

The Intertemporal Substitution and Income Effects of a VAT Rate Increase: Evidence from Japan¹

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Abstract

Pre-announced increases in consumption tax rates should induce intertemporal substitution effects among households. If the rate increase is uncompensated, income effects should also be present. Using Japan's April 1997 Value Added Tax (VAT) rate increase from three to five percent as a case study, along with monthly household expenditure data, we find that households spent ¥30,231 (~ \$302) more in the quarter prior to the rate increase than they would have in its absence, with an implied revenue loss to the Japanese government of ¥26.5 billion (~ \$265 million), or 0.26 percent of FY 1997 VAT revenue, as a result of pre-announcement. Consistent with theoretical predictions, increased outlays on durable and storable non-durable goods and services were responsible for the majority of the observed intertemporal substitution effects. Contrary to the conventional wisdom, but consistent with the Japanese government's revenue-neutral tax reform package, we find that the VAT rate increase did not significantly impact real household spending, once we have accounted for intertemporal substitution.

Keywords: Consumption taxation, Value Added Tax, VAT, intertemporal substitution, income effects

JEL Codes: H24, H31

1. Introduction

Pre-announced increases in consumption tax rates should affect household spending in two primary ways. First, anticipation of higher future prices should lead households to accelerate their purchases, as purchases originally planned for a time period following the rate increase are brought forward in order to avoid the tax increase. As a result, we would expect to observe an increase in household spending following announcement, but prior to implementation, of the rate increase, and a decline thereafter. This is the intertemporal substitution effect associated with a consumption tax rate increase. Second, if a rate increase is uncompensated, the higher prices associated with it reduce a household's permanent income, which should cause a decline in consumption.² As a result, we would expect to observe a decline in real household spending. This is the income effect associated with a consumption tax rate increase.

This paper uses Japan's April 1997 Value Added Tax (VAT) rate increase from three to five percent and average monthly household expenditure data to estimate the intertemporal substitution and income effects of an increase in consumption tax rates. We find the intertemporal substitution effects prior to the rate increase were large, though short-lived, as household expenditures rose sharply only after the impending rate increase became a certainty, while two earlier policy announcements appear to have been ignored. We also find that all intertemporal substitution occurred in 1997. That is, households did not bring forward purchases that would have occurred after 1997 had the rate increase not been announced in advance. In

² This statement will hold true provided that households are not Ricardian consumers. Ricardian consumers do not respond to changes in tax rates as long as the present value of their tax liabilities remains the same. For example, a Ricardian consumer believes that an increase in a tax rate today will be offset by a tax rate decrease in the future. Provided the expected present value of their tax liabilities remains the same, their permanent income does not change, and thus household consumption will not respond to current tax rate changes. As discussed below, Watanabe et al. (2001) cannot reject the null hypothesis that the share of Japanese households that are Ricardian consumers is zero.

addition, we find evidence that the income effect of the rate increase was not significantly different from zero, a finding which casts doubt on a widely expressed view that the 1997 VAT rate increase was largely responsible for Japan's recession of the late 1990's, but is consistent with the fact that the consumption tax rate increase was part of a tax reform package intended to be revenue-neutral.³

In particular, we find that the average Japanese household spent ¥30,231 (in ¥2005, approximately \$302) more in the quarter preceding implementation of the rate increase than they would have had the rate increase not occurred. Real expenditures during the three months preceding the tax increase were 0.61, 3.24, and 8.85 percent greater as a result of intertemporal substitution associated with the rate increase. This tax avoidance behavior on the part of consumers corresponded to a ¥26.5 billion (approximately \$265 million) revenue loss sustained by the Japanese government, which amounted to 0.26 percent of FY 1997 VAT revenue. The intertemporal substitution effects prior to the tax change were concentrated only in the quarter prior to implementation, which immediately followed final passage of the FY 1997 budget, the bill that made the rate increase an absolute certainty. This finding suggests that households were unaware of, ignored, or did not find credible two earlier announcements regarding the VAT rate increase, of which we believe the latter two explanations to be more likely.

Consistent with previous research on price sensitivity and consumer demand (e.g. Hendel and Nevo, 2004), we find that intertemporal substitution prior to the VAT rate increase was dominated by increased outlays on durable goods and services as well as storable non-durable goods and services. Increased expenditures on durable goods and services accounted for 43 percent of the intertemporal substitution effects prior to the tax increase, despite the fact that this

³ For examples of the consumption tax rate increase receiving blame for Japan's economic woes in the late 1990s, see Takahashi (1999), or more recently, "The Great Debt Drag" in the September 18th, 2010 edition of *The Economist*.

group accounts for just one-quarter of expenditure shares over our sample period. Storable non-durable goods and services (e.g. laundry detergent) were responsible for 25 percent of the intertemporal substitution effects, while accounting for just under one-quarter of expenditure over the sample period. Not surprisingly, the intertemporal substitution effects for non-storable non-durable goods and services are muted, as a household's ability to purchase this type of good prior to the tax increase and consume it following the tax increase is, by definition, limited.

Conventional wisdom holds that the 1997 VAT rate increase was ill-timed and largely responsible for Japan's "double dip" recession of the late 1990's. We instead provide evidence suggesting the rate increase did not have a significant negative impact on household spending in the months following its implementation, once intertemporal substitution is accounted for. In particular, we find that the average Japanese household spent only ¥562 (~\$6) less per month as a result of the VAT rate increase. When we decompose the income effect by good type, we find the rate increase caused households to cut back significantly on outlays on durable goods and services, while spending on non-durable goods and services increased, though not by a significant amount. This finding suggests that the income elasticity of demand for durable goods and services is positive and exceeds that for non-durables, a finding consistent with previous research (e.g. Bils and Klenow, 1998).

The remainder of the paper is organized as follows. Section 2 briefly discusses the goods and services for which we would expect to observe intertemporal substitution as well as the timing of income effects resulting from tax changes. Section 3 provides background on Japan's April 1997 VAT rate increase. Section 4 discusses the design and content of the Japanese Family Income and Expenditure Survey, the household expenditure data we use to estimate the intertemporal substitution and income effects associated with the VAT rate increase. Section 5

introduces the empirical methodology to identify the intertemporal substitution and income effects. Section 6 presents our results. Section 7 discusses the implications of our results and Section 8 concludes.

2. Theoretical Framework

2.1. Intertemporal Substitution

The intertemporal substitution effects associated with a VAT rate increase will depend not only on the intertemporal elasticity of substitution in consumption, but likely to an even greater extent on the durability and storability of the goods and services that households consume, characteristics which allow households to time purchases to exploit price variations without necessarily altering consumption levels.

Westin (1975) notes that durable goods offer a relatively constant service flow over moderate time periods, and thus the timing of their replacement should be highly discretionary, coinciding with periods characterized by relatively low prices, as would be the case in the period following announcement, but prior to implementation, of a VAT rate increase. More recently, House and Shapiro (2008) show that for sufficiently short-lived tax subsidies, and sufficiently long-lived capital goods, the elasticity of investment should be nearly infinite. That is, firms who had originally planned to make capital investments in the future have strong incentives to instead make the investment during the period of the subsidy. The authors' predictions can easily be applied to our framework, where the period preceding implementation serves as a proxy for a temporary tax subsidy, and household durable goods stand in for long-lived capital goods. As a result, we would expect to observe an increase in outlays on durable goods and services prior to the rate increase, and a decline thereafter.

As with durables, we expect to observe an increase in expenditures on storable non-durable goods and services prior to the VAT rate increase, though for different reasons. Hendel and Nevo (2004) find that the storable nature of some products, such as laundry detergent, allows for “stockpiling”, where consumers balance the costs of holding additional inventory against the gains of buying at a low price. An additional prediction of the consumer inventory model of Hendel and Nevo (2006) is that the duration of time until next purchase will be greater following a period of relatively low prices than it would be during a period characterized by constant prices. As a result, we would expect to observe a decline in expenditures on storable non-durable goods and services immediately following implementation of the rate increase, with a gradual return to trend.

Because the durability and storability of non-storable non-durable goods and services is, by definition, limited, any intertemporal substitution that occurs as a result of the rate increase in this category should be attributable to the intertemporal elasticity of substitution in consumption, or perhaps a limited amount of storability if purchases occur just before the rate increase.

2.2. The Income Effect

Increases in consumption tax rates are often offset by corresponding increases in benefit levels, decreases in marginal income tax rates, or a combination of the two.⁴ In this case, a rate increase should have no impact on a household’s permanent income, and thus no impact on the level of household consumption.

In the absence of compensation, an increase in the VAT rate, and the higher price level it implies, reduces a household’s permanent income. The Life Cycle Permanent Income

⁴ For example, New Zealand’s October 2010 Goods and Services Tax (GST) rate increase from 12.5 to 15 percent was accompanied by across-the-board reductions in personal tax rates, as well as indexing of benefits for the expected inflationary impact of the GST rate increase.

Hypothesis (LCPIH) predicts that a rational consumer will reduce their consumption immediately following announcement of the rate increase, which we would observe as a decline in real household spending.⁵ However, there is a growing literature that suggests the income effects associated with tax changes are absent until the tax change is implemented.

Watanabe et al. (2001) examine the spending responses of Japanese households to more than 40 changes in national income tax, local income tax, consumption tax, and social security contributions that occurred between 1975 and 1998. The authors find that over 80 percent of Japanese households respond to tax changes at the time of implementation, as opposed to the time of announcement, and conclude that most Japanese households follow a “near-rational” decision rule, in which the costs of obtaining and processing information associated with a policy announcement outweigh the benefits from improved consumption smoothing.⁶ Recent work by Mertens and Ravn (2010) using U.S. quarterly GDP data further supports this finding.⁷

3. The April 1997 VAT Rate Increase⁸

3.1. Background

VAT was imposed in Japan on April 1, 1989 at a rate of three percent on most goods and services, and remained at that level until April 1, 1997, when the rate was increased to five percent.⁹

⁵ It is also possible that households with a buffer stock of savings, or a bequest motive, would maintain their consumption level by drawing down on their savings. Alternatively, households could maintain their consumption level by boosting their labor supply.

⁶ The authors define “announcement” as the date which the Liberal Democratic Party (LDP) Tax Committee submits a proposal report to the government. This is followed by Cabinet approval of the proposal, which is then followed by Diet approval. They consider submission of the report to be “announcement” because Cabinet and Diet approval are virtually guaranteed following the Tax Committee’s submission.

⁷ Previous work by Poterba (1988), Parker (1999), and Souleles (1999, 2002) also finds that U.S. household spending does not respond to anticipated tax changes until the tax change is implemented.

⁸ Most of the factual content that follows comes from Ishi (2001) and Takahashi (1999).

The 1997 VAT rate increase, like the 1989 VAT imposition that preceded it, composed the latter portion of a revenue-neutral tax reform package that began with income tax reductions. However, the circumstances surrounding this particular tax reform differed greatly from those of the late 1980s. In particular, Japan's economy entered a prolonged recession from 1991 to 1993, with weak growth afterwards. In response, the government introduced a reform package (the "Murayama reform package") in September 1994 calling for income tax cuts to revive the economy, which was to be followed by an increase in the VAT rate from three to five percent once the economy had sufficiently recovered.¹⁰ The increase in the VAT rate was to serve the dual purposes of recouping revenues lost from the income tax reductions, while continuing the shift away from direct taxation towards indirect taxation.

Having judged the economy to have sufficiently recovered, and apparently eager to avoid letting the consumption tax become an issue in Fall 1996 elections to the Lower House of the Diet, the ruling Liberal Democratic Party moved quickly in June 1996 to pass the consumption tax rate increase. Legislation passed through the Upper House on June 25, 1996, and the VAT rate increase was scheduled to become effective April 1, 1997. However, the government stated that they would revisit the issue of the rate increase when they submitted the fiscal year 1997 budget, so the rate increase was not a certainty. On December 26, 1996, the government submitted the fiscal year 1997 budget, and decided to increase the VAT rate to five percent as

⁹ Exemptions included transfer of lease or land, transfer of securities and transfer of means of payment, interest on loans and insurance premiums, transfer of postal and revenue stamps, fees for government services, international postal money orders, foreign exchange, medical care under the Medical Insurance Law, social welfare services specified by the Social Welfare Services Law, midwifery service, burial and crematory service, transfer or lease of goods for physically handicapped persons, tuition, entrance fees, facilities fees, and examinations fees of schools designated by the Articles of the School Education Law, transfer of school textbooks, and the lease of housing units. Despite these exemptions, Japan's VAT is one of the broadest in the world.

