAZON MKTPLACE PMTS). Within the set of retail transactions, we identify online transactions as those containing the words “.CO,” “ONLINE,” “INTERNET,” or “COM.” Transactions not identified as online transactions are considered brick-and-mortar transactions. Further rules are outlined in Appendix A.

Amazon expenditure to remove the effect of sales tax by dividing by  $(1 + \text{household's local sales tax rate})$ .

Because implementation of the Amazon Tax should not affect households who do not shop at Amazon, we focus the majority of our analysis on households who spent at least \$100 at Amazon during the first six months of 2012, which is prior to implementation of the Amazon Tax in all five treatment states. Eighteen percent of our sample meets this requirement. After applying this filter, our sample falls to 244,968 households, 89,473 of which live in one of the five states that implemented the Amazon Tax over our sample period (24,360 in Texas, 3,502 in Pennsylvania, 40,488 in California, 6,086 in New Jersey, and 15,037 in Virginia).

Due to the nature of the substitution analysis presented in Section 5, we impose a different set of filters to generate that subsample. We detail the formation of this sample in Section 5.

Summary statistics of weekly household spending are presented in Table 1. Panel A shows the average weekly spending and likelihood of shopping at Amazon for the 12 weeks before and after the Amazon Tax is implemented in a given state. In general, households seem to be increasing the dollar amount and the likelihood of shopping at Amazon, though the increase appears to be stronger for the control group. Panel B shows the average spending at competing retailers in the 24 weeks surrounding the implementation of the Amazon Tax. The increase in spending at competing retailers in the control states is similar to that of the treatment states, making it difficult to estimate the substitution effects to competing retailers of the Amazon Tax from the summarized data. We analyze this formally in the subsequent sections.

#### **4 Empirical Analysis: The Effect of the Amazon Tax on Amazon Sales**

In this section, we examine the effects of the Amazon Tax on Amazon's sales in the treated states and compare them to the sales in states that did not change their laws. We perform this analysis in several forms: dollars adjusted for the increase in the gross price, raw dollars, likelihood to shop at Amazon, and the number of weekly purchases at Amazon.

We use a difference-in-differences methodology in which we measure the consumption effects after states start imposing sales tax on Amazon purchases. We create an *After transition* dummy variable, which takes a value of one if the week falls after the Amazon Tax implementation and zero otherwise. We also create an *Affected state* dummy variable, which

takes a value of one if the household resides in one of the five states that began to impose the tax during the 2012–2013 time period. The interaction term, *After transition* × *Affected state*, takes a value of one for households residing in one of the affected states in the household-weeks after implementation of the Amazon Tax. Our basic empirical specification is

$$Y_{ht} = \beta_0 + \beta_1 * \textit{After transition}_t \times \textit{Affected state}_h + \\ + \textit{Week Fixed Effects} + \textit{Household Fixed Effects} + \varepsilon_{ht}$$

$Y_{ht}$  is the dependent variable of interest and takes on the value of weekly Amazon expenditures (both raw dollars or dollars netted of the tax amount – by dividing by  $(1 + \tau_h)$  in the case that *After transition* × *Affected state* = 1), a dummy indicating whether the household purchased from Amazon in a given week, or the quantity of purchases from Amazon in a given week (winsorized at 7 purchases per week to reduce the effect of outliers). To determine whether large purchases are more sensitive to the law change,  $Y_{ht}$  takes the sum of weekly Amazon expenditures for the subset of purchases that are over \$150 and \$300.

#### 4.1 Average Value of Purchased Goods (Adjusted Dollar Amounts)

We begin our analysis by examining whether the average weekly amount that households spend on Amazon changes as a result of the new sales tax. For each treated state, we form an observation window around the implementation date: 12, 8, and 4 weeks before and after implementation of the sales tax. For each household in the sample, we aggregate the dollar amount spent on Amazon products within each week. Because we are interested in the value of the purchases for the household, we net the sales tax when it applies. (In Table 3, we provide a robustness test that does not remove the taxes.)

Our sample is composed of a treatment and a control group. The treatment group contains households that are in one of the five states in which the tax was implemented over our sample period. The control group contains the 45 other states that did not initiate an Amazon Tax during our sample period. Because the Amazon Tax should only affect Amazon customers, we begin by comparing the behavior of Amazon shoppers in treatment states to that of Amazon shoppers in control states. To be considered an Amazon shopper, we require the household to have spent at least \$100 at Amazon in the first 26 weeks of 2012. As explained above, the empirical specification is difference in differences, and we regress the weekly spending amount on a post-implementation dummy interacted with a dummy for an affected state. In this specification we

also include both household and week fixed effects. The interaction flags the subset of the sample subject to the tax change. We do not need to account for state fixed effects because household fixed effects are collinear with state fixed effects.

Table 2 presents the results of this analysis. In Panel A, Columns (1) to (5), we present the results for a window of  $\pm 12$  weeks. The regressions produce negative coefficients that are statistically significant for all interaction variables, meaning that households in affected states reduced their shopping amounts at Amazon across the board. The economic magnitude of the effects are meaningful: households reduced their consumption by 11.0% in Texas, 6.8% in Pennsylvania, 14.7% in California, 7.8% in New Jersey, and 3.4% in Virginia.

Based on our regressions, we can estimate the price elasticity as the change in demand ( $\Delta Q$ ) scaled by the change in price ( $\Delta P$ ), i.e., the tax rate. Our state-level estimates range between  $-0.7$  and  $-1.8$ , and the median is  $-1.1$ . These magnitudes are consistent with previous literature. For example, Einav, Knoepfle, Levin, and Sundaresan (2014) estimated the elasticity to sales tax as  $-1.7$ , slightly larger than our estimated effects.

In Panels B and C, we reduce the window to  $\pm 8$  weeks and  $\pm 4$  weeks, respectively. The statistical and economic significance is similar across specifications, indicating that our results are not driven by households accelerating their purchases in the weeks before the Amazon Tax is implemented.

To further assess whether the results are driven by short-term acceleration of purchases, we introduce an alternative specification that uses our entire sample period. This specification includes all five states that implemented the Amazon Tax (Panel A, Column (6)). Due to the large sample (more than 26 million household-week observations), the statistical power is very large for the variable of interest ( $t = 23.8$ ). This regression estimates that the average decline in Amazon purchases after the implementation of the tax is 9.5%, implying an elasticity of  $-1.3$ . The results are consistent with a structural change in the shopping behavior of households after the tax is implemented.

## **4.2 Average Spending (Unadjusted Dollar Amounts)**

In Table 2, we look at the sales amount net of taxes, because we were interested in measuring the change in the value of goods that are purchased by households following implementation of the tax. Next, we rerun the same analysis without adjusting the sales amounts.

This analysis examines whether households spend less money overall at Amazon (including taxes) when the Amazon Tax is in effect.

This analysis also addresses the potential concern of misidentification of state of residence. If a household lives in Nebraska and spends \$100 per week on Amazon but we mistakenly identify the state of residence as the treatment state of Virginia, we would erroneously adjust the Nebraska household's Amazon expenditures by 5% after Virginia implements the Amazon Tax to remove (nonexistent) sales tax charges. Thus, we would regard the household as spending \$95, corresponding to an elasticity of  $-1$ . We find this scenario extremely unlikely due to the very conservative requirements imposed in our algorithm to identify the household's city of residence. Nonetheless, this section and Section 4.4, which investigates the likelihood and frequency of Amazon purchases, help mitigate this concern.

In Table 3, we repeat the main tests of Table 2 using as the dependent variable the raw Amazon expenditure dollar amount, unadjusted for taxes. We observe a statistically significant reduction in the raw dollars of 4.9% and 7.1% for Texas and California, respectively. The coefficients from the other three states are not statistically different from zero. However, when we pool the results as in Table 2, we find that the overall spending among households in the treated states falls by 2.8%, which is statistically significant at the 1% level. This reduction in raw spending implies an elasticity of  $-0.4$ .

### **4.3 Is the Effect Different for Large Purchases?**

Given that the amount of sales tax charged on an item is proportional to its price, the amount of sales tax saved increases with the size of the purchase. For example, consider a household living in California, where the sales tax rate is 10%. If the household were to purchase a \$10 item at a local brick-and-mortar retailer (or from the website of a national retailer), it would result in a \$1 sales tax charge. Similarly, the purchase of a \$1,000 item would result in a \$100 sales tax charge. Clearly, prior to implementation of the Amazon Tax, this household would avoid more in sales taxes by purchasing the \$1,000 item online as opposed to the \$10 item. However, after implementation of the Amazon Tax, the tax avoidance incentive to make large purchases online is removed, and any observed change in behavior surrounding this event could be attributed to the Amazon Tax.

We test this prediction in Table 4, where we repeat the base regressions (from Table 2) with samples that are limited to purchases equal to or greater than \$150 (Panel A) or \$300 (Panel B) for a  $\pm 12$ -week window. Specifically, the dependent variable takes the value of the adjusted dollar Amazon expenditure for transactions that are equal to or greater than \$150 (Panel A) or \$300 (Panel B), and zero otherwise. Consistent with the prediction, Columns (1) to (5) show that the decrease in purchases is stronger for larger purchases.<sup>9</sup> Purchases greater than \$150 exhibit a decline of 8.8% (Virginia) to 22.9% (California). The elasticity for such purchases ranges from  $-1.8$  (Virginia) to  $-2.8$  (California), with a median elasticity of  $-2.0$ . Purchases greater than \$300 exhibit a decline of 11.1% (Virginia) to 32.5% (California). The elasticity for such purchases ranges from  $-2.1$  (New Jersey) to  $-4.0$  (California), with a median elasticity of  $-2.5$ .

We also conduct a pooled regression test (Column (6) in both panels), which uses the pooled data for the entire sample period without any windows. For the sample with purchases of \$150 or higher, we document an average decline of 15.5% in purchases and an average elasticity of  $-2.1$ . For the sample with purchases of \$300 or higher, we document an average decline of 23.8% in purchases and an average elasticity of  $-3.2$ .

#### **4.4 Likelihood and Frequency of Shopping at Amazon**

Next, we investigate whether the decline in spending is due to substitution to less expensive products within Amazon or simply a complete avoidance of Amazon, i.e., whether the tax affected the likelihood of shopping. Our specification is similar to the previous one; here we regress an indicator as to whether households shopped at all on Amazon in a particular week on household and week fixed effects. The variable of interest is, as before, an interaction of post-implementation of the tax and an indicator of whether the state initiated such a tax.

