The Effect of Consumption Taxes on Corporate Investment

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ABSTRACT

Using a large dataset on listed firms from 68 countries and numerous changes in consumption tax rates staggered over time and across countries, this paper examines how consumption taxes affect corporate investment. We show empirically that consumption taxes significantly decrease investments. The effect of consumption taxes on corporate investment is more pronounced for firms with low supply elasticities and for firms facing high demand elasticities because both types of firms are less able to pass the consumption tax over to consumers. We also show that investment of firms with more exposure to domestic consumers is more responsive to consumption tax changes. Taken together, our results suggest that consumption taxes represent a substantial burden to firms adversely affecting corporate investments.

Keywords: Consumption Tax, Investment, Tax Policy

JEL classification: G31, H24, H25

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1. Introduction

Consumption taxes represent around a third of tax revenues governments collect worldwide while corporate tax contributes less than 10% to tax revenues in OECD countries. Yet, while economists extensively analyzed the effect of corporate taxes on investment (e.g., Summers 1981, Auerbach 1983, Cummins, Hassett, and Hubbard 1996, Djankov et al. 2010, Ljungqvist and Smolyansky 2014, Giroux and Rauh 2015), there is no study that investigates the effect of consumption tax on corporate investment. There are different views of how consumption taxes affect investment. On the one hand, there is the view is that a consumption-based tax system leads to more growth (e.g., Barro 1990) as it removes important distortions, for example, on allocation of capital and firms' financing decisions (see, e.g., Hubbard 1997). The President's Advisory Panel on Federal Tax Reform states that "*consumption taxes do not discourage saving and investment, nor do they distort saving and investment decisions*".[1] Many economists thus argue that relative to capital taxation, consumption tax is a more efficient form of taxation because consumption taxes "*do not affect the return to savings and investing*" (Hines, 2007, p. 63).

However, before subscribing to consumption taxes as an efficient solution, we should understand how they affect investment because, in contrast to abovementioned view, a partial equilibrium analysis suggests that corporate investment can be affected by consumption taxes. As firms cannot fully pass the tax burden on to consumers (see, e.g., Poterba 1996, Kenkel 2005, or DeCicca, Kenkel, and Liu 2013), consumption taxes drive a wedge between the price that consumers pay and the price that producers receive. As long as neither supply nor demand have extreme price elasticities, consumers reduce the demanded quantity if prices carry an additional consumption tax component and producers face a reduced willingness to pay from consumers. Following a tax increase, the price paid by consumers increases, the price received by producers decreases, and quantity is reduced following a tax increase. This in turn reduces firms' surplus and the return on investments. We thus expect investments to respond negatively to consumption taxes.

Since consumption taxes generate a large proportion of tax revenues, it is important to understand the effects on the private business sector that generates the output on which consumption taxes are levied. Prior literature on this issue is scarce and typically relies on macroeconomic data with largely inconclusive results (e.g., Alesina et. al. 2002). Using firm-level data and exploiting changes in consumption tax rates, we show empirically that consumption taxes have a significantly negative impact on corporate investment. Consistent with our causal interpretation, we further show that negative effect of consumption taxes on corporate investment is stronger for firms that are less able to pass on the consumption tax to consumers or when firms' output is more exposed to domestic consumption tax rate changes.

[1] See p. 38 of the report (http://govinfo.library.unt.edu/taxreformpanel/final-report, last accessed, May 25, 2016).

Our identification strategy uses an international setting. We collect information on tax policy for 68 countries providing us with sufficient variation: we observe 95 changes in consumption tax rates staggered in time from 2001–2013 across 68 countries. We exploit 65 consumption tax increases and 30 consumption tax decreases in the standard consumption tax rate on goods and services both in countries employing value added tax and retail sales tax systems.[2] While some countries employ reduced consumption tax rates on some goods or charge excise taxes on specific goods, Vegh and Vultin (2015) report that the share of transactions associated with the standard consumption tax rate is, on average, 70 percent of the total sales tax base. Because consumption tax rate increases can be accompanied by other changes to tax policy, e.g., a contemporaneous cut in capital taxes, we control for seven other tax-policy variables to comprehensively characterize a country's tax policy including the corporate income tax, personal income taxes on wages, and the tax on corporate payouts.