¹⁰ The November 1994 reform package set a target date of April 1997 for the VAT rate increase.

planned. Below, we refer to June 1996 as “initial passage” of the VAT rate increase, and December 1996 as “final passage”.

3.2. Awareness of the VAT Rate Increase and Price Expectations

In order to make the claim that the VAT rate increase induced both intertemporal substitution and income effects, it must be the case that households were aware of the tax change, and in the case of intertemporal substitution effects, that households were aware of the rate increase prior to its implementation. While we cannot obtain a direct measure of awareness of the tax change, we can examine indirect measures. Figure 1 lists the number of articles in the Nihon Keizai Shinbun, Japan’s leading business newspaper with a circulation of over three million (in 2010), and the Yomiuri Shinbun, a leading non-business newspaper with a circulation of over 10 million (in 2010), that mention the phrase “consumption tax” in the years and months leading up to and following the VAT rate increase.¹¹ Coverage initially peaked in September 1994, which coincided with the passage of the Murayama reform package, suggesting that households may have been aware of the package’s goal of revenue-neutrality. Following a decline in coverage in 1995, there is a steady upward trend in coverage of the proposed rate increase beginning with initial passage in June 1996, a spike in coverage in October 1996, which coincided with elections to the Lower House of the Diet, and overall coverage peaks in the months following final passage, but prior to the tax change, with nearly 300 articles in the Nihon Keizai Shinbun mentioning the consumption tax in March 1997. Given the steady stream of coverage beginning in mid-1996 and the large number of articles in the months immediately

¹¹ In Japan, VAT is widely referred to as the “consumption tax”. Circulation numbers come from Japan’s Audit Bureau of Circulations.

preceding the rate change, it seems reasonable to assume that most Japanese households were aware of the VAT rate increase prior to and following its implementation.

Provided consumers were aware of the impending rate increase, their expectations of the incidence of the tax change would certainly impact their response. While we do not have direct evidence of consumer price expectations before the rate increase, we believe it likely that consumers expected a price increase from March to April 1997 of about two percent on goods and services that were subject to VAT. As documented by Ishi (2001), the Japanese government's official stance was that the burden of the VAT should be borne fully by consumers at the time of the rate increase.¹² We also find it likely that the smooth transition to VAT in 1989, in which prices on goods and services subject to the new VAT increased by just under three percent in the month the three percent VAT was introduced, should have allayed fears of excessive hikes in pre-tax prices when the rate increase took effect. Furthermore, Carroll et al. (forthcoming) find that full forward shifting at the time of a VAT rate increase is the norm across most countries, which the authors speculate is primarily due to wage rigidities that prevent backward shifting. Alternatively, the results of House and Shapiro (2008) would suggest that the pre-tax prices of durable goods should have risen by two percent following announcement, but prior to the tax change, with a two percent fall immediately after (and thus, no change in after-tax prices before and after the change), since the intertemporal elasticity of investment for long-lived durable goods is nearly infinite. Indeed, a German study cited by Carroll et al. finds nearly full forward shifting of a VAT rate increase, with one-third of the shift occurring before enactment as a result of intertemporal substitution. While the timing of the price increase may

¹² When the VAT was introduced in 1989, the government took several steps to ensure this outcome. First, a Special Council on the Transition was formed to promote enforcement of the VAT across agencies. Second, the government carried out an extensive advertising campaign to allay the public's fear of price hikes and to restrain overcharging by traders. A telephone service was also set up so consumers could report complaints about prices. Finally, the Economic Planning Agency increased the budget for the price monitoring system.

depend on the durability of a good or service, it seems reasonable to believe that consumers expected about a two percent increase in prices at the time of the VAT rate increase.

As seen in Table 1, average prices on goods and services subject to VAT rose by 2.45 percent between March and April 1997, due mostly to a rather large increase in the price of durable goods and services of 3.18 percent, while the price changes for non-durable goods and services were closer to 2 percent. Furthermore, it does not appear as if there is any systematic tendency for prices to increase markedly in April (prices in April 1996 and April 1998 increased by 0.56 and 0.17 percent, respectively), which leads us to believe that this price increase was primarily due to the tax change. Nor do we observe any systematic decline in prices after April 1997 that would suggest retailers bore any burden of the tax over a longer time frame. Finally, we do observe an increase in the price of durable goods of 1.36 percent in March 1997, but the subsequent increase in durable price levels in April 1997 would appear to be at odds with House and Shapiro's prediction.

3.3. Potential Confounding Factors

Three events took place in 1997 (our period of interest) that could have potentially reduced household expenditures in the months surrounding the VAT rate increase, and would bias downwards our estimates of the income effects, and perhaps the intertemporal substitution effects: the elimination of a special income tax break, increases in medical copayments, and the Japanese banking crisis.

In January 1997, it was announced that a special income tax break that had been in place for the previous few years would be eliminated. In June and December of each year, the tax break refunded 15 percent of income tax paid over the previous six months in the form of

reduced tax withheld. Given this tax change, a rational household would reduce their spending in January 1997 and subsequent months. As will be discussed below, this would bias downward our estimates of both the intertemporal substitution effects prior to the VAT rate increase as well as the income effect. If instead household spending did not respond until June, when households would have expected to receive the refund, our estimates of the intertemporal substitution effects following the rate increase, as well as the income effect, will be biased downward.

In September 1997, copayments on medical costs increased from ten percent to twenty percent, which would likely reduce expenditures on items subject to VAT as health care demand is price inelastic. If this were the case, our estimates of the intertemporal substitution effects following the VAT rate increase would be biased downwards, as would our estimate of the income effect.

Finally, in late November 1997, the Japanese banking crisis began with the bankruptcy of Sanyo Securities, and was followed in December 1997 by the bankruptcies of the Hokkaido Takushoku Bank and Yamaichi Securities. According to National Accounts data published by the Cabinet Office, Japanese households sustained a loss in financial wealth of ¥42 trillion (~\$420 billion) in 1997, or roughly \$10,000 per household. The wealth loss suffered by shareholders should have reduced the permanent income of the average Japanese household, and as a result, this event, perhaps even more so than the elimination of special income tax breaks and the increase in medical copayments, will potentially bias downward our estimates of the income effects associated with the VAT rate increase.

4. Data¹³

¹³ Much of the information below regarding the JFIES design and content is drawn from recent work by Stephens and Unayama (2009).

4.1. The Japanese Family Income and Expenditure Survey (JFIES)

To estimate the intertemporal substitution and income effects associated with the VAT rate increase, we utilize data from the Japanese Family Income and Expenditure Survey (JFIES) for the period 1992-2000. The JFIES is a panel survey in which households are interviewed each month for six consecutive months. It is a rotating panel, which means that in each month, one-sixth of the households are interviewed for the first time, one-sixth for the second time, and so on. Because of the overlapping nature of the data, a monthly cross-section is not a random sample, an issue we address below. In any given month, approximately 8,000 households are interviewed. Households record daily expenditure, income receipts, and tax payments in a diary that is collected once a month. Monthly household demographic information and labor force participation are also included. While one of the goals of the survey is to collect expenditure data from a nationally representative sample of households, two notable exclusions from the survey are agricultural workers and households with only one individual.¹⁴ If the response of these two groups to the consumption tax rate changes differed systematically from those covered by the survey, our estimates of the intertemporal substitution and income effects will not be indicative of the average Japanese household, but rather the average non-agricultural, multi-person household.

The JFIES expenditure data is highly disaggregated by item type, which is critical for our purposes, given our distinction between durable, storable, and non-storable non-durable goods and services and the fact that some goods and services were exempt from the VAT, and thus are excluded from our estimates. For example, the data allows us to distinguish between

¹⁴ As of 2002, single-person and agricultural households are included in the JFIES. As of the 2009 JFIES, single-person households comprised 11.8 percent of the population and were responsible for 18.1 percent of expenditures, while agricultural households accounted for 2 percent of the population, and 2.1 percent of expenditures.

expenditures on fresh vegetables, which we consider a non-storable non-durable good, and processed vegetables, which we define as a storable non-durable good, for reasons that will be made clear below. In addition, we can separate expenditures on, say, medical services, which are exempt from VAT, from those on medical supplies, which are not.

4.2. Categorizing Goods and Services

Our categorization of goods and services is a two-step process. First, we exclude expenditures on goods and services that were not subject to the VAT (see footnote 8). As a result, the ‘total expenditure’ category includes only goods and services that were subject to the VAT. Second, we divide the ‘total expenditure’ category into three subsets: durable, storable non-durable, and non-storable non-durable goods and services. We do so because we expect the intertemporal substitution effects to differ markedly across categories, as discussed above.

We define durable goods and services as goods and services which depreciate relatively slowly over time if not used and do not depreciate fully with use. This category includes traditional durables such as refrigerators and automobiles, as well as goods such as clothing that are classified as semi-durables in the JFIES. In addition, we include a select group of services such as home repair and tailoring, which consumers derive benefits from long after the service is provided.

We define storable non-durable goods and services as those goods and services that depreciate slowly over time if not used and fully if in use. For example, laundry detergent can be stored for long periods of time with little to no effect on its ability to clean clothing, but once it is put into use, whatever amount was used has been fully consumed. This category also includes rail service, due to the fact that many Japanese households purchase passes which are good for

train travel for several months. Thus, one might expect that a household would purchase a pass good for several months during a low price period, and use the pass during a relatively high price period.

We define non-storable non-durable goods and services as goods and services which are neither storable nor durable. That is, they depreciate relatively quickly over time when not in use, and when in use, are fully consumed. For example, fresh fruit, if not eaten, will spoil, and is fully consumed with use. This category also includes services such as taxi service, which must be immediately consumed at the point of purchase. See Appendix Table A.1 for a complete categorization of durable, storable non-durable, and non-storable non-durable goods and services.

4.3. Aggregation and Deflation of Monthly Expenditures

We were unable to gain access to the JFIES microdata. Instead, our initial dataset consists of item-specific average monthly household expenditures for single-year birth cohorts, where a household is placed into a cohort based on the year of birth of the household head. Each cohort is assigned a sample weight based on its share of the population (where the cohort sample weight is a function of the inverse sample weights for the households that belong to the cohort). After eliminating expenditures on VAT-exempt goods and services and placing each good or service into its respective category, we take a weighted sum of monthly household expenditures, with the weights being a cohort's sample weight as a fraction of the sum of sample weights. This weighted sum yields nominal monthly expenditures for the average Japanese household on durable, storable, and non-storable non-durable goods and services that were subject to VAT.

We then deflate nominal monthly expenditures for all goods and services, durable goods and services, storable goods and services, and non-storable non-durable goods and services that were subject to VAT, using VAT-inclusive consumer price indices specific to our categories.¹⁵ We are left with real monthly expenditures for the average Japanese household from 1992-2000. Table 2 presents summary statistics for the four expenditure categories over the sample period, while Figure 2 depicts the percentage deviation in seasonally-adjusted monthly expenditures from the sample average.¹⁶ Note that real household spending remains relatively stable between 1994 and 1997. Household spending again begins to decline in 1998, and continues its downward trend through the remainder of the sample period. Finally, note that there was a large spike in household spending in the first quarter of 1997, which suggests that the intertemporal substitution effects associated with the VAT rate increase were significant.

5. Empirical Methodology

5.1. Identifying the Intertemporal Substitution Effects

Suppose that real monthly household expenditures in year y and month m can be additively decomposed into a seasonal effect, δ_m , a tax effect, $T_{y,m}$, and an effect for all other factors that determine expenditure independent of the tax change and season, $B_{y,m}$. We can then express expenditure as follows:

$$E_{y,m} = \delta_m + T_{y,m} + B_{y,m}$$

Taking first differences, we have

$$E_{y,m} - E_{y,m-1} = \delta_m - \delta_{m-1} + T_{y,m} - T_{y,m-1} + B_{y,m} - B_{y,m-1}$$

¹⁵ In particular, we construct Laspeyres price indices for each of our four categories using item-specific price indices and expenditure shares in 1990 for each of these items as the weights.