In Table 5, we regress an indicator of whether the household-week contains at least one transaction at Amazon on the household and week fixed effects, in addition to the interaction between the post-implementation period and an indicator of whether the state was affected by the tax. The interaction coefficient is statistically significant and negative for two of the five states over the  $\pm 12$ -week window. When we pool the observations across states and use the entire sample period in Column (6), we find an average reduction of 3.7% in the likelihood of shopping,

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<sup>9</sup> We note that the sample mean is relatively small because in most household-weeks, there are no purchases greater than \$150, in which case the dependent variable is set to zero.

and an elasticity of  $-0.5$  at Amazon in a given week following implementation of an Amazon Tax. Our findings are similar to those of Alm and Melnik (2005) and Ballard and Lee (2007), who estimate the elasticity of the probability of online purchases to sales tax to be 0.5 and 0.2, respectively. Our figure is much smaller than that found by Goolsbee (2000a), who estimates the elasticity to be around 2.3, which is more than four times larger than our estimate.

In Table 6, we examine the frequency of shopping at Amazon. Here, the dependent variable is the number of purchases per week (instead of a dummy, as in Table 5), which we winsorize at 7 purchases per week. Similar to Table 5, we observe a statistically significant decrease in the frequency of Amazon purchases in two of the five states over the  $\pm 12$ -week window. When we pool the observations across states and use the entire sample period in Column (6), we find that the average number of purchases in a given week is reduced by 0.01 following the tax law implementation, or a decrease of 4.2% relative to the mean frequency of shopping.

## **5 The Substitution Effect to Other Retailers**

We have shown that Amazon shopping significantly declined following the introduction of the sales tax law. We next explore whether competing retailers benefited from the reduction in Amazon sales. As competitors, we use the top 25 retailers listed by *Stores Magazine*, excluding grocery stores and drug stores. We then examine whether there were any changes in the 4 groups of competing retailers, the sum of online and brick-and-mortar sales at the top 25 retailers, the online sales of these retailers, the brick-and-mortar sales of these retailers and the sales at Amazon Marketplace.

Our analysis in Section 4 defined the treatment households as those who lived in one of the five states to implement the Amazon Tax over our sample period. An underlying assumption with our analysis is that all households had access to Amazon.com over the sample period and that our results are not driven by changes in access to the website. Given the ubiquity of technology and the Internet over our sample period, we doubt that the observed reduction in Amazon purchases of the treated states relative to control states can be explained by changes in access to technology and the Internet.

In contrast, when evaluating sales substitution to competing retailers such as Walmart, access to the retailer is critical. A household is much more likely to purchase at a competing

retailer if the retailer has a brick-and-mortar location within the household’s city of residence. This is particularly true for the retailers we analyze, whose online sales constitute a very low percentage of their total sales. If we were to apply the same regression specifications as we did in Section 4, it would be difficult to prove that the results were not driven by changes in access to stores, such as the opening (or closing) of a new Walmart store, rather than being driven by changes in the Amazon Tax.

For this reason, we create a sample matched on city of residence to ensure that both the treatment and control groups have the same physical access to the competing retailers. In this setting, the treatment group is the Amazon shoppers (defined again as those households that spent at least \$100 on Amazon during the first six months of 2012), and the control group is the non-Amazon shoppers, or those that spent \$0 on Amazon during the first six months of 2012. Shoppers who spent between \$0 and \$100 at Amazon were dropped from the analysis.

In addition to matching households on city of residence, we further match households on the spending in one of four groups of competing retailers (online & brick-and-mortar, online, brick-and-mortar and Amazon Marketplace). A matched pair of households will have the closest amount spent on the group of retailers, spend at least \$100 in the group of retailers in the first six months of 2012, and the difference in the amount spent in the group of retailers between the matched households should not be larger than \$100. As mentioned above, the treatment group will also have spent \$100 on Amazon.com over the first six months of 2012 (i.e., the *Amazon Shopper* dummy will be 1), whereas the control group will have \$0 in Amazon.com expenditures over the first six months of 2012 (i.e., the *Amazon Shopper* dummy will equal 0).

The empirical specification that we use for substitution is

$$Y_{ht} = \beta_0 + \beta_1 * Amazon Shopper_h \times After Transition_t + \\ + Week Fixed Effects + Household Fixed Effects + \varepsilon_{ht}$$

$Y_{ht}$  is the dependent variable of interest and takes on the value of weekly spending in the category of interest. We first look at the sum of competing retailers after excluding Amazon and Amazon Marketplace. (Amazon Marketplace is explained in more detail in Section 5.4.) We then decompose this group of retailers into online and brick-and-mortar sales, which allows us to better understand the Amazon Tax’s effect on local economies through brick-and-mortar sales. Finally, we look at Amazon Marketplace—which is exempt from the Amazon Tax—as a substitute for Amazon. In order to determine whether the substitution effect is sensitive to the



size of the purchase,  $Y_{ht}$  takes the sum of weekly expenditures for relevant purchases that are over \$300 in Section 5.4.

### **5.1 Overall Substitution Effect to Other Retailers**

We assess how the Amazon Tax affects the sales of competing retailers in Panel A of Table 7. The list of competing retailers consists of Walmart (including Sam's Club), Target, Costco, Home Depot, Lowes, Sears, Best Buy, Macys, Apple, TJ Maxx, Kohls, and TrueValue. We aggregate sales for these retailers for every household-week and analyze whether the Amazon Tax affects the combined sales of this group of retailers. We find a positive and significant substitution effect in Texas and California, corresponding to a 6.5% and 3.5% increase in sales following implementation of the Amazon Tax, respectively. However, we find a negative substitution effect in Virginia, corresponding to a 3.7% reduction in sales following implementation of the Amazon Tax. When we pool all of the states together and use our entire sample period in Column (6), we find a positive and statistically significant substitution effect corresponding to a 3.4% increase in sales of competing retailers following implementation of the Amazon Tax. Overall, these results suggest competing retailers benefited from implementation of the Amazon Tax.

### **5.2 Substitution to Other Online Retailers**

We evaluate how the Amazon Tax affects the online sales of competing retailers in Panel B of Table 7. Because these retailers have physical presence in these states, their online sales were always taxed, unlike Amazon. Thus, when the Amazon Tax is implemented, the sales tax advantage is removed and shoppers are able to purchase from the website of a competing online retailer without facing any tax penalty. As in Panel A, we find a positive substitution effect for the online sales of competing retailers. However, unlike Panel A, the economic magnitudes are very large, corresponding to a statistically significant increase in sales of 27.0% and 23.2% for California and Texas, respectively. When we pool across states and across the entire sample period in Column (6), we estimate a 19.8% increase in the online sales of competing retailers.

### **5.3 Substitution to Brick-and-Mortar Retailers**

We examine the brick-and-mortar operations of these retailers in Panel C of Table 7. We find effects similar to those of Panel A, with positive substitution effects in Texas corresponding to a 5.5% increase in sales after implementation of the Amazon Tax, and a negative substitution effect in Virginia corresponding to a 4.4% reduction in sales. When we pool across states and across the entire sample period in Column (6), we estimate a 2.0% increase in the brick-and-mortar sales of competing retailers.

These results, combined with those of Table 7, Panel B, suggest the gains to leveling the playing field are primarily garnered by the online operations of retailers.

### **5.4 Substitution to Amazon Marketplace**

Next, we look at Amazon Marketplace as a substitute for Amazon. Amazon Marketplace is a collection of retailers that sell products on the Amazon website. Amazon has seamlessly integrated Amazon Marketplace retailers into its website so that users often do not realize that they have purchased from a retailer other than Amazon.com. Figure 4 illustrates how this looks in practice. After searching for an iPad on Amazon.com, the default seller for this particular item is Newhope Dreams, as shown in small print. This particular seller utilizes Amazon's fulfillment services, meaning that Amazon.com handles its inventory and shipping, and the buyers are provided with the identical delivery services that would be provided to Amazon's own customers, such as Amazon Prime delivery. Because the buyer receives a package with an Amazon.com box, it is very hard to differentiate an Amazon Marketplace purchase from an Amazon.com purchase. If the buyer wishes to choose a seller other than the default seller, he or she can select "More buying choices" as shown in the bottom right portion of Figure 4. A user can add one of the visible products directly to his or her cart or click on the "148 used & new" link at the bottom right to get to even more choices. Once she does so, she will arrive at a screen similar to Figure 5 where she can choose among the various retailers. Figure 6 shows an example of a product for which the default seller is Amazon.com, which looks remarkably similar to that shown in Figure 4.

Interestingly, in the vast majority of cases, Amazon Marketplace sellers do not collect sales taxes for residents living in "Amazon Tax" states even though Amazon is required to do

so.<sup>10</sup> Figures 7 and 8 show a sample checkout screen for an identical product for a resident living in California after implementation of the Amazon Tax. Though the two products have identical base prices, the total price of the product sold by Amazon.com is \$251.73 higher than the same product sold by an Amazon Marketplace merchant due to the sales tax.

Given how easy it is for a household living in one of the states to substitute from Amazon.com purchases to Amazon Marketplace purchases for many products, it is an interesting group of retailers to investigate. In Panel D of Table 7, we find economically large and statistically significant increases in Amazon Marketplace sales in Texas and California of 41.4% and 8.3%, respectively. When we pool across states and across the entire sample period in Column (6), we estimate a 15.2% increase in Amazon Marketplace sales, which is similar in magnitude to the substitution effect that we observed for competing retailers' online sales in Panel B.

## **5.5 Substitution of Large Purchases**

Next, we explore substitution for large purchases, as was done in Table 4. As expected, we find the substitution effects to be larger for larger purchases. Our test repeats the analysis in Table 7, except that we set sales below \$300 to zero.

The results of the analysis are presented in Table 8. The overarching result is that the substitution for large purchases is much stronger across all retail platforms. For brevity, we focus on Column (6) in each panel, which contains the results from the pooled regression across all treated states. Table 8, Panel A, shows that Amazon shoppers increase their overall spending for large purchases at other retailers (not including Amazon Marketplace) by 9.2%. This is a large increase relative to the overall increase for the unrestricted sample documented in Table 7, Panel A (3.4%).