The staggered nature of the consumption tax rate changes across time and countries provides us with an extensive set of plausible counterfactuals to employ a difference-in-differences design that is comparable to Ljungqvist and Smolyansky (2014). Firms in some countries are treated with a consumption tax change while others are not. In addition, these changes occur at different times in different countries. Our identification strategy rests on the assumption that firm's from counterfactual countries not experiencing a consumption tax change would have experienced similar variation in economic conditions as treated firms in countries with a tax change. Tax policy changes can be endogenous to economic conditions that might also change firms' incentive to invest aside from a distinct effect of consumption tax changes. To this end, we limit counterfactuals to firms from countries with similar economic growth or in the same geographical region as the country experiencing a tax rate change. Moreover, we examine cross-sectional differences in the response to changes in the consumption tax rate controlling for country-year fixed effects. This analysis limits counterfactuals to firms from the same country while controlling for any unobserved country-year variation.

Using a sample of about 40,000 listed firms across many countries, we find a robust negative effect of consumption taxes on firms' capital investments. A one-percentage point increase in the consumption tax rate decreases investments by -1.76% of the sample average capital investment. This result implies an elasticity of -0.19 of capital investments with respect to changes in the consumption tax rate. Consistent with the notion that consumption taxes affect capital investments indirectly, we find a higher elasticity (-0.37) of capital investment with respect to changes in corporate income tax rates.

[2] The vast majority of countries in our sample implement a goods and services tax with an input tax credit. This is a value added tax system. Only the U.S., Malaysia, and Zimbabwe (until 2004) have a retail sales tax system with no taxation of transactions between firms. Hence, in both systems, the consumption tax is no direct burden.

We employ firm-level panel data instead of aggregated data to provide evidence on cross-sectional differences in the effect of consumption taxes on investment. We base our cross-sectional tests on theory predicting that the incidence of consumption taxes on consumers vis-à-vis firms depends on the relative elasticities of supply and demand. Examining such cross-sectional variation further addresses endogeneity concerns of tax policy. While tax policy is likely to be endogenous at the aggregate level, tax changes are less likely to be endogenous when using firm-level data. Tax policy that may be designed to change aggregate investment affects firms differently, for example, depending on the relative elasticities of supply and demand; this cross-sectional variation in tax responsiveness is less likely to be endogenous (Cummins, Hassett, and Hubbard 1994).

First, we exploit differences supply elasticity of capital that can arise from financing frictions. For example, a firm with financing frictions faces a highly in inelastic capital supply curve (e.g., Stiglitz and Weiss 1981 or Farre-Mensa and Ljungqvist 2015). In such a case, our partial equilibrium analysis shows that the incidence of the consumption tax falls predominantly on the producer because of the limited ability to adjust investments. As a result, firms with low supply elasticity are more responsive to consumption tax changes. To proxy for a lower supply elasticity, we build on the notion that cash-poor firms have limited financial slack to fund all profitable investments internally and a limited ability to adjust investments (e.g., Duchin, Ozbas and Sensoy 2010). Second, we exploit differences in the responsiveness of demand to changes in consumption tax across firms. Firms facing more elastic demand are less likely to shift the burden of a consumption tax related price increase to consumers, for example, because there is a close substitute available to consumers. Again, this implies that these firms' investment will react more negatively to changes in consumption tax rates. Since firms with little market power face more elastic demand (Lerner 1934), we use a key outcome of market power, profit margins, as proxy for firms that face more elastic demand.

Our results are in line with these two predictions. While cash-rich firms decrease investment by -1.28% of the sample average investment as a response to a one-percentage point increase in the consumption tax rate, cash-poor firms reduce their investment by -2.12%. That is, investment of firms with lower supply elasticities is significantly more sensitive (+65%) to changes in the consumption tax rate than the investment of firms with higher supply elasticities. Turning to firms with higher market power, we find that firms with higher profit margins reduce investment by -1.42% of the sample average investment as a response to a one-percentage point increase in the consumption tax rate. Firms with low profit margins decrease investment significantly stronger (in total by -2.00%). The investment of firms with high profit margins (facing a less elastic demand curve) is less sensitive to consumption tax rate changes. The change in elasticities from -0.15 to -0.21 is equivalent to an increase of over 40% for firms with low profit margins. These results

document that predictable differences in tax incidence across firms translate into differential investment responses.