¹⁶ To remove seasonal effects, we regress the log of expenditure on month dummies, and plot the residuals.

$$\approx \delta_m - \delta_{m-1} + T_{y,m} - T_{y,m-1}$$

provided there is little change in $B_{y,m}$ from one month to the next. As mentioned above, there were three events in 1997, our period of interest, that potentially caused significant changes in $B_{y,m}$: the elimination of a special income tax break, an increase in medical copayments, and the onset of the Japanese banking crisis. While all three events would bias our estimates of the tax effects, $T_{y,m}$, downwards, we are particularly concerned that the banking crisis, which began in late November 1997 and peaked in December 1997, significantly impacted household spending. As a result, we are unable to identify the effect of the tax change on December 1997 expenditures or beyond.

Provided our assumption for $B_{y,m}$ holds, we can identify the expenditure effects of the tax change using the following empirical specification:

$$\Delta E_{y,m} = \Delta \delta_m + \Delta T_{1997,m} + \Delta u_{y,m},$$

where δ_m is the coefficient on an indicator function that takes on a value of 1 in month m , $T_{1997,m}$ is the coefficient associated with an indicator function that takes on a value of 1 in month m of the year 1997, and $u_{y,m}$ represents unobservables affecting expenditure in year y and month m .¹⁷ The empirical specification allows for tax effects beginning in January 1997, since this is the first month following final passage of the VAT legislation, and as a result, the first month we would expect to observe a rational consumer respond.¹⁸ We allow for tax effects through November 1997, since we cannot disentangle the effects of the tax change and banking crisis after that month.

¹⁷ As a robustness check, we also add year dummies to the above specification. These dummies capture average monthly growth rates in household spending within a year relative to the omitted year, and are important if growth rates varied considerably over the sample period. We find that inclusion of year dummies does not significantly impact the results of our baseline specification.

¹⁸ Furthermore, we find no evidence of intertemporal substitution prior to final passage of the VAT rate increase in December 1996.

Figure 3 graphically depicts identification of the monthly tax effects using the above first differenced specification. The top figure presents household expenditures in levels (assuming seasonal effects have already been removed), where the rate increase causes a deviation in spending from the trend level, E^* , in periods $y, m - 1$ and y, m , with the tax effects in the two periods given by $T_{y,m-1}$ and $T_{y,m}$, respectively. Once we take first differences (depicted in the bottom figure), in order to identify the coefficient $T_{y,m}$, we must also difference out the coefficient for the previous month, $T_{y,m-1}$. One might wonder, then, why we use a first-differenced specification rather than a level specification. We do so for two reasons. First, a level specification would require the stronger assumption (used in the next section) that there is little change in $B_{y,m}$ over our estimation period relative to some pre-defined base period. Second, we are attempting to identify the period-specific intertemporal substitution effects before and after the tax change, rather than the period-specific total tax effect (intertemporal substitution and income effect). If an income effect is present, and provided it is constant over time, first differencing will remove this effect in all months other than the month in which it first appears.

Recall that the Murayama reform package was intended to be revenue-neutral. Furthermore, benefits in Japan are indexed annually to changes in the Consumer Price Index, which includes the effects of the VAT rate increase on prices.¹⁹ As a result, theory would predict little to no income effect associated with the rate increase. However, the conventional wisdom is that the VAT rate increase was responsible for Japan's economic malaise of the late 1990s. For this reason, we allow for income effects. Defining the period-specific intertemporal substitution

¹⁹ Since the VAT rate was increased in April 1997, and benefit levels are indexed at the beginning of each calendar year, beneficiaries were not immediately compensated for the higher price levels they faced. Rather, they were compensated beginning in 1998. As a result, there may have been a negative income effect for this group, since it by and large consists of retirees who are unable to reap the benefits of the earlier income tax cuts. We plan to explore this issue further in future versions of this paper.

effect induced by the tax change as $\gamma_{y,m}$, and making the additional assumption that the income effect, α , associated with the tax change, is constant and appears after final passage of the rate increase, it follows that

$$T_{y,m} = \alpha_y + \gamma_{y,m} \quad y = 1997, 1 \leq m \leq 11$$

Therefore, after first differencing expenditures, the coefficient $\hat{T}_{1997,1}$ will identify the total tax effect for January 1997, while the coefficients $\hat{T}_{1997,2} - \hat{T}_{1997,11}$ identify the intertemporal substitution effects resulting from the VAT rate increase. Since the coefficient for January 1997 captures the (negative) income effect in addition to the intertemporal substitution effect, we interpret the coefficients for the three months leading up to the VAT rate increase as a lower bound on the increase in household spending (or the percentage increase in household spending if using a log specification) that would not have been observed had a rate increase not been implemented or announced in advance. Conversely, the coefficients for the months following implementation provide an estimate of the reduction in household spending that would not have been observed had a rate increase not been implemented.

If instead households perceived the 1994 Murayama reform package as revenue-neutral, the income effect associated with the VAT rate increase would be zero, and the coefficients for January 1997 through November 1997 would capture only intertemporal substitution effects. Still another possibility, consistent with the Watanabe et al. finding, is that the income effect did not appear until implementation of the rate increase. Under that scenario, the coefficients for January through March 1997 and May through November 1997 would capture only intertemporal substitution effects, while the coefficient for April 1997 would capture the total tax effect for that month.

Our estimation procedure is slightly complicated by the fact that the JFIES is a rotating panel survey and the sample weight for a household may differ in each period during which it is interviewed. Recall that our sample consists of aggregated household-level data. If we assume the existence of household fixed effects, then differencing will not completely remove the fixed effects because the household's weight in the sample varies from month to month. As a result, there may be serial correlation in the residuals up to six lags, since each household remains in the sample for six consecutive months. To address the problem of serial correlation, we utilize the Newey-West (1987) estimator, which corrects for serial correlation up to a specified number of lags, and also allows for arbitrary forms of heteroskedasticity.

5.2. Identifying the Income Effect

To identify the income effect associated with the VAT rate increase, we continue to assume that real monthly household spending can be additively decomposed into a seasonal effect, δ_m , a tax effect, $T_{y,m}$, and an effect encompassing all other factors independent of the tax change, $B_{y,m}$. We further assume that

- 1) The sum of the pre-tax change and post-tax change intertemporal substitution effects is zero.
- 2) The post-tax change intertemporal substitution effects ($\gamma_{1997,m}, m \geq 4$), which are expected to be negative, reach zero by the end of our estimation period, which is December 1997.²⁰
- 3) During our estimation period, there is little to no change in $B_{y,m}$ relative to a pre-defined base period, which we define as the quarter prior to the period when the tax change

²⁰ This assumption is confirmed by the intertemporal substitution analysis. That is, we cannot reject the hypothesis that all intertemporal substitution occurred between January and November 1997.

begins to affect expenditures. We thus choose as our base period the fourth quarter of 1996, since the intertemporal substitution effects became evident in January 1997.²¹ In addition, this period coincides with final passage of the VAT rate increase legislation. Provided these assumptions hold, the following empirical specification will allow us to identify the income effect associated with the VAT rate increase:

$$E_{y,m} = \delta_m + B_y + T_{1997,m} + \epsilon_{y,m},$$

where δ_m is a coefficient associated with an indicator function that takes on a value of 1 in month m , B_y is a coefficient associated with an indicator function that takes on a value of 1 in each month of year y , $T_{1997,m}$ is a coefficient for an indicator function that takes on a value of 1 in month m of the year 1997, and $\epsilon_{y,m}$ accounts for unobservables affecting expenditures in each period. We do not include a year dummy for 1997, since the specification contains a full set of year-month indicators for 1997. Furthermore, the dummy for 1996 takes on a value of 1 only in the months January to September. As a result, the omitted period is 1996 Q4, since average monthly household expenditures during this quarter serve as the base against which 1997 monthly expenditures are compared.

The $T_{1997,m}$ coefficients capture average monthly deviations in household spending in month m of 1997 relative to average monthly spending during the base period. Thus, $T_{1997,m}$, $1 \leq m \leq 11$, should capture both intertemporal substitution effects and the income effect, if present. Provided all of the aforementioned assumptions hold, summing the $T_{1997,m}$ coefficients and dividing by the number of months since final passage will yield the average change in

²¹ We also experimented with a specification that defined December 1996 as the base period, since household expenditures in this month should best reflect underlying economic conditions just prior to the appearance of the tax effects, once we control for seasonality. The coefficients were qualitatively similar to our baseline specification, but the variance-covariance matrix was highly singular, and as a result, we do not report the results here.

monthly spending resulting from the VAT rate increase, which we interpret as the income effect.²² Alternatively, we can examine individual $T_{1997,m}$ coefficients in the later months of 1997, months for which the post-rate increase intertemporal substitution effects should have had less of an impact on household spending. Both approaches are used in the analysis below.

Under what conditions will these assumptions fail? Assumption 1 seems relatively innocuous. However, Assumptions 2 and 3 are potentially problematic. Applying the results of House and Shapiro to a household consumption context, intertemporal substitution should be spread out over a long period of time for long-lived durable goods following a temporary tax subsidy. For our purposes, this would imply that households may have brought forward purchases of long-lived durable goods (e.g. refrigerators) that would not have been made for perhaps several years in the absence of the VAT rate increase. If this was the case, then the post-tax change intertemporal substitution effects will not reach zero by the end of our estimation period, the sum of the estimated pre-tax change and post-tax change intertemporal substitution effects will be positive, and as a result, our estimate of the income effect will have an upward bias. To address this issue, we first note that it is unlikely that households are as forward looking as firms, which is the environment from which House and Shapiro's results are derived. Nevertheless, it is not unreasonable to believe that some households may have brought forward purchases that would have occurred after 1997 had the VAT rate increase not been imposed. However, a test of the sum of the coefficients on our 1997 month indicators from the intertemporal substitution analysis cannot reject the null hypothesis that all intertemporal

²² Our methodology is still valid if the income effect associated with the VAT rate increase appears at the same time as the pre-tax change intertemporal substitution effects. Summing the coefficients will still cancel out the intertemporal substitution effects, leaving us with only the income effect. We would, however, need to divide by the number of months since implementation, rather than the number of months since final passage, in order to determine the average change in monthly household spending. Doing so increases the absolute magnitude of the income effect only slightly.

substitution occurred between January and November 1997. As a result, we believe Assumption 2 is valid.

In Section 3.3, we addressed several events other than the VAT rate increase that could have affected expenditures during our estimation period (leading to a failure of Assumption 3), potentially biasing our estimates of the intertemporal substitution and income effect downwards. To the extent that these events reduced household spending, it further reinforces our findings below that the VAT rate increase had no impact on household spending.

Again, our estimation is complicated by the fact that the JFIES is a rotating panel survey and our dataset consists of aggregated household-level data. Allowing for household fixed effects implies serial correlation in the error terms. Since our empirical specification to identify the income effect is in levels rather than differences, serial correlation should only be present up to five lags rather than six. Again, we use the Newey-West estimator to correct for serial correlation.

6. Results

6.1. Intertemporal Substitution Effects

6.1.1. Descriptive Results

Figure 4 plots the residuals of regressions of the logarithm of (real monthly) total, durable, storable non-durable, and non-storable non-durable expenditures on month indicators. The residuals represent the seasonally-adjusted percentage deviation in monthly expenditures in each respective category from the sample average. Figure 4 covers the periods following the initial announcement of the VAT rate increase in late 1994 to December 1998.