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<sup>10</sup> In its terms of service, Amazon clearly states that the tax collection responsibility falls solely on Amazon Marketplace retailers as explained here:

[http://www.amazon.com/gp/help/customer/display.html/ref=hp\\_left\\_cn?ie=UTF8&nodeId=200787200](http://www.amazon.com/gp/help/customer/display.html/ref=hp_left_cn?ie=UTF8&nodeId=200787200)

“You are solely responsible for your use of the tax collection services, including for reviewing and determining the correct product tax codes, collection settings and all related information for your products, and for documenting and paying all taxes to the appropriate taxing authorities for your transactions. Amazon disclaims all responsibility for your use of the tax collection services. Except to the extent Amazon makes specific services available to you: (i) Amazon does not calculate or collect any product-based excise taxes or any fees or surcharges; (ii) Amazon does not provide support for sales or use tax exemptions based upon the identity of any individual, corporation or other entity, or the intended use of a product by any individual, corporation or other entity; and (iii) you are solely responsible for any non-U.S. taxes and duties (including their collection and payment).”

We also observe that the substitution to other online retailers (that always collected sales taxes) is stronger when the purchase amount is higher. Panel B reports an increase of 23.7% in purchases in online sales for large purchases, relative to an increase of 19.8% for all purchases (Table 7, Panel B).

Furthermore, the increase in purchases at brick-and-mortar retailers is more pronounced for large purchases than for the combination of all purchases. Panel C shows that Amazon shoppers increased their brick-and-mortar large purchases by 6.5%, relative to 2.0% for all purchases (Table 7, Panel C).

Finally, Amazon shoppers diverted their large tax-paying Amazon purchases to the tax-exempt Amazon Marketplace. Panel D shows that the sales via Amazon Marketplace increased by 60.5% for the large purchases category, relative to an increase of 15.2% for all purchases (Table 7, Panel D).

Overall, we find that there was statistically and economically significant substitution toward competing retailers after implementation of the Amazon Tax. We find that this substitution effect is concentrated among large purchases and online purchases. Our results suggest that although taxing online retailers would help the local economy by bringing sales to local brick-and-mortar retailers, the substitution effect is more likely to be concentrated among the online operations of the competing retailers.

## **6 Conclusion**

Internet taxation is an important issue that will continue to be debated for years to come. Despite the importance of widespread “Amazon Tax” laws, little is currently known about their effect on the demand for Internet retailers such as Amazon.com and whether the implementation of such laws leads to substitution effects such as bolstering local sales at brick-and-mortar stores when online retailers’ sales tax price advantage is removed.

Using transaction-level data of 1.4 million households, we identify the effects of Amazon Taxes on the purchasing behavior of residents living in five states that adopted such laws over 2012–2013. We find that Amazon sales fall by 9.5% after implementation of an Amazon Tax, corresponding to an elasticity of  $-1.3$ . We find the effect to be more concentrated in large purchases, such as those over \$300. For this subset of purchases, we find that Amazon sales fall by 23.8% after implementation of the Amazon Tax, corresponding to an elasticity of  $-3.2$ . In

addition to reductions in the dollar amounts of Amazon spending, we find a statistically significant reduction in the probability and frequency of Amazon spending.

We document that Amazon shoppers change their purchases to competing platforms. Specifically, we document that forgone Amazon sales shift to both other online retailers and brick-and-mortar retailers. The substitution is especially strong for large purchases of \$300 or higher. While some of the substitution occurs in online retailers and brick-and-mortar retailers who have presence in the effected state, some of the sales shift to Amazon Marketplace, a retail platform that is provided by Amazon for small retailers that remains largely exempt from sales tax. Hence, some of Amazon's forgone sales are channeled to other tax-exempt retailers.

The results suggest that broader and more consistently applied sales tax collection of online purchases, such as those suggested by the Marketplace Fairness Act of 2013, will lead to an increase in the online sales of national retailers while only modestly increasing local brick-and-mortar revenues.

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## Appendix A. Method of Categorizing Transactions

### Retail

- Outflow, and
- Amount over \$0.5 and NOT over \$5,000, and
- Contains one of the following keywords:
  - “wal” and “mart” or “sam”
  - “sam” and “club”
  - “target”
  - “cstco” or “costco”
  - “home” and “dep” or “goods”
  - “lowe’s” or “lowes”
  - “best” and “buy”
  - “sears”
  - “amazon” or “amazon.com”
  - “macys” or “macy\*s” or “macy’s”
  - “kohl”
  - “apple” and “store”
  - “maxx” or “marshalls”
  - “tru” and “val”
- Does NOT contain one of the following keywords:
  - “pmt” but not “marketplace”
  - “payment” but not “marketplace”
  - “pymt” but not “marketplace”
  - “pmts” but not “marketplace”
  - “payments” but not “marketplace”
  - “pymts” but not “marketplace”
  - “bill pay”
  - “paymnt”
  - “paymnts”
  - “gas”
  - “epay”
  - “atm”
  - “telepay”
  - “withdrwl”
  - “withdrawl”
  - “ach”
  - “des:payment”
  - “maxxx”
  - “checkpaymt”
  - “checkpaymt”
  - “brokerage”
  - “:bill pay”
  - “co id:”
  - “co id”
  - “outgoing”
  - “transfer”
  - “wire”
  - “amazon” and “web”
  - “aws.amazon”
  - “amazon” and “p.o.s.”
  - “funds”
  - “banks”
  - “web pymt”
  - “video on demand”
  - “amazon digital svcs”
  - “amazon services kindle”
  - “sears mastercard”
  - “foodmaxx”
  - “itunes”
  - “amazon” and “services”
- Online transactions contain one of the following keywords in the first 50 characters of the description
  - “.co”
  - “online”
  - “internet”
  - “.com”

**Table 1. Average Weekly Expenditures Before and After Sales Tax Change**

This summary table presents sample statistics for various retailers in the +/-12-week window before and after implementation of Amazon Tax laws. We present both the average dollar spending and the likelihood of spending at a particular retailer in a given week. If the transaction occurs after the tax law changes and the household resides in one of the five affected states, we adjust the post-implementation transactions by dividing by (1+local sales tax rate). “Other online retailers” include online transactions from Amazon Marketplace, Walmart (including Sam’s Club), Target, Costco, Home Depot, Lowes, Sears, Best Buy, Macys, Apple, TJ Maxx, Kohls, and TrueValue. “Brick-and-mortar transactions” include brick-and-mortar transactions from Walmart, Target, Costco, Home Depot, Lowes, Sears, Best Buy, Macys, Apple, TJ Maxx, Kohls, and TrueValue.

**Panel A: Univariate weekly Amazon expenditure statistics (dollar means and likelihood)**

|  |                   | States (12-week window) |        |        |        |        |
|--|-------------------|-------------------------|--------|--------|--------|--------|
|  |                   | TX                      | PA     | CA     | NJ     | VA     |
| <b>Average weekly spending on Amazon</b> |                   |                         |        |        |        |        |
| Pre-tax implementation                   | Treated state     | \$2.74                  | \$3.58 | \$3.02 | \$3.72 | \$5.73 |
|  | 45 Control states | \$2.97                  | \$3.07 | \$3.08 | \$3.82 | \$3.97 |
| Post-tax implementation                  | Treated state     | \$2.57                  | \$3.62 | \$3.27 | \$3.57 | \$5.91 |
|  | 45 Control states | \$3.12                  | \$3.31 | \$3.82 | \$4.02 | \$4.26 |
| <b>Likelihood of shopping at Amazon</b>  |                   |                         |        |        |        |        |
| Pre-tax implementation                   | Treated state     | 4.0%                    | 5.2%   | 4.3%   | 5.2%   | 8.2%   |
|  | 45 Control states | 4.4%                    | 4.5%   | 4.5%   | 5.5%   | 5.7%   |
| Post-tax implementation                  | Treated state     | 4.1%                    | 5.7%   | 4.8%   | 5.3%   | 8.6%   |
|  | 45 Control states | 4.6%                    | 4.9%   | 5.3%   | 5.8%   | 6.1%   |

**Panel B: Univariate weekly retail expenditure statistics, excluding Amazon (dollar means)**

|   |                   | States (12-week window) |         |         |         |         |
|---|-------------------|-------------------------|---------|---------|---------|---------|
|   |                   | TX                      | PA      | CA      | NJ      | VA      |
| <b>Average weekly spending at other online retailers (including Amazon Marketplace)</b> |                   |                         |         |         |         |         |
| Pre-tax implementation  | Treated state     | \$74.74                 | \$61.99 | \$57.15 | \$58.83 | \$88.60 |
|   | 45 Control states | \$56.82                 | \$62.60 | \$63.54 | \$70.88 | \$69.83 |
| Post-tax implementation   | Treated state     | \$84.37                 | \$62.20 | \$58.57 | \$55.65 | \$85.37 |
|   | 45 Control states | \$62.96                 | \$62.87 | \$65.19 | \$69.70 | \$67.90 |
| <b>Average weekly spending at brick-and-mortar retailers</b>                            |                   |                         |         |         |         |         |
| Pre-tax implementation  | Treated state     | \$69.83                 | \$56.25 | \$52.10 | \$52.79 | \$80.08 |
|   | 45 Control states | \$51.72                 | \$57.31 | \$58.23 | \$64.70 | \$63.44 |
| Post-tax implementation   | Treated state     | \$79.26                 | \$56.06 | \$52.23 | \$49.38 | \$75.71 |
|   | 45 Control states | \$57.57                 | \$57.23 | \$58.41 | \$63.19 | \$60.62 |



**Table 2. Effect of Amazon Tax on Weekly Amazon Expenditures**

This table explores the effect of the Amazon Tax on weekly Amazon expenditures. Because the Amazon Tax should only affect households that make purchases on Amazon, we require that households make at least \$100 in purchases in the first six months of 2012 (prior to implementation of the Amazon Tax by any of the relevant states). The dependent variable is the sum of all Amazon transactions over the course of a week. If the transaction occurs after the tax law changes and the household resides in one of the five affected states, we adjust the post-law transactions by dividing by (1+local sales tax rate). The regressions employ a difference-in-differences setting in which the control group is the 45 states that did not initiate an Amazon Tax during our sample and the treated groups are the individual states (in Specifications (1) through (5)) or all states combined that implemented the tax over our sample period (Specification (6)). Panels A-C compute the +/-12-, 8-, and 4-week windows surrounding the implementation of the law, respectively. Mean weekly expenditures are provided in each column, as are the average tax rate change for the treated states as well as an estimate of elasticity. All regressions are OLS regressions. Standard errors are clustered at the household level. *t*-statistics are reported in parentheses. \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively.