The final set of cross-sectional analyses centers on the exposure of firms' output to domestic consumption tax rate changes based on how much of their output is directly affected by a shift in the demand curve of domestic consumers. To that end, we exploit two dimensions: the fraction of a firm's output sold domestically as opposed to internationally and the fraction of an industry's output sold directly and indirectly to end-consumers. First, we proxy for the geographical location of customers. The investment of firms with sales to foreign customers should not be as responsive to changes in domestic consumption taxes as opposed to firms with sales to domestic customers. While there is only limited information on the spatial distribution of sales in financial accounts, we use the availability of data on the fraction of international sales for a subsample of firms as a proxy for the responsiveness of firms to consumption taxes. In line with our prediction, we find that the investment of firms with a higher share of domestic sales is more adversely affected by changes in the consumption tax rate.

Second, we expect that the extent to which a firm is affected by a shift in consumers' demand curve should be a function of how much of its output is directly or indirectly sold to end consumers. That is, firms that sell most of their output to end consumers are likely more affected by a shift in the demand curve as opposed to firms that primarily serve as input producers for other firms earlier in the supply chain. For the latter, we expect the effect of a shift in the demand curve to decay the more remote their output is from final consumers. Ozdagli and Weber (2016) develop an empirical proxy for the closeness to end consumers at the industry level using data from the Bureau of Economic Analysis by sorting industries into layers by the fraction of output sold directly and indirectly to end-consumers. While using their measure based on the input-output structure of the U.S. economy is prone to measurement error in an international setting, we find that the effect of consumption taxes on investment is concentrated in firms that operate in industries that are closer to end-consumers in the supply chain. Both findings corroborate the causal interpretation of our earlier findings on the negative effect of consumption tax rate changes on investment.

While the consistency of the cross-sectional tests supports a causal interpretation of a negative effect of consumption taxes on investment, these tests also allow us to control for unobserved variation in economic conditions at the country-level by including country-year fixed effects. Including country-year fixed effects also ensures that the counterfactual comes from within the country. We find that our results on the investment response of cash-poor firms, firms with low profit margins, firms with high domestic sales, and firms closer to final consumers relative to their counterfactual (from the same country) to consumption tax rate changes are largely unaffected by including country-year fixed effects. We also obtain similar results if we account for unobserved

variation in economic conditions among neighboring countries. This indicates that our attempts at mitigating the effect of unobserved variation in economic outcomes in our baseline estimation are effective. Overall, these results support a causal interpretation of our findings.

To address remaining concerns that unobserved variation in economic conditions explains our results, we complement each analyses by using an alternative, more stringent set of counterfactuals to economically more comparable countries. These tests also account for the notion that policymakers may be prone to increasing consumption tax rates during recessions (e.g., Romer and Romer 2010). While it is not feasible to apply their narrative approach to about 100 consumption tax rate changes, we document robustness of our findings to the exclusion of firms from countries with negative GDP growth. Finally, an alternative way to control for time-varying unobservable variation is to include lagged investments as an additional control using the dynamic panel estimation procedure proposed by Arellano and Bond (1991). This estimation produces very similar results. Other robustness tests relate to specific research design choices, such as using lagged control variables and using alternative clustering of standard errors. These tests confirm our primary findings. Overall, we document that our difference-in-differences as well as our triple difference results are largely insensitive to these alternative research design choices.