Broadly speaking, household expenditures do not appear to respond to the impending VAT rate increase in any manner until the first quarter of 1997, which followed final passage of the fiscal year 1997 budget and immediately preceded implementation of the rate increase. During the first quarter of 1997, we observe a steady upward trend in expenditures that peaks in March 1997, the month prior to implementation, suggesting that the intertemporal substitution effects associated with the rate increase were significant. In April 1997, we observe a sharp drop in spending from the previous month, but the decline in spending is a return to spending in line with average expenditures in 1995 and 1996. We expected to observe a larger decline in expenditures in April 1997, as one might expect that those most likely to avoid the tax by bringing forward purchases were those who originally planned to make durable purchases soon after implementation. We suspect that some retailers did not immediately raise their prices on April 1, 1997, allowing consumers additional time to make purchases subject to the lower VAT rate. Spending remains slightly below average for the next quarter, but appears to recover by late third quarter 1997, suggesting that the income effects associated with the VAT rate increase were minimal. We observe a sharp drop in spending in December 1997, which coincided with the onset of the Japanese banking crisis discussed above. Because we believe this crisis had a lasting impact on household expenditures, our estimation period is restricted to the January through November 1997, as we cannot disentangle the effects of the crisis and any additional effects of the VAT rate increase that may have persisted beyond 1997.

When we decompose total expenditures into expenditures on durables, storable non-durables, and non-storable non-durables, a richer story emerges. As expected, the intertemporal substitution effects for durable goods and services appear to be quite large. In March 1997, for example, spending on durables was more than 20 percent above the sample average. Spending the month prior to that was nearly as high. Following implementation, expenditures on durables

declined, falling below average expenditures in 1995 and 1996. However, the decline in average durable expenditures in the eight months following implementation relative to expenditures in 1995 and 1996 is not statistically significant.

Expenditures on storable non-durable goods and services around the time of the VAT rate increase also appear to be consistent with theoretical predictions. We observe a large spike in expenditures on storable non-durables in March 1997, followed by several months of below average expenditures that gradually return to trend. This suggests that households did indeed engage in stockpiling prior to the tax change in order to avoid higher future prices, and consistent with the results of Hendel and Nevo (2006), duration until the following purchase is longer following a period of relatively low prices.

As noted above, we expect to observe little intertemporal substitution among non-storable non-durables goods and services relative to durables and storables, since by definition, these goods are limited mainly to intertemporal substitution in consumption. By and large, this is what we observe. There is a monotonic increase in expenditures on non-storable non-durables in the quarter prior to the tax change, suggesting the presence of intertemporal substitution in consumption and perhaps a small amount of stockpiling of fresh foods in late March. Also note the rather significant decline in non-storable non-durable expenditures in the two quarters following initial passage of the rate increase. We initially suspected that liquidity constrained households reduced expenditures on non-storable non-durables during these months in order to finance durables purchases prior to the rate increase. However, the summer of 1996 was much cooler than average, which resulted in a reduction in cooling costs. Furthermore, an E. Coli outbreak in July 1996 lead to a large decline in purchases of fresh meat, vegetables, and fruit.

6.1.2 Regression Analysis

Table 3 presents log- and level-deviations in average household expenditures from trend for each month of 1997.²³ As discussed in section 5.1, provided our identifying assumptions are valid, we interpret the sum of the coefficients on the January 1997 to March 1997 indicators as a lower bound on the (pre-rate increase) intertemporal substitution effects associated with the April 1997 VAT rate increase.

We find the intertemporal substitution effects to be both statistically and economically significant. Total expenditures on goods and services subject to the VAT increased in each of the three months following final passage, but preceding implementation, of the rate increase. We observe spending increases of 0.61, 3.24, and 8.85 percent in the first three months of 1997, respectively (relative to what we would have observed in the absence of a rate increase), which amounted to an increase in per-capita household expenditures of ¥30,231 (in 2005 ¥; approximately \$302) in the first quarter of 1997.

A direct result of the intertemporal substitution on the part of Japanese households is revenue losses to the government. To obtain a rough estimate of the losses sustained by the government as a result of pre-announcement, we put the pre-tax change intertemporal substitution effects into 1997 ¥ using the March 1997 CPI data that we constructed for all goods and services subject to the VAT. We multiply this amount by 0.02, the amount of the rate increase, to get an estimate of the revenue loss per household. Finally, we multiply by the total number of households in Japan in March 1997 (45.4 million, according to the Labor Force Survey) to derive the total revenue loss sustained by the Japanese government. We find that the Japanese government sustained a revenue loss of roughly ¥26.5 billion (~\$265 million) as a

²³ The full specification can be found in Appendix Tables A.2.1 and A.3.1. Appendix Tables A.2.2 and A.3.2 add year dummies to the baseline specification to control for heterogeneity in growth rates over the sample period.

result of pre-announcement of the rate increase, which amounted to 0.26 percent of fiscal year 1997 VAT revenue.

Increased outlays on durable goods and services prior to the tax change were responsible for most of the observed intertemporal substitution. Durable expenditures increased by 8.9 and 19.35 percent in February and March of 1997, respectively, and accounted for 55 percent of the intertemporal substitution that occurred in March 1997, despite the fact that durables comprised only 25 percent of household expenditure shares over our sample period. The durable response was driven largely by purchases of household appliances, consumer electronics, and clothing.

A significant amount of intertemporal substitution is also evident among storable non-durable goods and services. Outlays on storable non-durables increased by 9.98 percent in March 1997, with the average Japanese household spending ¥6,774 (~\$68) more in the first quarter of 1997 on storables than they otherwise would have in the absence of a rate increase. The response is largely due to increased expenditures on domestic storables, such as laundry detergent, and rail passes, which in Japan are good for several months after first use. Households also spent significantly larger amounts on non-storable non-durable goods and services in the first quarter of 1997, which is consistent with a positive intertemporal elasticity of substitution in consumption, and perhaps some last minute stockpiling of fresh food.

Our first-differenced specification should remove any income effect associated with the tax change for the months following implementation. As a result, the coefficients associated with the year-month indicators following implementation capture the post-rate increase intertemporal substitution effects, which are expected to be negative. Several months of below trend expenditures followed implementation of the VAT rate increase, with a return to trend by late third quarter 1997, and a subsequent decline in the fourth quarter, which we believe is

largely attributable to the Japanese banking crisis. We find that durable expenditures remained below trend for all but one month following implementation, while expenditures on storable non-durables dropped sharply in April 1997, with a gradual return to trend, as would be predicted by Hendel and Nevo. Finally, we cannot reject the null hypothesis that all intertemporal substitution occurred in 1997 (i.e. the null that the sum of the January 1997 to November 1997 coefficients is zero), which is an important assumption for our identification of the income effect below.

One might worry that the error terms for durables, storables, and non-storable non-durables are contemporaneously correlated. To allow for this possibility, we jointly regressed durable, storable and non-storable non-durable expenditures on the right-hand side variables given in (1) using a seemingly unrelated regression (SUR) framework.²⁴ Doing so does not impact our results in a meaningful way.²⁵ We also augmented our baseline specification with the inclusion of year dummies to control for the possibility of heterogeneous growth rates over the sample period. Inclusion of the year dummies did not significantly impact our results, as seen in Appendix Tables A.2.2 and A.3.2.

6.2. Income Effect

6.2.1. Descriptive Results

Figure 5 plots the percentage deviation in 1997 seasonally-adjusted monthly expenditures from average seasonally-adjusted monthly expenditures for 1996 Q4, along with 95 percent confidence intervals. Following implementation of the rate increase, household spending trended slightly below the 1996 average, before dropping sharply in December 1997, likely as a

²⁴ To our knowledge, there does not exist an SUR estimator that controls for serial correlation up to several lags like the Newey-West estimator does. As a result, these results do not control for serial correlation.

²⁵ Results are available from authors upon request.

result of the onset of the Japanese banking crisis. Given that some of the decline in the months immediately following implementation is due to intertemporal substitution (and perhaps the elimination of special income tax breaks and higher medical copayments), it would appear that the income effect resulting from the rate increase was small.

When decomposing these deviations, we note that durable expenditures remain below 1996 Q4 durable expenditures throughout 1997, while non-durable expenditures return to or exceed their 1996 Q4 level, suggesting that the income effect, while apparently small, may provide evidence of non-homothetic preferences, with an income elasticity for durables that exceeds one.

6.2.3. Regression Analysis

Table 4 presents several different tests for whether there was a significant reduction in household spending (independent of the intertemporal substitution effects) following implementation of the VAT rate increase.²⁶ In general, our results suggest that the rate increase did not have a significant impact on real household expenditures, a finding which stands in contrast to the conventional wisdom that the consumption tax rate increase was largely responsible for Japan's recession in the late 1990s, but is consistent with the revenue-neutral nature of the tax reform package that the VAT rate increase was a part of.

Our first test for the income effect examines total expenditures on goods and services subject to the VAT. We find that real monthly household spending declined by only ¥562 (~\$6) as a result of the rate increase. Even when we make the extreme assumption that the large decline in household spending in December 1997 was due to the rate increase rather than the bank crisis, as we do in test (2), we find that average monthly household spending following

²⁶ The full specification can be found in Appendix Table A.4.

implementation did not differ significantly from the 1996 Q4 average. Given our belief that the steep decline in December 1997 expenditures was largely a result of the bank crisis as well as the possibility that the elimination of special income tax breaks and higher medical copayments further reduced spending after the VAT rate increase, it would appear that the VAT rate increase had no more than a small negative impact on household spending.

Despite the small negative impact, the rate increase does appear to have led to a change in the composition of expenditures, as expenditures on durables decreased significantly during the estimation period, while spending on non-storable non-durables increased significantly. This finding suggests that preferences are non-homothetic, and in particular, that the income elasticity of demand for durable goods and services exceeds one.

Another method to determine whether the VAT rate increase led to a significant reduction in household spending is to examine the percentage deviation (from the 1996 Q4 seasonally-adjusted monthly average) in spending several months after the tax change, but prior to the bank crisis, periods in which the post-tax change intertemporal substitution effects should have been smaller. In particular, we examine the coefficients for September, October, and November 1997. Doing so, the rate increase appears to have had a somewhat larger impact on household spending than is suggested by our first two tests. Average household spending in October and November 1997 was ¥3,812 (~\$38) and ¥4,205 (~\$42) lower than average monthly spending in 1996 Q4.²⁷ Even so, it would appear that the VAT rate increase led to at most a modest reduction in household spending, and the event is perhaps undeserving of the disproportionate blame it often receives for Japan's recession of the late 1990's.

²⁷ The first bank failure occurred in the second half of November 1997, and may have contributed to the reduction in spending in that month.

7. Discussion

In this paper, we characterized the household spending response to Japan's April 1997 VAT rate increase from three to five percent, demonstrating the following:

- 1) In the quarter following the final passage of legislation, but prior to implementation, Japanese households engaged in a significant (both statistically and economically) amount of intertemporal substitution, which resulted in modest revenue losses for the Japanese government.
- 2) Increased outlays on both durable and storable non-durable goods and services were responsible for the vast majority of the intertemporal substitution effects.
- 3) The income effect of the rate increase was negative, but small.

We now consider each of the findings in turn.

Despite two prior announcements of the impending VAT rate increase in September 1994 and June 1996, Japanese households did not engage in a significant amount of intertemporal substitution until after final passage of the rate increase legislation in December 1996. This finding suggests households were either unaware of, ignored, or did not perceive as credible the initial announcements. Based on our examination of newspaper references to the consumption tax increase (and assuming coverage was similar in other papers), we consider it to be unlikely that households were unaware of the likelihood of a rate increase, especially following the June 1996 legislation, which coincided with a steady upward trend in news coverage. If households simply ignored the initial announcements, perhaps because the costs of processing the information regarding the rate increase outweighed the benefits of bringing forward purchases (especially those on durable goods), this suggests that governments need not worry much about the timing of announcement, since households will not engage in intertemporal substitution until

the final few months before implementation, and some delay between announcement and implementation is inevitable. It is also plausible that households did not perceive as wholly credible the initial announcements regarding the VAT rate increase. The initial announcement in November 1994 set only a target date of April 1997 for the rate increase, while the June 1996 legislation left open the possibility that the rate increase would not take effect as scheduled. As has been well documented in the literature on firm investment (e.g. Dixit and Pindyck, 1994), given the irreversibility of investment decisions, and an environment characterized by uncertainty, there is an option value to waiting for more complete information. Until the fiscal year 1997 budget was submitted, the VAT rate increase was not an absolute certainty, and therefore households may have been biding their time until it became so. We tend to favor this latter explanation for the late (though large) response by Japanese households. If this was the case, it would suggest that governments should be deliberately vague regarding the timing of VAT implementations or rate increases in order to minimize the amount of time available to households to engage in intertemporal substitution, which, as has been highlighted in prior literature on the imposition of a consumption tax (e.g. Kaplow, 2008), reduces its efficiency by leaving less capital available to be taxed inelastically following implementation.