**Panel A: Effect of Amazon Tax on weekly Amazon expenditures (+/-12-week window)**

| Dependent variable:<br>Sample:<br>State: | Weekly Amazon expenditures (Adjusted for change in sales tax) |                       |                        |                       |                       |                        |
|--|---|-----------------------|------------------------|-----------------------|-----------------------|------------------------|
|  | +/- 12 week window  |                       |                        |                       |                       | Entire sample          |
|  | TX  | PA                    | CA                     | NJ                    | VA                    | TX, PA, CA, NJ, VA     |
|  | (1)   | (2)                   | (3)                    | (4)                   | (5)                   | (6)                    |
| After Transition ×<br>Affected State     | -1.360***<br>(-9.912)   | -0.872***<br>(-2.585) | -1.961***<br>(-16.152) | -0.980***<br>(-3.936) | -0.506***<br>(-2.793) | -1.349***<br>(-23.769) |
| Household Fixed Effect                   | Yes   | Yes                   | Yes                    | Yes                   | Yes                   | Yes                    |
| YYYYWW Fixed Effect                      | Yes   | Yes                   | Yes                    | Yes                   | Yes                   | Yes                    |
| Obs                                      | 4,316,520   | 3,815,928             | 4,703,592              | 3,877,944             | 4,092,768             | 25,721,640             |
| R <sup>2</sup>                           | 0.12  | 0.15                  | 0.15                   | 0.17                  | 0.17                  | 0.10                   |
| Mean for affected state(s)               | \$12.42   | \$12.84               | \$13.36                | \$12.54               | \$14.86               | \$14.13                |
| Coef/Mean                                | -11.0%  | -6.8%                 | -14.7%                 | -7.8%                 | -3.4%                 | -9.5%                  |
| Avg Tax Rate Change                      | 8.0%  | 6.3%                  | 8.2%                   | 7.0%                  | 5.0%                  | 7.4%                   |
| Price elasticity                         | -1.4  | -1.1                  | -1.8                   | -1.1                  | -0.7                  | -1.3                   |

**Table 2. Effect of Amazon Tax on Weekly Amazon Expenditures (Cont.)****Panel B: Effect of Amazon Tax on weekly Amazon expenditures (+/-8 week window)**

| Dependent variable:<br>Sample:<br>State: | Weekly Amazon expenditures (Adjusted for change in sales tax) |                     |                        |                       |                       |
|--|---|---------------------|------------------------|-----------------------|-----------------------|
|  | +/- 8 week window   |                     |                        |                       |                       |
|  | TX  | PA                  | CA                     | NJ                    | VA                    |
|  | (1)   | (2)                 | (3)                    | (4)                   | (5)                   |
| After Transition ×<br>Affected State     | -1.400***<br>(-8.310)   | -0.725*<br>(-1.820) | -1.491***<br>(-11.173) | -0.923***<br>(-3.071) | -0.640***<br>(-3.123) |
| Household Fixed Effect                   | Yes   | Yes                 | Yes                    | Yes                   | Yes                   |
| YYYYWW Fixed Effect                      | Yes   | Yes                 | Yes                    | Yes                   | Yes                   |
| Obs                                      | 2,877,680   | 2,543,952           | 3,135,728              | 2,585,296             | 2,728,512             |
| R <sup>2</sup>                           | 0.15  | 0.18                | 0.18                   | 0.19                  | 0.20                  |
| Mean for affected state                  | \$12.63   | \$12.07             | \$12.52                | \$12.57               | \$14.35               |
| Coef/Mean                                | -11.1%  | -6.0%               | -11.9%                 | -7.3%                 | -4.5%                 |
| Avg Tax Rate Change                      | 8.0%  | 6.3%                | 8.2%                   | 7.0%                  | 5.0%                  |
| Price elasticity                         | -1.4  | -0.9                | -1.5                   | -1.0                  | -0.9                  |

**Panel C: Effect of Amazon Tax on weekly Amazon expenditures (+/-4 week window)**

| Dependent variable:<br>Sample:<br>State: | Weekly Amazon expenditures (Adjusted for change in sales tax) |                      |                       |                      |                       |
|--|---|----------------------|-----------------------|----------------------|-----------------------|
|  | +/- 4 week window   |                      |                       |                      |                       |
|  | TX  | PA                   | CA                    | NJ                   | VA                    |
|  | (1)   | (2)                  | (3)                   | (4)                  | (5)                   |
| After Transition ×<br>Affected State     | -1.466***<br>(-6.080)   | -1.273**<br>(-2.235) | -1.861***<br>(-9.667) | -0.870**<br>(-2.006) | -0.879***<br>(-3.046) |
| Household Fixed Effect                   | Yes   | Yes                  | Yes                   | Yes                  | Yes                   |
| YYYYWW Fixed Effect                      | Yes   | Yes                  | Yes                   | Yes                  | Yes                   |
| Obs                                      | 1,438,840   | 1,271,976            | 1,567,864             | 1,292,648            | 1,364,256             |
| R <sup>2</sup>                           | 0.22  | 0.23                 | 0.25                  | 0.26                 | 0.26                  |
| Mean for affected state                  | \$12.64   | \$12.32              | \$13.30               | \$12.77              | \$14.78               |
| Coef/Mean                                | -11.6%  | -10.3%               | -14.0%                | -6.8%                | -5.9%                 |
| Avg Tax Rate Change                      | 8.0%  | 6.3%                 | 8.2%                  | 7.0%                 | 5.0%                  |
| Price elasticity                         | -1.5  | -1.6                 | -1.7                  | -1.0                 | -1.2                  |

**Table 3. Effect of Amazon Tax on Weekly Amazon Expenditures  
(Unadjusted for Sales Tax Change)**

This table explores the effect of the Amazon Tax on weekly Amazon expenditures. Because the Amazon Tax should only affect households that make purchases on Amazon, we require that households make at least \$100 in purchases in the first six months of 2012 (prior to implementation of the Amazon Tax by any of the relevant states). The dependent variable is the sum of all Amazon transactions over the course of a week. Unlike Table 2, if the transaction occurs after the tax law changes and the household resides in one of the five affected states, we do not adjust the post-law transactions by dividing by (1+local sales tax rate). The regressions employ a difference-in-differences setting in which the control group is the 45 states that did not change their implementation of the Amazon Tax over our sample and the treated groups are the individual states (in Specifications (1) through (5)) or all states combined that implemented the tax over our sample period (Specification (6)). Mean weekly expenditures are provided in each column, as are the average tax rate change for the treated states as well as an estimate of elasticity. All regressions are OLS regressions. Standard errors are clustered at the household level. *t*-statistics are reported in parentheses. \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively.

| Dependent variable:<br>Sample:<br>State: | Weekly Amazon expenditures (Not adjusted for change in sales tax) |                    |                       |                    |                  |                       |
|--|---|--------------------|-----------------------|--------------------|------------------|-----------------------|
|  | +/- 12 week window  |                    |                       |                    |                  | Entire sample         |
|  | TX  | PA                 | CA                    | NJ                 | VA               | TX, PA, CA, NJ, VA    |
|  | (1)   | (2)                | (3)                   | (4)                | (5)              | (6)                   |
| After Transition ×<br>Affected State     | -0.622***<br>(-4.431)   | -0.181<br>(-0.524) | -0.985***<br>(-7.886) | -0.212<br>(-0.830) | 0.186<br>(1.000) | -0.409***<br>(-6.991) |
| Household Fixed Effect                   | Yes   | Yes                | Yes                   | Yes                | Yes              | Yes                   |
| YYYYWW Fixed Effect                      | Yes   | Yes                | Yes                   | Yes                | Yes              | Yes                   |
| Obs                                      | 4,316,520   | 3,815,928          | 4,703,592             | 3,877,944          | 4,092,768        | 25,721,640            |
| R <sup>2</sup>                           | 0.12  | 0.15               | 0.15                  | 0.17               | 0.17             | 0.10                  |
| Mean for affected state(s)               | \$12.79   | \$13.17            | \$13.82               | \$12.94            | \$15.23          | \$14.69               |
| Coef/Mean                                | -4.9%   | -1.4%              | -7.1%                 | -1.6%              | 1.2%             | -2.8%                 |
| Avg Tax Rate Change                      | 8.0%  | 6.3%               | 8.2%                  | 7.0%               | 5.0%             | 7.4%                  |
| Price elasticity                         | -0.6  | -0.2               | -0.9                  | -0.2               | 0.2              | -0.4                  |

**Table 4. Effect of Amazon Tax on Large Amazon Expenditures**

This table explores the effect of the Amazon Tax on large Amazon expenditures. Because the Amazon Tax should only affect households that make purchases on Amazon, we require that households make at least \$100 in purchases in the first six months of 2012 (prior to implementation of the Amazon Tax by any of the relevant states). The dependent variable is the sum of all Amazon large transactions over the course of a week. Panel A looks at transactions over \$150, and Panel B examines transactions over \$300. If the transaction occurs after the tax law changes and if the household resides in one of the five affected states, we adjust the post-law transactions by dividing by (1+local sales tax rate). The regressions employ a difference-in-differences setting in which the control group is the 45 states that did not change their implementation of the Amazon Tax over our sample period, and the treated groups are the individual states (in Specifications (1) through (5)) or all states combined that implemented the tax over our sample period (Specification (6)). We limit observations to a +/-12-week window surrounding the implementation of the law, with the exception of Specification (6), which looks at the whole sample period. All regressions are OLS regressions. Standard errors are clustered at the household level. *t*-statistics are reported in parentheses. \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively.