While we lack data on the intertemporal substitution effects of VAT rate increases in other countries, the response in Japan strikes us as quite large. Recall that a two percent increase in the VAT rate caused a nine percent increase in expenditures on goods and services subject to VAT in the month prior to implementation, and expenditures on durable goods and services increased by nearly 20 percent that same month. This begs the question of whether we should expect to observe such a response in other countries that adopt a VAT or increase their rate. One reason for the large response is that Japan is a developed economy, and as documented by

Summers and Heston (1988), durable goods and services comprise a larger share of expenditures in high income countries than in developing or transition economies, who have been the most frequent adopters of VAT in recent years (Ebrill et al., 2001). As a result, we should expect the magnitude of intertemporal substitution in a developed economy such as Japan to exceed that in less developed economies. On the other hand, dwellings in Japan are on average smaller than in other developed economies such as the United States, and thus storage space is more dear, so we might expect that intertemporal substitution of storable non-durable goods and services in the United States would exceed what we observed for Japan should the U.S. impose a VAT in the future.

Numerous articles in the popular press and a handful of academic articles have blamed the 1997 VAT rate increase for triggering Japan's economic slump of the late 1990s. While we are constrained by the inherent difficulty of separately identifying the intertemporal substitution effects and the income effect as well as disentangling the effects of the Japanese banking crisis and the VAT rate increase on expenditures after November 1997, our analysis suggests that in the months following implementation but prior to the banking crisis, the VAT rate increase had no more than a small negative impact on real household spending, with spending on goods and services subject to the VAT falling by well less than the amount of the rate increase. While this finding should not be surprising given the revenue-neutral nature of the Murayama tax reform, alternative explanations, which are more convincing if households perceived the VAT rate increase to be uncompensated, do exist. This analysis has neglected the impact of consumption tax rate changes on labor supply. It is entirely possible that households react to rate increases not by reducing consumption, but by increasing their lifetime labor supply, an empirical question that would be difficult to ascertain. Another possibility is that households draw down on buffer

stocks of savings, which also seems plausible in a country with a high savings rate like Japan. Clearly, more research needs to be done on the longer-term impact of VAT changes on household spending, labor supply, and saving (not to mention the fact that one of the primary rationales behind a tax-mix switch away from income taxation and towards consumption taxation is the removal of the disincentive to save that exists under an income tax), preferably in a country where the change was not soon followed by another major event that significantly impacted household expenditures, and in a country that has experienced both compensated and uncompensated rate hikes.

The International Monetary Fund (IMF) recently recommended that Japan raise its consumption tax rate from five to fifteen percent in order to reduce its public debt, which as a percentage of GDP is one of the highest in the world, and the highest among developed countries.²⁸ The current debate among economists and policymakers is whether to phase in such an increase.²⁹ Unfortunately, our analysis focuses on only one modest rate increase, and as such, it is difficult to contribute to this debate without making assumptions about government objectives. Future researchers in this area should seek out a country with expenditure data similar to the JFIES which has experienced both small (1-2 percent) and large (≥ 5 percent) VAT rate increases. If the intertemporal substitution effects are increasing and convex in the tax change, the disruption to macroeconomic stability and the present discounted value of revenue losses sustained by the government would be greater the larger is the rate increase. This would suggest that a gradual phase-in of, say, one percent per year would be the appropriate policy. If, however, the intertemporal substitution effects are concave in the tax change, a larger rate

²⁸ "IMF urges tax increase to tackle Japan debt," Reuters, July 14, 2010, <http://www.reuters.com/article/idUSNLEIE69620100714>

²⁹ Hayashi, Yuka. "Japan Looks Hard at Trimming Huge Debt," The Wall Street Journal Online, March 1, 2010, <http://online.wsj.com/article/SB10001424052748703940704575089952215368646.html>

increase would be warranted, whereas intertemporal substitution that is linear in the tax change might also suggest a larger rate increase due to the relative administrative ease of a single tax rate increase.

Given additional assumption about government objectives, we can use Japan's experience to make conjectures about whether a phased-in rate increase is appropriate. Suppose that the government has the dual objectives of maximizing revenue and minimizing disruptions to macroeconomic stability. Clearly, one large rate increase would maximize revenue, while a phase-in would minimize disruptions to macroeconomic stability. The larger is the intertemporal substitution response to a rate increase, the more desirable a phase-in would become. Thus, given Japan's large response to the modest 1997 rate increase, a phase-in of future rate increases could be more desirable. Related to this, phase-ins might be more appropriate for developed economies, as their larger expenditure shares on durable goods imply a greater amount of intertemporal substitution than in developing economies.

8. Conclusion

This paper examines the intertemporal substitution and income effects associated with a VAT rate increase, using Japan's April 1997 rate increase as a case study. We find that households engaged in a significant amount of intertemporal substitution in the quarter following announcement of, but prior to, the rate increase. Two earlier announcements regarding the rate increase appear to have been ignored, likely because they were non-binding and did not make the rate increase a certainty. Consistent with theoretical predictions, we find that the vast majority of the intertemporal substitution response was due to increased outlays on durable and storable non-

durable goods and services, suggesting that the intertemporal substitution response will be larger in developed economies, where expenditures shares for durables are relatively high.

Contrary to the conventional wisdom, but consistent with the revenue-neutral nature of the tax reform package of which the VAT rate increase was a part, we find evidence suggesting that the VAT rate increase had little to no negative impact on household spending in Japan, though we stress that our results are only suggestive, given the inherent difficulty of separately identifying income and substitution effects and our inability to disentangle the effects of the rate increase and the banking crisis after November 1997.

Future research in this area should examine the sensitivity of the intertemporal substitution response to both small and large rate changes in order to judge whether phased-in rate increases are appropriate. In addition, examination of cases in which a major crisis did not closely follow a rate change and for which there is heterogeneity in the amount of compensation provided would be helpful in determining the effect of rate increases on household spending over the long-run.

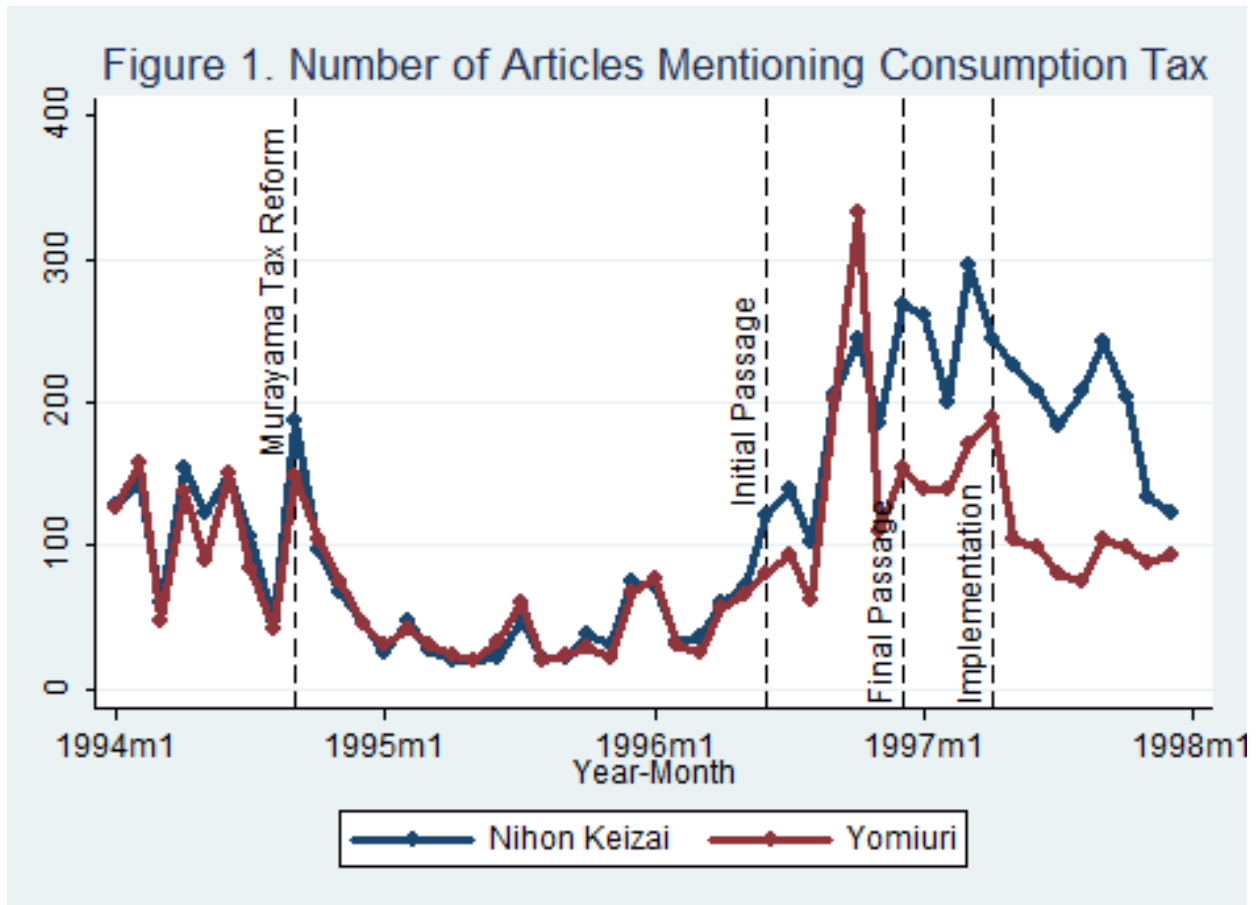
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Source: Authors' calculations

Table 1. Consumer Price Index for Goods and Services Subject to VAT 1996-1998						
	1996		1997		1998	
Month	CPI	Percent Change*	CPI	Percent Change	CPI	Percent Change
January	103.28	-0.10	103.37	-0.24	104.79	-0.01
February	103.04	-0.24	103.14	-0.23	104.52	-0.26
March	103.22	0.18	103.18	0.04	104.97	0.43
April	103.80	0.56	105.70	2.45	105.14	0.17
May	103.97	0.17	105.84	0.13	105.59	0.42
June	103.47	-0.48	105.84	0.00	105.00	-0.56
July	103.43	-0.04	105.29	-0.52	104.11	-0.85
August	103.25	-0.17	105.42	0.12	103.97	-0.13
September	103.62	0.36	105.80	0.36	105.03	1.02
October	103.81	0.18	106.08	0.26	106.05	0.97
November	103.38	-0.41	105.10	-0.92	105.92	-0.12
December	103.62	0.23	104.80	-0.29	105.32	-0.56

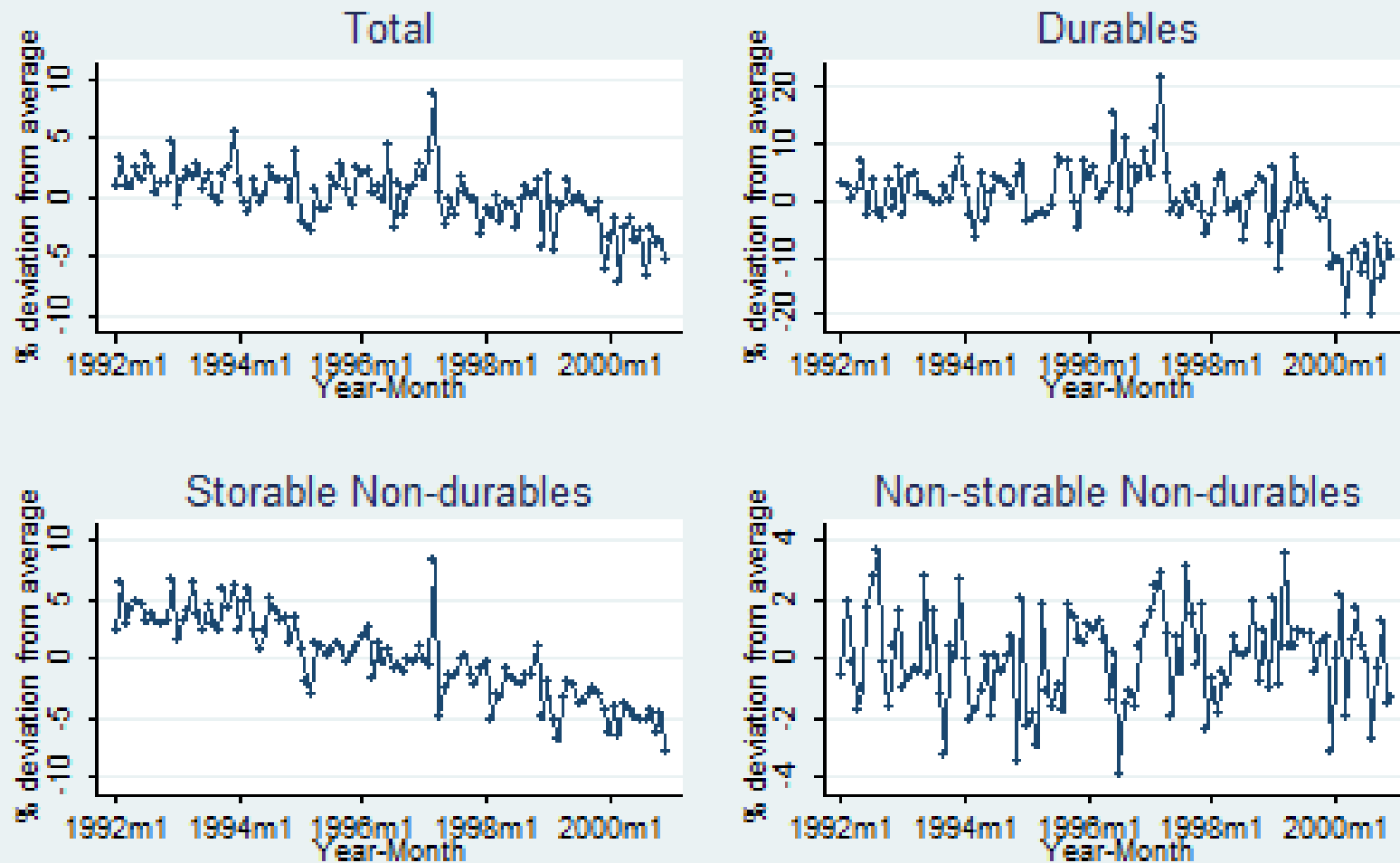
*Percent change on prior month

Note: Base year is 2005.

Table 2. Summary Statistics for Real Monthly Expenditures on Goods and Services Subject to VAT (in 2005 ¥)					
Expenditure Category	Observations	Mean	Std. Dev.	Min	Max
Total	108	251,547	26,287	212,907	341,050
Durables	108	62,959	11,690	42,779	102,049
Storable Non-Durables	108	56,872	7,613	47,323	85,074
Non-Storable Non-Durables	108	131,716	10,504	117,237	154,525

Note: Divide sample averages by 100 to get a rough approximation of real monthly expenditures on items subject to VAT in U.S. dollars.

Figure 2. Real Monthly Expenditures
Seasonal effects removed



Note: The above figures are the residuals from a regression of the logarithm of real monthly expenditures on month indicators.

Figure 3. Identifying the Effects of a VAT Rate Increase on Household Spending Using a First-Differenced Specification

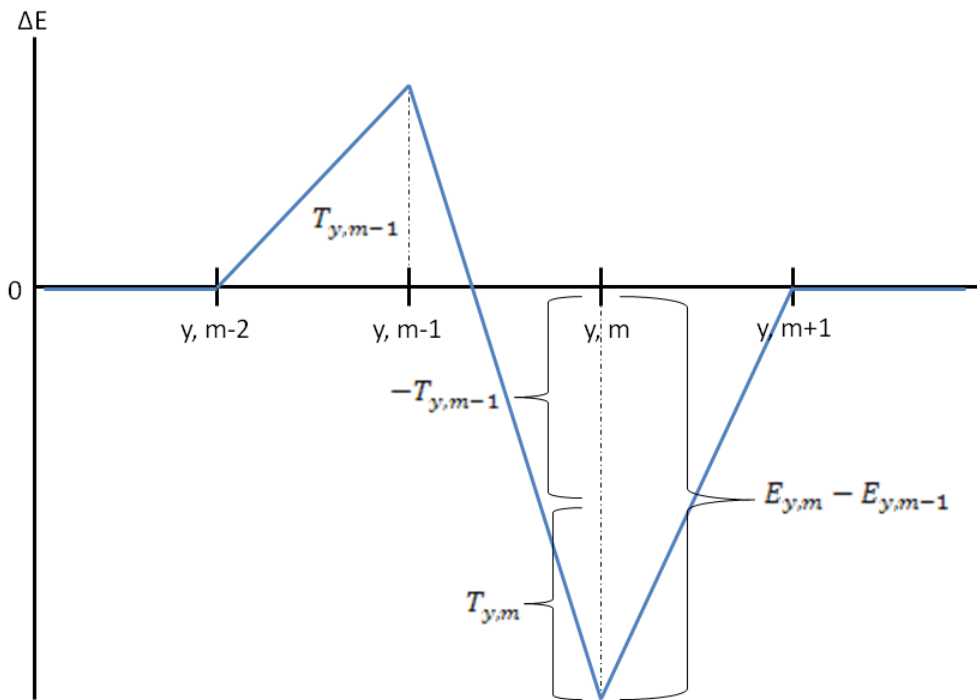
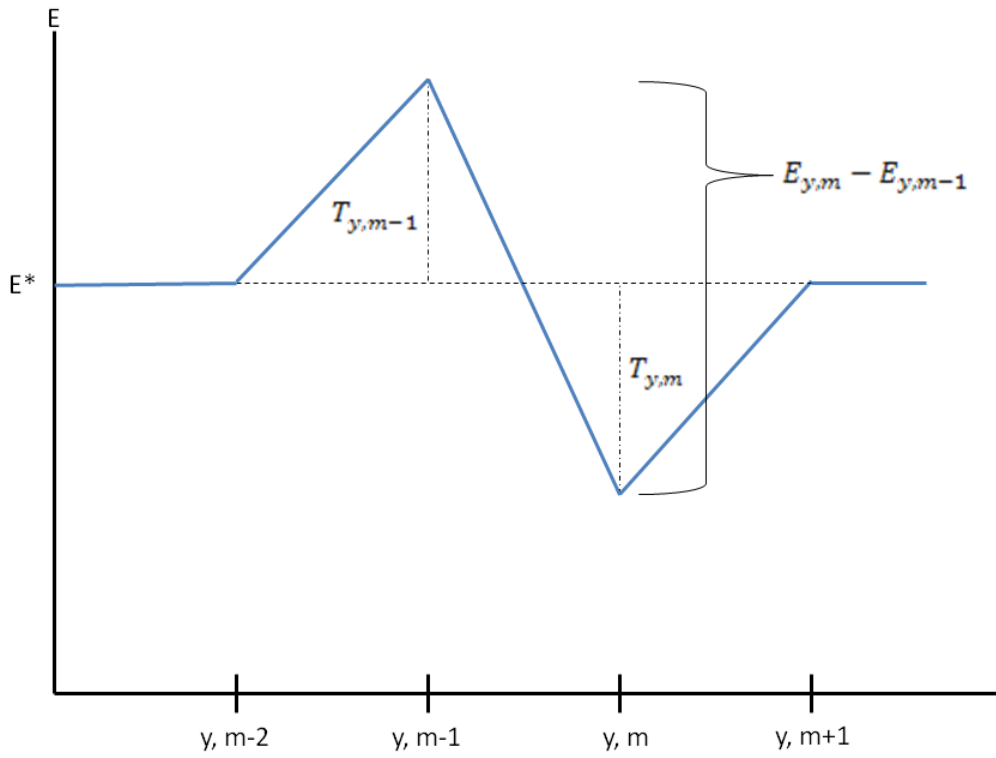
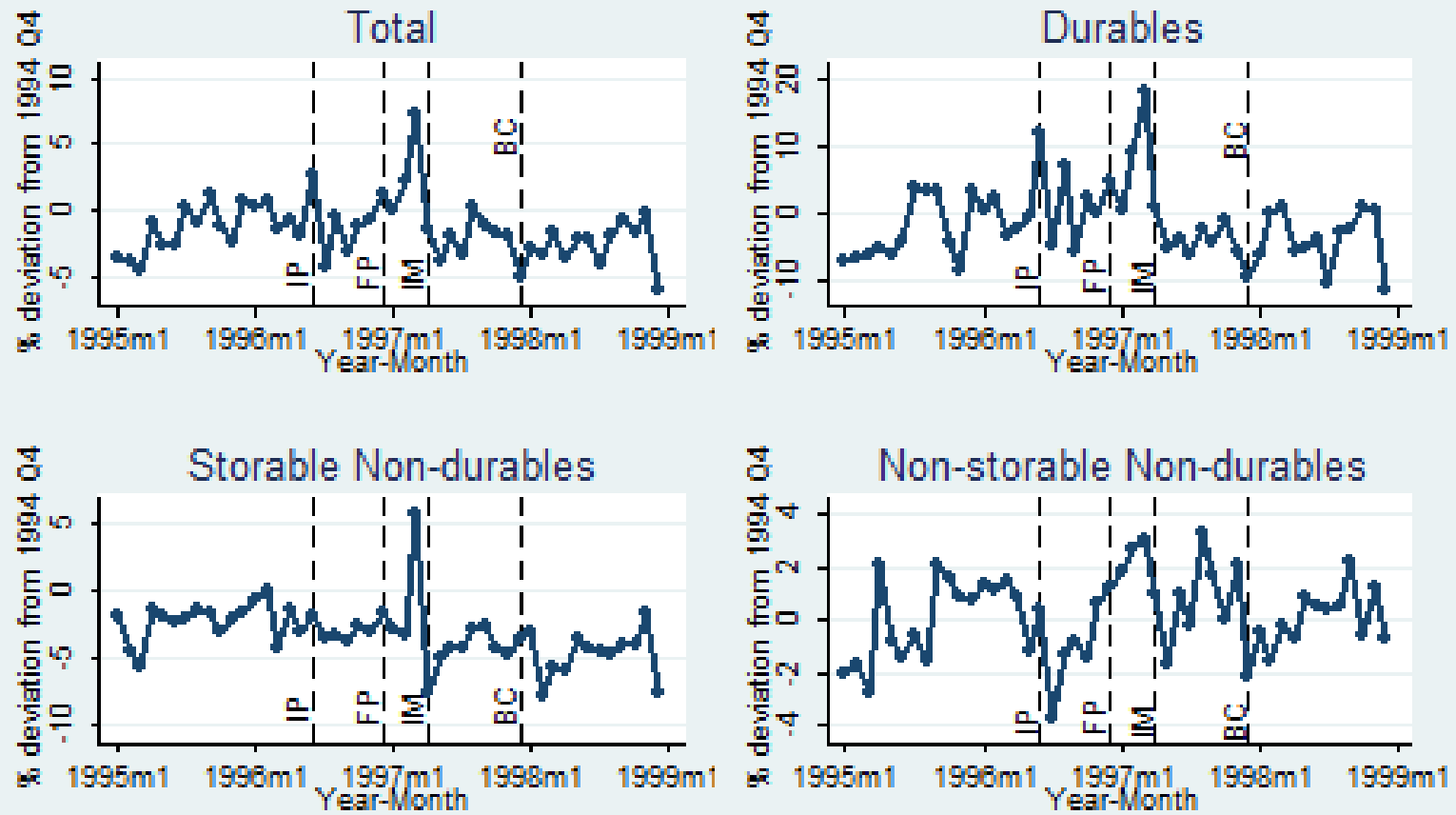