**Panel A: Effect of Amazon Tax on weekly large (≥\$150) Amazon expenditures**

| Dependent variable:<br>Sample:<br>State: | Weekly Amazon expenditures ≥ \$150 (Adjusted for change in sales tax) |                      |                       |                      |                      |                        |
|--|---|----------------------|-----------------------|----------------------|----------------------|------------------------|
|  | +/- 12 week window  |                      |                       |                      |                      | Entire sample          |
|  | TX  | PA                   | CA                    | NJ                   | VA                   | TX, PA, CA, NJ, VA     |
|  | (1)   | (2)                  | (3)                   | (4)                  | (5)                  | (6)                    |
| After Transition ×<br>Affected State     | -0.708***<br>(-4.571)   | -0.703**<br>(-1.969) | -1.154***<br>(-8.574) | -0.568**<br>(-2.285) | -0.390**<br>(-2.221) | -0.773***<br>(-14.653) |
| Household Fixed Effect                   | Yes   | Yes                  | Yes                   | Yes                  | Yes                  | Yes                    |
| YYYYWW Fixed Effect                      | Yes   | Yes                  | Yes                   | Yes                  | Yes                  | Yes                    |
| Obs                                      | 4,316,520   | 3,815,928            | 4,703,592             | 3,877,944            | 4,092,768            | 25,721,640             |
| R <sup>2</sup>                           | 0.07  | 0.08                 | 0.08                  | 0.08                 | 0.08                 | 0.03                   |
| Mean for affected state(s)               | \$4.79  | \$4.48               | \$5.03                | \$4.15               | \$4.45               | \$4.97                 |
| Coef/Mean                                | -14.8%  | -15.7%               | -22.9%                | -13.7%               | -8.8%                | -15.5%                 |
| Avg Tax Rate Change                      | 8.0%  | 6.3%                 | 8.2%                  | 7.0%                 | 5.0%                 | 7.4%                   |
| Price elasticity                         | -1.9  | -2.5                 | -2.8                  | -2.0                 | -1.8                 | -2.1                   |

**Table 4. Effect of Amazon Tax on Large Amazon Expenditures (Cont.)**

**Panel B: Effect of Amazon Tax on weekly large ( $\geq$ \$300) Amazon expenditures**

| Dependent variable:                         | Weekly Amazon expenditures $\geq$ \$300 (Adjusted for change in sales tax) |                    |                       |                    |                    |                        |
|---|--|--------------------|-----------------------|--------------------|--------------------|------------------------|
|   | +/- 12 week window   |                    |                       |                    |                    | Entire sample          |
| Sample:                                     | TX   | PA                 | CA                    | NJ                 | VA                 | TX, PA, CA, NJ, VA     |
| State:                                      | (1)  | (2)                | (3)                   | (4)                | (5)                | (6)                    |
| After Transition $\times$<br>Affected State | -0.496***<br>(-3.357)  | -0.512<br>(-1.499) | -0.934***<br>(-7.188) | -0.332<br>(-1.469) | -0.242<br>(-1.493) | -0.622***<br>(-12.690) |
| Household Fixed Effect                      | Yes  | Yes                | Yes                   | Yes                | Yes                | Yes                    |
| YYYYWW Fixed Effect                         | Yes  | Yes                | Yes                   | Yes                | Yes                | Yes                    |
| Obs   | 4,316,520  | 3,815,928          | 4,703,592             | 3,877,944          | 4,092,768          | 25,721,640             |
| R <sup>2</sup>                              | 0.07   | 0.07               | 0.07                  | 0.07               | 0.07               | 0.03                   |
| Mean for affected state(s)                  | \$2.49   | \$2.40             | \$2.88                | \$2.22             | \$2.18             | \$2.61                 |
| Coef/Mean                                   | -19.9%   | -21.3%             | -32.5%                | -15.0%             | -11.1%             | -23.8%                 |
| Avg Tax Rate Change                         | 8.0%   | 6.3%               | 8.2%                  | 7.0%               | 5.0%               | 7.4%                   |
| Price elasticity                            | -2.5   | -3.4               | -4.0                  | -2.1               | -2.2               | -3.2                   |

**Table 5. Effect of Amazon Tax on the Likelihood of Purchasing at Amazon**

This table explores the effect of the Amazon Tax on the likelihood of shopping at Amazon. Because the Amazon Tax should only affect households that make purchases on Amazon, we require that households make at least \$100 in purchases in the first six months of 2012 (prior to implementation of the Amazon Tax by any of the relevant states). The dependent variable is a dummy variable equal to 1 if the household purchased at Amazon over the course of the week and 0 otherwise. The regressions employ a difference-in-differences setting in which the control group is the 45 states that did not change their implementation of the Amazon Tax over our sample period, and the treated group is the individual states (in Specifications (1) through (5)) or all states combined that implemented the tax over our sample period (Specification (6)). The mean probability of shopping at Amazon is provided in each column, as are the average tax rate change for the treated states as well as an estimate of elasticity. All regressions are OLS regressions. Standard errors are clustered at the household level. *t*-statistics are reported in parentheses. \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively.

| Dependent variable:<br>Sample:<br>State: | Household shopped at Amazon during the week dummy |                  |                        |                     |                    |                        |
|--|---|------------------|------------------------|---------------------|--------------------|------------------------|
|  | +/- 12 week window                                |                  |                        |                     |                    | Entire sample          |
|  | TX  | PA               | CA                     | NJ                  | VA                 | TX, PA, CA, NJ, VA     |
|  | (1)   | (2)              | (3)                    | (4)                 | (5)                | (6)                    |
| After Transition ×<br>Affected State     | -0.006***<br>(-5.529)                             | 0.000<br>(0.094) | -0.010***<br>(-10.666) | -0.004*<br>(-1.784) | -0.000<br>(-0.109) | -0.007***<br>(-13.637) |
| Household Fixed Effect                   | Yes   | Yes              | Yes                    | Yes                 | Yes                | Yes                    |
| YYYYWW Fixed Effect                      | Yes   | Yes              | Yes                    | Yes                 | Yes                | Yes                    |
| Obs                                      | 4,316,520   | 3,815,928        | 4,703,592              | 3,877,944           | 4,092,768          | 25,721,640             |
| R <sup>2</sup>                           | 0.20  | 0.22             | 0.23                   | 0.25                | 0.25               | 0.17                   |
| Mean for affected state(s)               | 0.17  | 0.18             | 0.18                   | 0.17                | 0.20               | 0.19                   |
| Coef/Mean                                | -3.5%   | 0.0%             | -5.5%                  | -2.3%               | 0.0%               | -3.7%                  |
| Avg Tax Rate Change                      | 8.0%  | 6.3%             | 8.2%                   | 7.0%                | 5.0%               | 7.4%                   |
| Elasticity                               | -0.4  | 0.0              | -0.7                   | -0.3                | 0.0                | -0.5                   |

**Table 6. Effect of Amazon Tax on the Frequency of Amazon Purchases**

This table explores the effect of the Amazon Tax on the frequency of shopping at Amazon. Because the Amazon Tax should only affect households that make purchases on Amazon, we require that households make at least \$100 in purchases in the first six months of 2012 (prior to implementation of the Amazon Tax by any of the relevant states). The dependent variable is the number of times the household purchased at Amazon in a given week. The regressions employ a difference-in-differences setting in which the control group is the 45 states that did not change their implementation of the Amazon Tax over our sample period, and the treated group is the individual states (in Specifications (1) through (5)) or all states combined that implemented the tax over our sample period (Specification (6)). The mean frequency of shopping at Amazon is provided in each column, as are the average tax rate changes for the treated states as well as an estimate of elasticity. All regressions are OLS regressions. Standard errors are clustered at the household level. *t*-statistics are reported in parentheses. \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively.

| Dependent variable:<br>Sample:<br>State: | Number of times household shopped at Amazon during the week |                    |                        |                     |                  |                        |
|--|---|--------------------|------------------------|---------------------|------------------|------------------------|
|  | +/- 12 week window  |                    |                        |                     |                  | Entire sample          |
|  | TX  | PA                 | CA                     | NJ                  | VA               | TX, PA, CA, NJ, VA     |
|  | (1)   | (2)                | (3)                    | (4)                 | (5)              | (6)                    |
| After Transition ×<br>Affected State     | -0.012***<br>(-6.011)                                       | -0.003<br>(-0.587) | -0.025***<br>(-13.189) | -0.007*<br>(-1.699) | 0.001<br>(0.271) | -0.013***<br>(-12.329) |
| Household Fixed Effect                   | Yes   | Yes                | Yes                    | Yes                 | Yes              | Yes                    |
| YYYYWW Fixed Effect                      | Yes   | Yes                | Yes                    | Yes                 | Yes              | Yes                    |
| Obs                                      | 4,316,520   | 3,815,928          | 4,703,592              | 3,877,944           | 4,092,768        | 25,721,640             |
| R <sup>2</sup>                           | 0.26  | 0.28               | 0.28                   | 0.29                | 0.29             | 0.21                   |
| Mean for affected state(s)               | 0.26  | 0.29               | 0.29                   | 0.29                | 0.35             | 0.31                   |
| Coef/Mean                                | -4.7%   | -1.0%              | -8.5%                  | -2.4%               | 0.3%             | -4.2%                  |
| Avg Tax Rate Change                      | 8.0%  | 6.3%               | 8.2%                   | 7.0%                | 5.0%             | 7.4%                   |
| Elasticity                               | -0.6  | -0.2               | -1.0                   | -0.3                | 0.1              | -0.6                   |

**Table 7. Substitution Effects from the Amazon Tax**

This table explores the effect of the Amazon Tax on the sales of competing retailers. The dependent variable is the sum of all transactions over the course of a week for a particular group of retailers. In Panel A, the dependent variable is the sum of weekly retail transactions, including both online and brick-and-mortar sales. In Panel B, the dependent variable is the sum of weekly online transactions. In Panel C, the dependent variable is the sum of weekly brick-and-mortar transactions. In Panel D, the dependent variable is the sum of weekly Amazon Marketplace transactions. Online transactions consist of online transactions from Walmart (including Sam’s Club), Target, Costco, Home Depot, Lowes, Sears, Best Buy, Macys, Apple, TJ Maxx, Kohls, and TrueValue. Retail transactions constitute all transactions from this same set of retailers. Brick-and-mortar transactions include brick-and-mortar transactions from this same set of retailers. We create a dummy variable called *Amazon Shopper* that is equal to 1 (the treatment group) if the household spends \$100 at Amazon over the first six months of 2012, and 0 otherwise (the control group). We first match treatment and control groups by city of residence. We then match treatment and control groups by the spending in a particular category over the first six months of 2012, requiring that both groups have at least \$100 in expenditures in the category and that the difference in spending between treatment and control be no more than \$100. We remove any state that does not change its Amazon Tax policy during our sample, leaving us with five states. We create a dummy variable *After Transition* equal to 1 if the week falls after implementation of the Amazon Tax, and 0 otherwise. The independent variable of interest is the interaction of *Amazon Shopper* and *After Transition*. All regressions are OLS regressions. Standard errors are clustered at the household level. *t*-statistics are reported in parentheses. \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively.