Figure 4. Real Monthly Expenditures (1995-1998)
Seasonal effects removed



IP = Initial Passage FP = Final Passage IM = Implementation BC = Bank Crisis

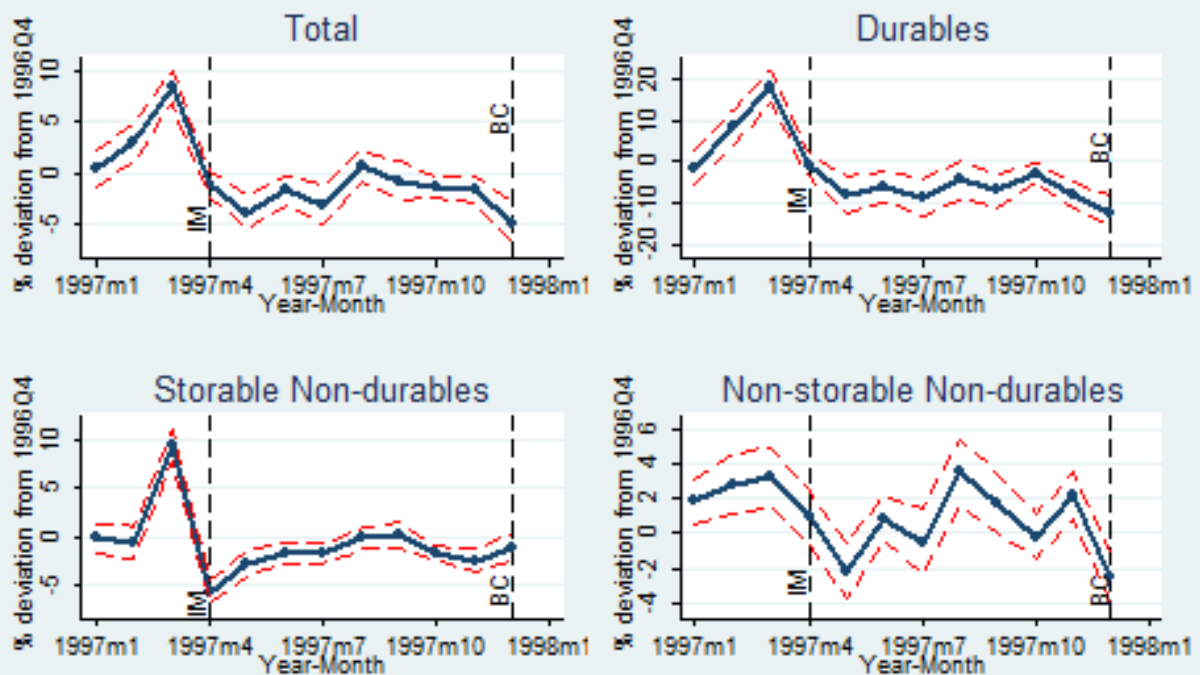
Note: The above figure plots the residuals from a regression of the logarithm of real monthly expenditures on month indicators, using the Newey-West estimator to correct for serial correlation and arbitrary forms of heteroskedasticity in the error terms.

Table 3. Deviations in Seasonally-Adjusted Real Household Spending from Trend, 1997					
Expenditure Category	Month	% Change	Std. Error	Change (in 2005 ¥)	Std. Error
Total	January	0.61	1.66	786	5,107
	February	3.24**	1.29	6,104	4,016
	March	8.85***	1.18	23,341***	3,566
	April	-0.73	1.00	-2,463	3,088
	May	-3.42***	1.05	-8,742***	3,069
	June	-1.14	0.95	-3,490	2,691
	July	-2.58**	1.04	-7,243**	2,840
	August	1.40	0.89	2,677	2,462
	September	-0.03	1.02	-1,037	2,935
	October	-0.58	0.84	-2,280	2,579
	November	-0.68	1.01	-2,503	3,103
	December	-4.01**	1.66	-13,350**	5,110
Durables	January	-1.27	2.91	-2,379	2,149
	February	8.90***	2.27	2,216	1,644
	March	19.35***	2.57	12,015***	1,745
	April	0.81	2.32	-741	1,606
	May	-5.75**	2.86	-4,135**	1,818
	June	-3.26	2.78	-2,889	1,744
	July	-5.56**	2.84	-4,185**	1,776
	August	-0.82	2.78	-1,544	1,536
	September	-2.64	2.45	-2,136	1,585
	October	1.74	2.14	81	1,361
	November	-2.96	2.47	-2,190	1,610
	December	-6.66**	2.91	-5,855***	2,153
Storable Non-durables	January	0.82	1.15	745	1,036
	February	0.14	1.10	308	846
	March	9.98***	0.99	5,721***	749
	April	-5.30***	0.99	-2,600***	780
	May	-2.62**	1.04	-1,325	811
	June	-1.82*	0.99	-950	791
	July	-2.09**	0.98	-1,276	776
	August	-0.76	0.96	-583	767
	September	-0.63	1.02	-571	825
	October	-2.74***	0.97	-1,749*	772
	November	-3.69***	1.02	-2,271***	855
	December	-2.55**	1.14	-2,092**	1,032
Non-storable Non-durables	January	1.34	1.06	1,865	1,566
	February	2.42**	1.13	2,841*	1,548
	March	2.90***	1.04	4,116**	1,500
	April	0.64	0.89	770	1,242
	May	-2.43***	0.90	-3,201**	1,239
	June	0.67	0.74	752	1,005
	July	-0.66	0.91	-927	1,213
	August	3.41***	0.91	4,931***	1,284
	September	1.69*	0.86	2,030*	1,130
	October	-0.21	0.81	-289	1,091
	November	2.20***	0.64	2,675***	884
	December	-2.53**	1.06	-3,893**	1,567

The above table presents the coefficients for differenced year-month indicators from regressions of first differenced (log first differenced) real monthly household expenditures on a constant, differenced month indicators, and differenced year/month indicators for 1997 using the Newey-West estimator to correct for serial correlation. The coefficients in Column 3 represent the percentage deviation in household spending from trend, while the coefficients in Column 5 represent the change in average household expenditures from trend. Each regression includes month

indicators to control for seasonal variation in expenditures. In addition, a second specification includes year dummies to control for heterogeneity in spending growth over the sample period. These results are presented in the Appendix, along with the full baseline specification. We interpret the coefficients for January through March 1997 as the intertemporal substitution effects resulting from the VAT rate increase. That is, additional spending that would not have been observed had the VAT rate increase not been imposed or announced in advance. Note: *, **, *** represent statistical significance at the ten, five, and one percent levels, respectively.

Figure 5. Percentage Deviation in Real Monthly Expenditures
Relative to 1996 Q4 base period



IM = Implementation BC = Bank Crisis

Note: The above figure is constructed in the following manner:

- 1) The logarithm of monthly expenditure is regressed on month indicators
- 2) The monthly log residuals for 1996 Q4 are averaged
- 3) We subtract the average log residuals for 1996 Q4 from the 1997 monthly log residuals, and plot.

Table 4. Tests for Significance of Income Effects

Test [†]	Total		Durables		Storable Non-durables		Non-storable Non-durables	
	Sum	p-value	Sum	p-value	Sum	p-value	Sum	p-value
1) $\sum_{m=1}^{11} T_{1997,m} = 0$	-562	0.77	-1,623	0.09*	-348	0.29	1,695	0.03**
2) $\sum_{m=1}^{12} T_{1997,m} = 0$	-1,784	0.28	-2,230	0.01***	-395	0.14	1,220	0.09*
3) $T_{1997,9} = 0$	-2,620	0.34	-4,321	0.00***	53	0.91	2,089	0.07*
4) $T_{1997,10} = 0$	-3,812	0.03**	-2,266	0.01**	-940	0.00***	-259	0.77
5) $T_{1997,11} = 0$	-4,205	0.05**	-4,891	0.00***	-1,277	0.01***	2,634	0.0***

†The p-values for tests (1) and (2) are derived from F-tests, while the p-values for tests (3)-(5) are derived from t-tests. We interpret the sums for tests (1) and (2) as the change in average monthly spending resulting from the VAT rate increase, while the sums for tests (3)-(5) represent the seasonally adjusted change in spending in month m resulting from the VAT rate increase.

*, **, and *** represent statistical significance at the ten, five, and one percent level, respectively.

Appendix

Table A.1. Categorization of Goods and Services Subject to VAT		
Durables	Storable Non-Durables	Non-Storable Non-Durables
Tools	Grains (e.g. noodles)	Bread
Cooking appliance	Fish (dried, fish paste)	Fish (fresh)
Refrigerator	Meat (processed)	Meat (raw)
Vacuum	Dairy (e.g. butter)	Dairy (e.g. milk)
Washing machine/dryer	Vegetable (e.g. beans)	Vegetable (fresh)
Other household durables (e.g. microwave)	Fruit (canned)	Fruit (fresh)
Air conditioner	Oils, spices, and seasonings	Cake
Fan heaters	Sugar	Cooked food (e.g. sushi)
Stove	Sweets (e.g. chocolate)	Electricity
Other heating and cooling appliances	Cooked food	Natural gas
General furniture	Beverages (e.g. tea)	Water
Clock	Alcoholic beverages	Flowers
Lighting	Light bulbs	Newspaper
Floor coverings and curtains	Domestic goods (e.g. laundry detergent)	Eating out
Other interior furnishings	Cloth	Domestic services
Bedding	Medicine	Bus fare
Utensils	Medical supplies (e.g. bandages)	Taxi fare
Japanese clothing	Gasoline	Airfare
Western clothing	Stationery	Other public transit
Women's coats	Film	Automotive fees
Shirts	Recording media (e.g. CD)	Automotive insurance
Underwear	Pet food	Telephone service
Other clothing	Personal care items (e.g. toothbrush)	Recreational good repair
Footwear	Tobacco	Recreational durable good repair
Automobile	Rail service	Lodging
Other vehicle		Package tour
Bicycle		Lesson fees
Auto parts		Television service
Telephone		Movie or play admission
Textbook		Other admissions
Television		Other recreational services
Stereo		Other insurance
Portable audio equipment		Social expenses (e.g. money gifts)
Video recorder		
Camera		
Computer		
Musical instrument		
Desk		
Other recreational durable goods		
Golf equipment		
Other sporting goods		
Sport outfits		
Toys		
Other recreational goods		
Books		
Personal care item (e.g. hair dryer)		

Personal effects (e.g. umbrella)		
Handbag		
Accessories (e.g. watch)		
Other personal effects (e.g. cane)		
Home repair (e.g. plumbing)		
Clothing services (e.g. tailoring)		
Auto repair		
Personal care services (e.g. haircut)		
Personal effect services (e.g. watch repair)		

Table A.2.1 Percentage Deviation on Prior Month's Spending, Baseline Specification								
Variable	Total		Durables		Storable Non-durables		Non-storable Non-durables	
	% Change	Std. Err.	% Change	Std. Err.	% Change	Std. Err.	% Change	Std. Err.
Δ February	-10.22	1.07	-10.28	2.92	2.59	1.18	-15.28	0.72
Δ March	8.43	0.95	22.43	2.67	11.99	1.18	0.75	0.61
Δ April	0.68	0.91	12.20	2.12	9.70	1.02	-8.15	0.77
Δ May	-0.17	0.96	5.31	2.40	10.40	0.96	-6.85	0.85
Δ June	-3.66	0.99	8.86	2.63	6.92	0.87	-13.84	0.71
Δ July	7.47	1.23	26.97	2.84	18.33	0.92	-6.38	0.98
Δ August	5.46	1.07	0.43	2.64	16.82	0.90	2.82	0.98
Δ September	-6.96	1.17	-3.06	2.47	5.62	0.97	-13.83	0.92
Δ October	-1.79	1.06	8.40	2.11	11.45	1.00	-11.90	0.92
Δ November	-2.92	1.13	9.94	2.54	9.67	1.01	-14.18	0.68
Δ December	29.14	1.79	52.55	3.11	47.58	1.22	9.10	1.15
Δ Jan 1997	0.61	1.66	-1.27	2.91	0.82	1.15	1.34	1.06
Δ Feb 1997	3.24	1.29	8.90	2.27	0.14	1.10	2.42	1.13
Δ Mar 1997	8.85	1.18	19.35	2.57	9.98	0.99	2.90	1.04
Δ Apr 1997	-0.73	1.00	0.81	2.32	-5.30	0.99	0.64	0.89
Δ May 1997	-3.42	1.05	-5.75	2.86	-2.62	1.04	-2.43	0.90
Δ Jun 1997	-1.14	0.95	-3.26	2.78	-1.82	0.99	0.67	0.74
Δ Jul 1997	-2.58	1.04	-5.56	2.84	-2.09	0.98	-0.66	0.91
Δ Aug 1997	1.40	0.89	-0.82	2.78	-0.76	0.96	3.41	0.91
Δ Sep 1997	-0.03	1.02	-2.64	2.45	-0.63	1.02	1.69	0.86
Δ Oct 1997	-0.58	0.84	1.74	2.14	-2.74	0.97	-0.21	0.81
Δ Nov 1997	-0.68	1.01	-2.96	2.47	-3.69	1.02	2.20	0.64
Δ Dec 1997	-4.01	1.66	-6.66	2.91	-2.55	1.14	-2.53	1.06
Constant	-0.10	0.10	-0.17	0.25	-0.15	0.09	-0.03	0.09

Note: See notes for Table 3.