**Panel A: Competing retailers’ total sales**

| Dependent variable:<br>Sample:<br>State: | Weekly total retail expenditures, excluding Amazon & Amazon Marketplace |                  |                     |                  |                       |                     |
|--|---|------------------|---------------------|------------------|-----------------------|---------------------|
|  | +/- 12 week window  |                  |                     |                  |                       | Entire sample       |
|  | TX  | PA               | CA                  | NJ               | VA                    | TX,PA,CA,NJ,VA      |
|  | (1)   | (2)              | (3)                 | (4)              | (5)                   | (6)                 |
| After Transition ×<br>Amazon Shopper     | 6.049***<br>(7.545)   | 1.749<br>(0.860) | 2.599***<br>(4.434) | 0.098<br>(0.064) | -3.512***<br>(-3.130) | 2.764***<br>(7.008) |
| Household Fixed Effect                   | Yes   | Yes              | Yes                 | Yes              | Yes                   | Yes                 |
| YYYYWW Fixed Effect                      | Yes   | Yes              | Yes                 | Yes              | Yes                   | Yes                 |
| Obs                                      | 868,392   | 89,808           | 1,338,024           | 179,328          | 465,192               | 2,940,744           |
| R <sup>2</sup>                           | 0.21  | 0.19             | 0.20                | 0.19             | 0.24                  | 0.21                |
| Mean Spending of Treat.                  | \$93.20   | \$64.70          | \$74.15             | \$66.20          | \$95.09               | \$82.43             |
| Coef/Mean                                | 6.5%  | 2.7%             | 3.5%                | 0.1%             | -3.7%                 | 3.4%                |



**Table 7. Substitution Effects from the Amazon Tax (Cont.)**

**Panel B: Competing retailers' online sales**

| Dependent variable:<br>Sample:<br>State: | Weekly total online retail expenditures, excluding Amazon & Amazon Marketplace |                  |                     |                  |                    |                     |
|--|--|------------------|---------------------|------------------|--------------------|---------------------|
|  | +/- 12 week window   |                  |                     |                  |                    | Entire sample       |
|  | TX   | PA               | CA                  | NJ               | VA                 | TX,PA,CA,NJ,VA      |
|  | (1)  | (2)              | (3)                 | (4)              | (5)                | (6)                 |
| After Transition ×<br>Amazon Shopper     | 2.625***<br>(3.263)  | 1.467<br>(0.558) | 3.148***<br>(3.872) | 1.736<br>(1.243) | -0.028<br>(-0.029) | 2.084***<br>(4.449) |
| Household Fixed Effect                   | Yes  | Yes              | Yes                 | Yes              | Yes                | Yes                 |
| YYYYWW Fixed Effect                      | Yes  | Yes              | Yes                 | Yes              | Yes                | Yes                 |
| Obs                                      | 177,312  | 17,208           | 246,432             | 36,696           | 98,688             | 576,336             |
| R <sup>2</sup>                           | 0.05   | 0.05             | 0.07                | 0.06             | 0.07               | 0.06                |
| Mean Spending of Treat.                  | \$11.29  | \$7.77           | \$11.67             | \$7.42           | \$7.90             | \$10.50             |
| Coef/Mean                                | 23.2%  | 18.9%            | 27.0%               | 23.4%            | -0.4%              | 19.8%               |

**Panel C: Competing retailers' brick-and-mortar sales**

| Dependent variable:<br>Sample:<br>State: | Weekly total brick-and-mortar retail expenditures |                   |                  |                  |                       |                     |
|--|---|-------------------|------------------|------------------|-----------------------|---------------------|
|  | +/- 12 week window                                |                   |                  |                  |                       | Entire sample       |
|  | TX  | PA                | CA               | NJ               | VA                    | TX,PA,CA,NJ,VA      |
|  | (1)   | (2)               | (3)              | (4)              | (5)                   | (6)                 |
| After Transition ×<br>Amazon Shopper     | 4.954***<br>(6.484)                               | 2.994*<br>(1.652) | 0.678<br>(1.300) | 0.957<br>(0.674) | -3.970***<br>(-3.794) | 1.586***<br>(4.376) |
| Household Fixed Effect                   | Yes   | Yes               | Yes              | Yes              | Yes                   | Yes                 |
| YYYYWW Fixed Effect                      | Yes   | Yes               | Yes              | Yes              | Yes                   | Yes                 |
| Obs                                      | 864,096   | 89,304            | 1,329,840        | 178,464          | 464,808               | 2,926,512           |
| R <sup>2</sup>                           | 0.22  | 0.20              | 0.22             | 0.20             | 0.26                  | 0.23                |
| Mean Spending of Treat.                  | \$90.25   | \$60.38           | \$69.66          | \$62.72          | \$91.26               | \$78.58             |
| Coef/Mean                                | 5.5%  | 5.0%              | 1.0%             | 1.5%             | -4.4%                 | 2.0%                |

**Table 7. Substitution Effects from the Amazon Tax (Cont.)**

**Panel D: Amazon Marketplace expenditures**

| Dependent variable:<br>Sample:<br>State: | Weekly Amazon Marketplace Expenditures |                  |                     |                  |                  |                     |
|--|--|------------------|---------------------|------------------|------------------|---------------------|
|  | +/- 12 week window                     |                  |                     |                  |                  | Entire sample       |
|  | TX                                     | PA               | CA                  | NJ               | VA               | TX,PA,CA,NJ,VA      |
|  | (1)                                    | (2)              | (3)                 | (4)              | (5)              | (6)                 |
| After Transition ×<br>Amazon Shopper     | 3.892***<br>(12.831)                   | 1.051<br>(1.149) | 0.829***<br>(3.220) | 0.433<br>(0.581) | 0.398<br>(0.742) | 1.551***<br>(8.934) |
| Household Fixed Effect                   | Yes                                    | Yes              | Yes                 | Yes              | Yes              | Yes                 |
| YYYYWW Fixed Effect                      | Yes                                    | Yes              | Yes                 | Yes              | Yes              | Yes                 |
| Obs                                      | 198,576                                | 20,064           | 285,768             | 37,776           | 94,680           | 636,864             |
| R <sup>2</sup>                           | 0.07                                   | 0.08             | 0.10                | 0.12             | 0.14             | 0.10                |
| Mean Spending of Treat.                  | \$9.40                                 | \$9.45           | \$10.01             | \$10.86          | \$12.35          | \$10.21             |
| Coef/Mean                                | 41.4%                                  | 11.1%            | 8.3%                | 4.0%             | 3.2%             | 15.2%               |

**Table 8. Substitution Effects from the Amazon Tax for Large Purchases**

This table explores the effect of the Amazon Tax on the large sales ( $\geq \$300$ ) of competing retailers. The dependent variable is the sum of all transactions ( $\geq \$300$ ) over the course of a week for a particular group of retailers. In Panel A, the dependent variable is the sum of weekly retail transactions, including both online and brick-and-mortar sales. In Panel B, the dependent variable is the sum of weekly online transactions. In Panel C, the dependent variable is the sum of weekly brick-and-mortar transactions. In Panel D, the dependent variable is the sum of weekly Amazon Marketplace transactions. Online transactions include online transactions from Amazon Marketplace, Walmart (including Sam’s Club), Target, Costco, Home Depot, Lowes, Sears, Best Buy, Macys, Apple, TJ Maxx, Kohls, and TrueValue. Retail transactions include all transactions from the same set of retailers. Brick-and-mortar transactions include brick-and-mortar transactions from the same set of retailers. We create a dummy variable called *Amazon Shopper* that is equal to 1 (the treatment group) if the households spends \$100 at Amazon over the first six months of 2012, and 0 otherwise (the control group). We first match the treatment and control groups by city of residence. We then match the treatment and control groups by the spending in a particular category over the first six months of 2012, requiring that both groups have at least \$100 in expenditures in the category and that the difference in spending between treatment and control be no more than \$100. We remove any state that does not change its Amazon Tax policy during our sample, leaving us with five states. We create a dummy variable *After Transition* equal to 1 if the week falls after implementation of the Amazon Tax, and 0 otherwise. The independent variable of interest is the interaction of *Amazon Shopper* and *After Transition*. All regressions are OLS regressions. Standard errors are clustered at the household level. *t*-statistics are reported in parentheses. \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively.

**Panel A: Competing retailers total sales ( $\geq \$300$ )**

| Dependent variable:                         | Weekly total retail expenditures, excluding Amazon & Amazon Marketplace $\geq \$300$ |                  |                     |                    |                    |                     |
|---|--|------------------|---------------------|--------------------|--------------------|---------------------|
|   | +/- 12 week window   |                  |                     |                    |                    | Entire sample       |
| Sample:                                     |  |                  |                     |                    |                    | TX,PA,CA,NJ,V       |
| State:                                      | TX   | PA               | CA                  | NJ                 | VA                 | TX,PA,CA,NJ,V       |
|   | (1)  | (2)              | (3)                 | (4)                | (5)                | (6)                 |
| After Transition $\times$<br>Amazon Shopper | 4.168***<br>(6.056)  | 1.067<br>(0.557) | 2.101***<br>(3.845) | -0.863<br>(-0.643) | -1.680<br>(-1.637) | 2.006***<br>(5.596) |
| Household Fixed Effect                      | Yes  | Yes              | Yes                 | Yes                | Yes                | Yes                 |
| YYYYWW Fixed Effect                         | Yes  | Yes              | Yes                 | Yes                | Yes                | Yes                 |
| Obs   | 868,392  | 89,808           | 1,338,024           | 179,328            | 465,192            | 2,940,744           |
| R <sup>2</sup>                              | 0.08   | 0.08             | 0.08                | 0.08               | 0.09               | 0.08                |
| Mean Spending of Treat.                     | \$22.10  | \$16.78          | \$21.17             | \$17.99            | \$24.97            | \$21.73             |
| Coef/Mean                                   | 18.9%  | 6.4%             | 9.9%                | -4.8%              | -6.7%              | 9.2%                |

**Table 8. Substitution Effects from the Amazon Tax for Large Purchases (Cont.)**

**Panel B: Competing retailers' online sales ( $\geq \$300$ )**

| Dependent variable:<br>Sample:<br>State:    | Weekly total online retail expenditures, excluding Amazon & Amazon Marketplace $\geq$ |                  |                    |                  |                    |                     |
|---|---|------------------|--------------------|------------------|--------------------|---------------------|
|   | +/- 12 week window  |                  |                    |                  |                    | Entire sample       |
|   | TX  | PA               | CA                 | NJ               | VA                 | TX,PA,CA,NJ,V       |
|   | (1)   | (2)              | (3)                | (4)              | (5)                | (6)                 |
| After Transition $\times$<br>Amazon Shopper | 2.246***<br>(2.814)   | 1.362<br>(0.575) | 2.095**<br>(2.520) | 0.792<br>(0.598) | -0.070<br>(-0.073) | 1.510***<br>(3.193) |
| Household Fixed Effect                      | Yes   | Yes              | Yes                | Yes              | Yes                | Yes                 |
| YYYYWW Fixed Effect                         | Yes   | Yes              | Yes                | Yes              | Yes                | Yes                 |
| Obs   | 177,312   | 17,208           | 246,432            | 36,696           | 98,688             | 576,336             |
| R <sup>2</sup>                              | 0.05  | 0.05             | 0.06               | 0.06             | 0.06               | 0.06                |
| Mean Spending of Treat.                     | \$6.39  | \$4.51           | \$7.55             | \$4.59           | \$4.45             | \$6.37              |
| Coef/Mean                                   | 35.1%   | 30.2%            | 27.7%              | 17.3%            | -1.6%              | 23.7%               |

**Panel C: Competing retailers' brick-and-mortar sales ( $\geq \$300$ )**

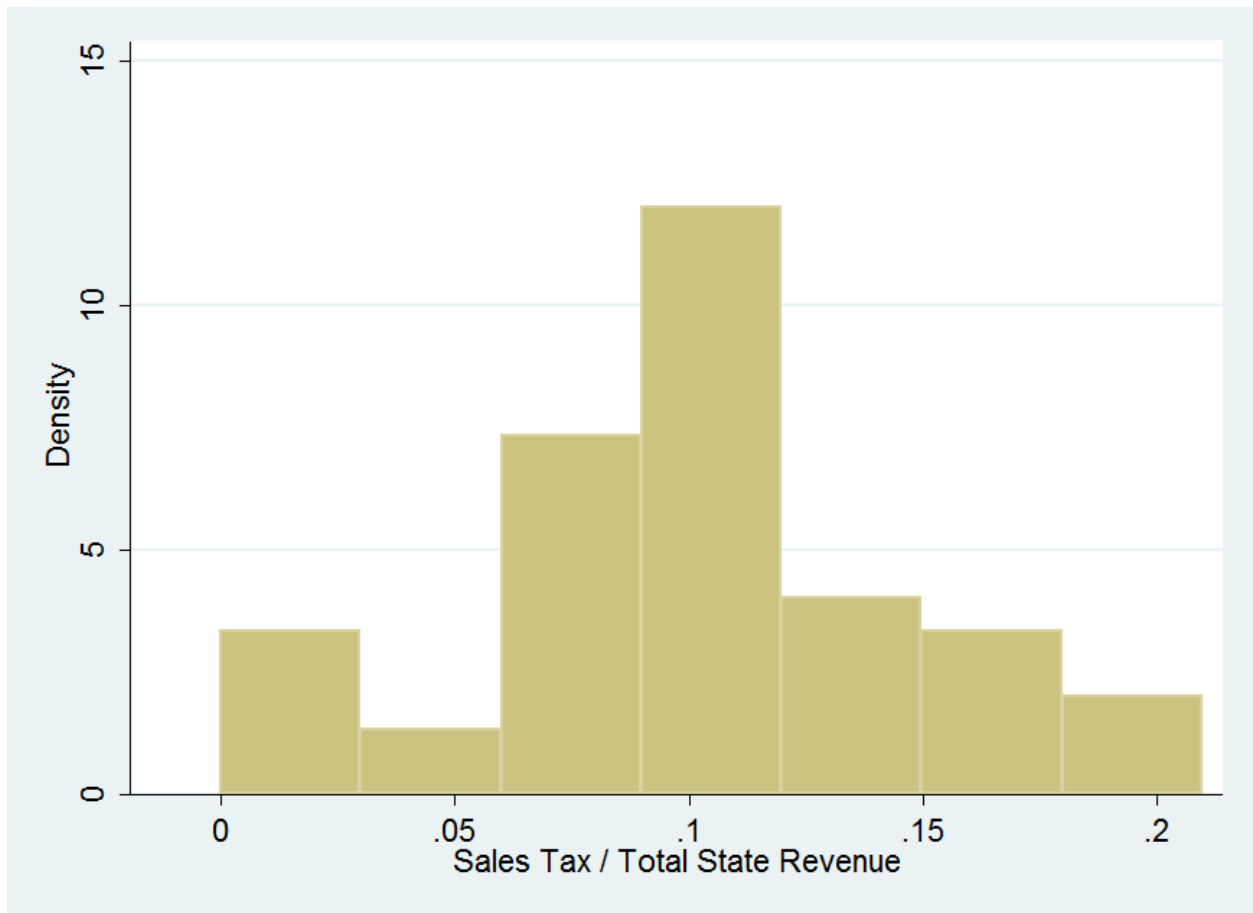
| Dependent variable:<br>Sample:<br>State:    | Weekly total brick-and-mortar retail expenditures $\geq$ \$300 |                  |                  |                  |                     |                     |
|---|--|------------------|------------------|------------------|---------------------|---------------------|
|   | +/- 12 week window   |                  |                  |                  |                     | Entire sample       |
|   | TX   | PA               | CA               | NJ               | VA                  | TX,PA,CA,NJ,V       |
|   | (1)  | (2)              | (3)              | (4)              | (5)                 | (6)                 |
| After Transition $\times$<br>Amazon Shopper | 3.218***<br>(4.940)  | 2.439<br>(1.572) | 0.536<br>(1.097) | 0.129<br>(0.103) | -1.601*<br>(-1.697) | 1.214***<br>(3.696) |
| Household Fixed Effect                      | Yes  | Yes              | Yes              | Yes              | Yes                 | Yes                 |
| YYYYWW Fixed Effect                         | Yes  | Yes              | Yes              | Yes              | Yes                 | Yes                 |
| Obs   | 864,096  | 89,304           | 1,329,840        | 178,464          | 464,808             | 2,926,512           |
| R <sup>2</sup>                              | 0.08   | 0.07             | 0.08             | 0.08             | 0.09                | 0.08                |
| Mean Spending of Treat.                     | \$19.92  | \$13.16          | \$17.68          | \$15.43          | \$21.72             | \$18.73             |
| Coef/Mean                                   | 16.2%  | 18.5%            | 3.0%             | 0.8%             | -7.4%               | 6.5%                |

**Table 8. Substitution Effects from the Amazon Tax for Large Purchases (Cont.)**

**Panel D: Amazon Marketplace expenditures ( $\geq$ \$300)**

| Dependent variable:<br>Sample:<br>State:    | Weekly Amazon Marketplace Expenditures $\geq$ \$300 |                  |                  |                  |                    |                     |
|---|---|------------------|------------------|------------------|--------------------|---------------------|
|   | +/- 12 week window                                  |                  |                  |                  |                    | Entire sample       |
|   | TX  | PA               | CA               | NJ               | VA                 | TX,PA,CA,NJ,V       |
|   | (1)   | (2)              | (3)              | (4)              | (5)                | (6)                 |
| After Transition $\times$<br>Amazon Shopper | 2.167***<br>(7.928)                                 | 0.992<br>(1.414) | 0.209<br>(0.943) | 0.243<br>(0.412) | -0.067<br>(-0.157) | 0.695***<br>(4.622) |
| Household Fixed Effect                      | Yes   | Yes              | Yes              | Yes              | Yes                | Yes                 |
| YYYYWW Fixed Effect                         | Yes   | Yes              | Yes              | Yes              | Yes                | Yes                 |
| Obs   | 198,576   | 20,064           | 285,768          | 37,776           | 94,680             | 636,864             |
| R <sup>2</sup>                              | 0.05  | 0.05             | 0.05             | 0.05             | 0.05               | 0.05                |
| Mean Spending of Treat.                     | \$0.85  | \$1.12           | \$1.26           | \$1.16           | \$1.42             | \$1.15              |
| Coef/Mean                                   | 253.6%  | 88.2%            | 16.6%            | 21.0%            | -4.7%              | 60.5%               |

**Figure 1: Histogram of (Sales Tax Revenue / Total State Revenue) for the 50 States in 2011**



## Figure 2: Sample of Amazon Reviews Indicating Sales Tax Avoidance on Apple Products

★★★★★ **Good Price**, December 3, 2012

By [Golf Dad](#)

Amazon Verified Purchase ([What's this?](#))

This review is from: **Apple Mac Mini MD389LL/A with Lion Server (NEWEST VERSION)** (Personal Computers)

Ordered for the price and am very happy with this ordering method over buying direct from Apple.  
Saved money on tax. Thanks

★★★★★ **I bought this back in October**, January 23, 2013

By [Stephen Friese](#)

Amazon Verified Purchase ([What's this?](#))

This review is from: **Apple iPad 2 MC979LL/A Tablet (16GB, Wifi, White) 2nd Generation** (Personal Computers)

It was a gift for my fiance's birthday. She loves using it. She has used her cell phone, but this takes the place of that and provides nearly every function a laptop would. Save sales tax and buy it online.

★★★★★ **Best Price**, July 31, 2013

By [nigel birch](#)

Amazon Verified Purchase ([What's this?](#))

This review is from: **Apple iPad MC706LL/A (32GB, Wi-Fi, Black)3rd Generation** (Personal Computers)

This was brand new the color is great and price beat competitor since there is no sales tax in my state I luv it

★★★★★ **OMG**, March 28, 2013

By [rlctnt1](#)

Amazon Verified Purchase ([What's this?](#))

This review is from: **Apple MacBook Pro MD101LL/A 13.3-Inch Laptop (NEWEST VERSION)** (Personal Computers)

All is well...very satisfied with the performance and everything else. I will not go back to a regular PC. Thanks Amazon. Follow up: 2 months later and this is by far the best computer I have ever owned. I'm not on it 24/7 so battery life has been great and thanks to the great slip case I got there are still no scratches on the body either. The CD drive runs smooth and pretty quiet as well. I would recommend getting the MAC on here if your state currently is not charged sales tax yet by Amazon. Luckily Illinois still is not being charged sales tax.