Variable	Total		Durables		Storable Non-durables		Non-storable Non-durables	
	% Change	Std. Err.	% Change	Std. Err.	% Change	Std. Err.	% Change	Std. Err.
Δ February	-10.21	1.12	-10.28	3.07	2.60	1.23	-15.28	0.74
Δ March	8.44	1.02	22.43	2.85	12.01	1.27	0.75	0.65
Δ April	0.69	0.97	12.20	2.24	9.72	1.08	-8.15	0.82
Δ May	-0.15	1.03	5.31	2.54	10.43	1.05	-6.85	0.89
Δ June	-3.65	1.07	8.87	2.78	6.96	0.96	-13.84	0.75
Δ July	7.49	1.33	26.98	3.00	18.38	1.02	-6.38	1.04
Δ August	5.48	1.16	0.44	2.77	16.87	1.00	2.82	1.05
Δ September	-6.94	1.26	-3.06	2.60	5.68	1.06	-13.82	0.98
Δ October	-1.76	1.15	8.40	2.22	11.52	1.08	-11.90	0.99
Δ November	-2.89	1.20	9.95	2.68	9.75	1.08	-14.17	0.74
Δ December	29.18	1.89	52.56	3.28	47.66	1.26	9.11	1.21
Year 1993	0.14	0.67	0.37	1.22	0.08	0.58	0.10	0.45
Year 1994	-0.05	0.59	0.15	1.13	-0.13	0.51	-0.04	0.54
Year 1995	-0.02	0.60	0.27	1.28	-0.09	0.47	-0.11	0.52
Year 1996	0.12	0.57	0.37	1.23	0.11	0.52	0.06	0.49
Year 1997	-0.06	0.41	-0.39	0.81	0.23	0.41	-0.06	0.36
Year 1998	-0.35	0.62	-0.46	1.33	-0.50	0.69	-0.08	0.45
Year 1999	-0.07	0.94	-0.10	2.00	0.16	0.58	-0.17	0.61
Year 2000	0.16	0.67	0.37	1.10	-0.17	0.52	0.17	0.62
Δ Jan 1997	0.62	1.73	-1.26	3.02	0.84	1.15	1.34	1.11
Δ Feb 1997	3.23	1.31	8.89	2.29	0.10	1.13	2.42	1.14
Δ Mar 1997	8.80	1.21	19.34	2.61	9.87	0.91	2.90	1.06
Δ Apr 1997	-0.80	1.00	0.79	2.10	-5.49	0.86	0.64	0.89
Δ May 1997	-3.52	1.06	-5.78	2.69	-2.88	0.83	-2.44	0.89
Δ Jun 1997	-1.27	0.95	-3.30	2.55	-2.15	0.75	0.66	0.72
Δ Jul 1997	-2.74	1.13	-5.61	2.72	-2.48	0.81	-0.67	0.94
Δ Aug 1997	1.22	0.95	-0.87	2.54	-1.23	0.86	3.39	0.96
Δ Sep 1997	-0.24	1.12	-2.69	2.41	-1.17	0.98	1.67	0.93
Δ Oct 1997	-0.82	1.02	1.68	2.12	-3.35	1.08	-0.22	0.91
Δ Nov 1997	-0.95	1.21	-3.04	2.69	-4.37	1.18	2.18	0.74
Δ Dec 1997	-4.31	1.92	-6.74	3.24	-3.30	1.36	-2.55	1.28
Constant	-0.09	0.39	-0.24	0.81	-0.11	0.40	-0.01	0.34

Note: See notes for Table 3.

Variable	Total		Durables		Storable Non-durables		Non-storable Non-durables	
	Change (2005 ¥)	Std. Err.	Change (2005 ¥)	Std. Err.	Change (2005 ¥)	Std. Err.	Change (2005 ¥)	Std. Err.
	Δ February	-22762	2395	-4510	1295	1327	587	-19834
Δ March	20913	2411	11953	1506	6185	679	1071	840
Δ April	1831	2264	6176	1118	4992	582	-10949	1046
Δ May	-72	2426	2721	1266	5385	581	-9248	1151
Δ June	-8012	2564	4605	1463	3636	575	-18072	964
Δ July	18699	3268	14694	1639	9803	648	-8616	1330
Δ August	13767	2924	597	1336	8983	674	4043	1402
Δ September	-15083	3324	-1096	1533	3114	759	-18020	1229
Δ October	-3405	3175	4464	1316	6155	777	-15655	1267
Δ November	-5892	3444	5250	1640	5256	855	-18431	971
Δ December	80105	5532	32694	2303	29116	1104	13371	1696
Δ Jan 1997	786	5107	-2379	2149	745	1036	1865	1566
Δ Feb 1997	6104	4016	2216	1644	308	846	2841	1548
Δ Mar 1997	23341	3566	12015	1745	5720	749	4116	1500
Δ Apr 1997	-2463	3088	-741	1606	-2600	780	770	1242
Δ May 1997	-8742	3069	-4135	1818	-1325	811	-3201	1239
Δ Jun 1997	-3490	2691	-2889	1744	-950	791	752	1005
Δ Jul 1997	-7243	2840	-4185	1776	-1276	776	-927	1213
Δ Aug 1997	2677	2462	-1544	1536	-583	767	4931	1284
Δ Sep 1997	-1037	2935	-2136	1585	-571	825	2030	1130
Δ Oct 1997	-2280	2579	81	1361	-1749	772	-289	1091
Δ Nov 1997	-2503	3103	-2190	1610	-2271	855	2675	884
Δ Dec 1997	-13350	5110	-5855	2153	-2092	1032	-3893	1567
Constant	-323	289	-135	151	-110	70	-44	117

Note: See notes from Table 3.

Variable	Total		Durables		Storable Non-durables		Non-storable Non-durables	
	Change (2005 ¥)	Std. Err.	Change (2005 ¥)	Std. Err.	Change (2005 ¥)	Std. Err.	Change (2005 ¥)	Std. Err.
Δ February	-22750	2502	-4508	1365	1334	611	-19833	948
Δ March	20936	2617	11957	1623	6197	734	1072	904
Δ April	1865	2435	6182	1204	5011	621	-10947	1114
Δ May	-27	2638	2729	1368	5410	637	-9246	1210
Δ June	-7955	2810	4614	1566	3667	640	-18070	1025
Δ July	18767	3555	14706	1751	9840	720	-8613	1415
Δ August	13847	3197	610	1426	9026	746	4046	1496
Δ September	-14992	3599	-1081	1629	3163	824	-18016	1317
Δ October	-3303	3446	4480	1392	6210	838	-15650	1363
Δ November	-5778	3681	5268	1735	5317	911	-18426	1049
Δ December	80230	5822	32715	2426	29184	1154	13377	1789
Year 1993	471	2267	313	909	63	606	152	641
Year 1994	-161	1926	126	817	-100	463	-62	759
Year 1995	-59	1793	226	850	-61	425	-173	716
Year 1996	401	1695	309	816	86	447	85	670
Year 1997	-90	1404	-234	599	194	415	-83	495
Year 1998	-1145	1943	-406	898	-380	538	-131	606
Year 1999	-170	2967	-36	1431	122	570	-255	884
Year 2000	492	2361	295	888	-111	566	253	877
Δ Jan 1997	820	5343	-2373	2232	764	1059	1866	1636
Δ Feb 1997	6035	4090	2204	1638	271	834	2838	1556
Δ Mar 1997	23171	3630	11987	1741	5628	643	4108	1528
Δ Apr 1997	-2735	3076	-785	1445	-2748	620	758	1236
Δ May 1997	-9116	3043	-4196	1653	-1529	577	-3218	1209
Δ Jun 1997	-3966	2665	-2966	1534	-1210	532	731	960
Δ Jul 1997	-7822	3074	-4279	1646	-1591	561	-953	1253
Δ Aug 1997	1996	2634	-1654	1297	-953	613	4900	1352
Δ Sep 1997	-1820	3217	-2264	1529	-997	745	1995	1216
Δ Oct 1997	-3165	3099	-63	1345	-2230	799	-329	1237
Δ Nov 1997	-3490	3683	-2351	1753	-2809	953	2630	1043
Δ Dec 1997	-14439	5928	-6032	2425	-2685	1207	-3943	1885
Constant	-294	1329	-201	579	-89	402	-20	467

Note: See notes for Table 3.

Table A.4. Deviations in 1997 Monthly Spending from 1996 Q4 Base Period, Full Specification									
Variable	Total		Durables		Storable Non-durables		Non-durables		
	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	
February	-23225	2863	-4755	1553	1140	715	-19809	1148	
March	20537	2658	11839	1769	6101	752	943	1004	
April	1331	2081	6048	879	4680	565	-10930	1126	
May	-392	2213	2448	1258	5046	488	-8801	1087	
June	-10226	1990	3231	974	3064	483	-18031	854	
July	18628	2333	14563	1470	9231	484	-7828	870	
August	11846	2514	-506	1232	8254	456	4299	1370	
September	-16381	2538	-1419	1124	2277	476	-17877	1268	
October	-5940	1934	3384	992	5100	474	-15698	1108	
November	-8730	1606	4074	1089	4070	477	-18510	754	
December	76963	5995	31423	2805	27800	1193	13256	1744	
Year 1992	1448	1917	-2742	962	2149	408	978	826	
Year 1993	737	2362	-2522	1095	2123	457	224	886	
Year 1994	-1124	2020	-2849	1143	1698	348	-624	872	
Year 1995	-3598	2328	-3110	1068	31	327	-580	1112	
January 1996	1581	3081	-1752	1506	973	617	2224	1112	
February 1996	2857	2881	-558	1394	1424	515	1741	1303	
March 1996	-264	2706	-2371	1562	-454	511	2683	1382	
April 1996	-1706	2163	-3023	1067	332	446	1218	1160	
May 1996	-5575	2537	-2625	1526	-500	494	-2492	1165	
June 1996	7148	2004	5409	976	327	433	466	958	
July 1996	-12425	2312	-5295	1542	-726	397	-5798	977	
August 1996	-47	2486	1718	1285	-516	402	-1831	1510	
September 1996	-7464	2812	-5291	1260	-702	508	-1202	1265	
January 1997	989	3081	-1761	1506	0	617	2813	1112	
February 1997	6294	2881	2629	1394	-194	515	3658	1303	
March 1997	22971	2706	11848	1562	5169	511	4980	1382	
April 1997	-3184	2163	-1343	1067	-2866	446	1379	1160	
May 1997	-10117	2537	-5041	1526	-1510	494	-3127	1165	
June 1997	-3446	2004	-3144	976	-846	433	1125	958	
July 1997	-9817	2312	-6132	1542	-1117	397	-1408	977	
August 1997	1480	2486	-2968	1285	-212	402	4874	1510	
September 1997	-3332	2812	-4791	1260	-37	508	1981	1265	
October 1997	-3812	1827	-2266	931	-940	314	-259	937	
November 1997	-4206	2226	-4891	1187	-1277	486	2634	929	
December 1997	-15224	3551	-8909	1725	-912	705	-4006	1125	
Year 1998	-5926	2074	-3996	1096	-1255	368	-33	818	
Year 1999	-6247	3058	-4432	1558	-1970	344	790	1263	
Year 2000	-12798	2026	-9361	888	-2937	493	-109	919	
Constant	238976	3081	50838	1506	47570	617	139720	1112	

Note: See notes for Table 4.