**Figure 3: Google Products Price Search, Sorted by Total Price**

Apple iPad mini Wi-Fi 16 GB - Black & slate  
**\$330 online, \$300 nearby**  
 #2 in Apple Tablet Computers » ★★★★★ 2,649 reviews [Write a review](#) [Add to Shortlist](#)  
 October 2012 - Apple - iOS - 16 GB - Wi-Fi Only - 7.9 inch - With Camera - 10.9 ounce - 10 hour battery

iPad mini makes one thing clear: its 7.9-inch display more than measures up to the complete iPad experience. View web pages in Safari. See where you are and what's around you using Maps. Flick through your photos and watch videos in vivid detail. And wave hello to the family on a... more »

Online stores shipping to Columbus, OH  
 Free shipping  Refurbished / used

| Sellers   | Seller Rating | Details                     | Base Price                      | Total Price     |                        |
|---|---------------|-----------------------------|---------------------------------|-----------------|------------------------|
| eBay - pawnbroker19                               | No rating     | Free shipping, No tax, Used | \$339.99                        | <b>\$339.99</b> | <a href="#">Shop »</a> |
| PCM   | No rating     | No tax                      | \$329.00 \$12.28 shipping       | \$341.28        | <a href="#">Shop »</a> |
| Rakuten.com Shopping - ... Trusted Store          | 23 ratings    | No tax                      | \$335.00 \$9.50 shipping        | \$344.50        | <a href="#">Shop »</a> |
| Rakuten.com Shopping - Lucky ...                  | No rating     | Free shipping, No tax       | \$349.99                        | \$349.99        | <a href="#">Shop »</a> |
| Rakuten.com Shopping - Click Go ... Trusted Store | ★★★★★ (748)   | Free shipping, No tax       | \$349.99                        | \$349.99        | <a href="#">Shop »</a> |
| Rakuten.com Shopping - Quality ... Trusted Store  | ★★★★★ (160)   | Free shipping, No tax       | \$349.99                        | \$349.99        | <a href="#">Shop »</a> |
| Best Buy  | ★★★★★ (61)    | Free shipping               | \$329.99 \$22.27 tax            | \$352.26        | <a href="#">Shop »</a> |
| Walmart   | ★★★★★ (79)    |                             | \$329.00 \$27.18 tax & shipping | \$356.18        | <a href="#">Shop »</a> |

**Figure 4: Example of Products Sold by Amazon Marketplace on Amazon.com**

Apple iPad with Retina Display MD510LL/A (16GB, Wi-Fi, Black) 4th Generation  
 by Apple  
 ★★★★★ 1,301 customer reviews | 143 answered questions

List Price: \$499.00  
 Price: **\$469.00** Prime  
 You Save: \$30.00 (6%)

Note: This item may be available at a lower price from other sellers that are not eligible for Amazon Prime.

**Only 9 left in stock.**  
 Sold by Newhope Dreams and Fulfilled by Amazon.

Want it Saturday, Feb. 22? Order within **16 hrs 17 mins** and choose **Saturday Delivery** at checkout. [Details](#)

Size: 16 GB

128 GB 16 GB 32 GB 64 GB

Item Shape: **Wi-Fi**  
 Wi-Fi Wi-Fi + AT&T Wi-Fi + Sprint Wi-Fi + Verizon

Color: **Black**

- 9.7 Retina Display; 2048 x 1536 Resolution
- Apple iOS 6; Dual-Core A6X Chip with Quad-Core Graphics
- 5 MP iSight Camera; 1080p HD Video Recording
- Wi-Fi (802.11a/b/g/n); 16 GB Capacity
- Up to 10 Hours of Battery Life; 1.44 lbs

[See more product details](#)

48 new from \$419.00 95 used from \$319.99 5 refurbished from \$374.99

Share [Email](#) [Facebook](#) [Twitter](#) [Pinterest](#)

Qty: 1

Include 3-Year Drops & Spills Warranty for \$99.28  
 Include 2-Year Drops & Spills Warranty for \$73.56

[Add to Cart](#)

or

[Sign in to turn on 1-Click ordering.](#)

[Add to Wish List](#)

Trade in your item  
 Get up to a **\$222.25** Gift Card. [Learn More](#)


**More buying choices**

- Tech Cell Corp \$462.39 + \$5.99 shipping [Add to Cart](#)
- syounus1 \$462.90 + \$5.99 shipping [Add to Cart](#)
- EverythingDeals \$469.00 & eligible for free shipping with Amazon Prime [Add to Cart](#)

148 used & new from \$319.99



**Figure 5: Example of a Product that Is Sold by Both Amazon and Amazon Marketplace**



New offers for  
**Nikon D800 36.3 MP CMOS FX-Format Digital SLR Camera (Body Only)**  
 by Nikon  
 ★★★★★ 336 customer reviews


[Return to product information](#) | [Have one to sell?](#) | Every purchase on Amazon.com is protected by an A-to-z guarantee.

All **New from \$2,796.95 (Save 6%)** Used from \$2,361.51 (Save 21%) Refurbished from \$2,390.00 (Save 20%)

Show  Prime offers only | Sorted by: **Price + Shipping**

| Price + Shipping        | Condition  | Seller Information  | Buying Options  |
|-------------------------|--|---|---|
| <b>\$2,796.95</b> Prime | New  | <b>amazon.com.</b><br>In Stock.<br>• Free Two-day Shipping: Get it Tuesday, February 25.<br>• Order within <b>36hr 45min</b> for these delivery dates.<br>Domestic shipping rates and return policy.  | Add to cart<br>or<br>Turn on 1-Click to use your Amazon Prime benefits. |
| <b>\$2,796.95</b> Prime | New  | <b>Roberts</b><br>FULFILLMENT BY AMAZON<br>★★★★★ 99% positive over the past 12 months. (8,239 total ratings)<br>In Stock.<br>• Free Two-day Shipping: Get it Tuesday, February 25.<br>• Order within <b>36hr 45min</b> for these delivery dates.<br>Domestic shipping rates and return policy.          | Add to cart<br>or<br>Turn on 1-Click to use your Amazon Prime benefits. |
| <b>\$2,796.95</b> Prime | New<br>Brand new, factory fresh. Authorized Nikon USA dealer. Full Nikon USA warranty. | <b>Murphy's Camera</b><br>FULFILLMENT BY AMAZON<br>★★★★★ 100% positive over the past 12 months. (4,614 total ratings)<br>In Stock.<br>• Free Two-day Shipping: Get it Tuesday, February 25.<br>• Order within <b>36hr 15min</b> for these delivery dates.<br>Domestic shipping rates and return policy. | Add to cart<br>or<br>Turn on 1-Click to use your Amazon Prime benefits. |

**Figure 6: Example of Product Sold by Amazon.com on Amazon.com**



**Nikon D800 36.3 MP CMOS FX-Format Digital SLR Camera (Body Only)**  
 by Nikon  
 ★★★★★ 336 customer reviews | 72 answered questions

List Price: \$2,999.95  
 Price: **\$2,796.95** Prime  
 You Save: \$203.00 (7%)

**Only 19 left in stock (more on the way).**  
**Ships from and sold by Amazon.com. Gift-wrap available.**

**Want it Saturday, Feb. 22?** Order within **16 hrs 46 mins** and choose **Saturday Delivery** at checkout. [Details](#)

- Extreme resolution 36.3-megapixel FX-format (35.9 x 24.0mm) CMOS sensor
- Full 1080p HD broadcast quality video and minimized rolling shutter
- View simultaneous Live View output on external monitors and record uncompressed video via HDMI terminal
- Multi-Area Full HD D-Movie Video Recording Mode
- Comprehensive high fidelity audio recording and playback control

**Figure 7: Checkout Process for Amazon.com Purchase for California Resident after the Amazon Tax Is Implemented**

**Important message**

Check this box to default to these delivery and payment options in the future.

**Shipping address**

Cali  
10920 WILSHIRE BLVD  
LOS ANGELES, CA 90024-6502  
United States  
Phone: 6143771170 [Change](#)

Or try Amazon Locker  
20 locations near this address [▼](#)

**Payment method**

**Billing address**

**Gift cards & promotional codes**

Enter Code

**Order Summary**

|                                       |                   |
|---------------------------------------|-------------------|
| Items:                                | \$2,796.95        |
| Shipping & handling:                  | \$0.00            |
| <b>Total before tax:</b>              | <b>\$2,796.95</b> |
| <b>Estimated tax to be collected:</b> | <b>\$251.73</b>   |
| <b>Order total:</b>                   | <b>\$3,048.68</b> |

How are shipping costs calculated?  
Prime shipping benefits have been applied to your order.

**Get \$50 Off Instantly**

Receive a \$50 Amazon.com gift card instantly upon approval for the Amazon.com Rewards Visa card.

**Guaranteed delivery: Feb. 25, 2014** If you order in the next 36 hours and 41 minutes [\(Details\)](#)

**Nikon D800 36.3 MP CMOS FX-Format Digital SLR Camera (Body Only)**  
by NIKON  
**\$2,796.95**   
Only 19 left in stock (more on the way).  
**Quantity: 1** [Change](#)  
Sold by: Amazon.com LLC  
[Add gift options](#)

**Choose your Prime delivery option:**

FREE Standard Shipping --get it Wednesday, Feb. 26

FREE Two-Day Shipping --get it Tuesday, Feb. 25

\$5.99 One-Day Shipping --get it Monday, Feb. 24

\$10.99 Saturday Delivery --get it Saturday, Feb. 22

**Figure 8: Checkout Process for Amazon Marketplace Purchase for California Resident after the Amazon Tax Is Implemented**

**Important message**

Check this box to default to these delivery and payment options in the future.

**Shipping address**

Cali  
10920 WILSHIRE BLVD  
LOS ANGELES, CA 90024-6502  
United States  
Phone: 6143771170 [Change](#)

Or try Amazon Locker  
20 locations near this address [▼](#)

**Payment method**

**Billing address**

**Gift cards & promotional codes**

Enter Code

**Order Summary**

|                                       |                   |
|---------------------------------------|-------------------|
| Items:                                | \$2,796.95        |
| Shipping & handling:                  | \$0.00            |
| <b>Total before tax:</b>              | <b>\$2,796.95</b> |
| <b>Estimated tax to be collected:</b> | <b>\$0.00</b>     |
| <b>Order total:</b>                   | <b>\$2,796.95</b> |

How are shipping costs calculated?  
Prime shipping benefits have been applied to your order.

**Get \$50 Off Instantly**

Receive a \$50 Amazon.com gift card instantly upon approval for the Amazon.com Rewards Visa card.

**Guaranteed delivery: Feb. 25, 2014** If you order in the next 39 hours and 24 minutes [\(Details\)](#)

**Nikon D800 36.3 MP CMOS FX-Format Digital SLR Camera (Body Only)**  
by NIKON  
**\$2,796.95**   
Only 8 left in stock.  
**Quantity: 1** [Change](#)  
Sold by: Roberts LP  
[Add gift options](#)

**Choose your Prime delivery option:**

FREE Standard Shipping --get it Wednesday, Feb. 26

FREE Two-Day Shipping --get it Tuesday, Feb. 25

\$5.99 One-Day Shipping --get it Monday, Feb. 24

\$10.99 Saturday Delivery --get it Saturday, Feb. 22