One drawback of our approach to use a firm-level sample from 68 countries is that this results in an unbalanced panel. For example, U.S. firms comprise around 20% of our sample. Our difference-in-differences estimate averages across treated observations. This raises the concern that our results may be driven by consumption tax rate changes from only a few countries with many observations. We mitigate this concern in three ways. First, we replicate our earlier findings excluding firms from one country at a time, concluding that no single country is driving the results. Second, we perform 1,000 draws of 50 firms per country to obtain the distribution of the coefficients identified in a balanced sample. Average and median coefficients across these 1,000 estimations are in line with our earlier results. Finally, we collapse the data from the firm-year level to the country-year level by using average or median values. In this specification using more than 800 country-year observations and including country fixed effects, results are consistent with our baseline findings.

Taken together, we contribute to the literature on the effects of fiscal policy on economic growth and corporate investments. Using firm-level data, previous literature examines how corporate taxes (e.g., Summers 1981, Auerbach 1983, Cummins, Hassett, and Hubbard 1996, Djankov et al. 2010, Ljungqvist and Smolyansky 2014 or Giroux and Rauh 2015) or dividend taxes (Yagan 2015, Becker, Jacob, Jacob 2013, Alstadsæter, Jacob, and Michaely 2015,) affect corporate investment. Macroeconomic approaches fail to detect effects of consumption taxes on aggregate, private business investment (e.g., Alesina et al. 2002). We contribute to this debate and show that

consumption taxes—a major part of total tax revenues—affect corporate investment. This finding also adds to the literature on price effects of consumption taxes. Since firms cannot fully pass the tax over to consumers (see, e.g., Poterba 1996, Kenkel 2005, or DeCicca, Kenkel, and Liu 2013), consumption taxes adversely affect corporate investments and thus economic growth.

Our results also have implications for longstanding debate on the efficiency of consumption versus capital-based tax systems (see, e.g., Barro 1990, Kneller, Bleaney, and Gemell 1999, Arnold et al. 2011). Proponents of a consumption-based tax suggests that a move towards a more consumption-based tax system with lower taxation on capital can lead to efficiency gains (see, e.g., Hubbard 1997; Altig, Auerbach, Koltikoff, Smetters, and Walliser 2001). In contrast, there are views that taxing capital is "*not a bad idea after all*" (e.g., Conesa, Kitao, and Krueger 2009). While our paper does not allow us to draw conclusions about overall efficiency, we show that firms' investments are less responsive to changes in consumption taxes than to changes in capital taxation. Hence, it is possible that a consumption-based tax policy with high taxation on consumption and low tax rates on capital leads to higher corporate investments while keeping tax revenues neutral. In any case, we may have to acknowledge that raising consumption taxes may come at the cost of lower investments, in particular of firms facing low supply elasticity or high demand elasticity.

2. Consumption Tax Systems around the World and Investment Effects

2.1 Consumption Tax Systems around the World

We observe two different consumption tax systems in most countries in the world. First, there are retail sales tax systems as, for example, implemented in the United States. Second, there are value added tax systems implemented in most countries worldwide. These systems are also called *goods and services tax* (e.g., in Australia, Belgium, or Canada). We collect tax information on consumption taxes for 68 countries over the 2001–2013 period. We use the KPMG *Indirect tax rates table*, all available issues of the Ernst and Young *Worldwide Corporate Tax Guide*, as well as the Ernst and Young *worldwide VAT, GST and sales tax guide*. We complement and crosscheck our consumption tax information on some countries with Vegh and Vuletin (2015). During our sample period, only one country (Malaysia) in addition to the United States runs a retails sales tax system. Zimbabwe moved from a retail sales tax system to a value added tax system in 2004.[3] All other countries in our sample run a value added tax or goods and services tax system.

Table 1 summarizes the consumption tax systems for our sample countries and average tax rate on sales in each country over the period 2001–2013. The average tax rate in Table 1 represents the

[3] Likewise, India introduced a general value added tax in 2005. We were not able to obtain regional retail sales tax information on India prior to their 2005 general consumption tax introduction. Hence, India is not included in our sample prior to 2005.

standard tax rate on goods and services. Many countries have reduced tax rates on basic food (e.g., China, Germany, Korea), medicine (e.g., Czech Republic, Iceland, Hungary) or hotels (e.g., Germany, Latvia, Sweden). However, we do not use these reduced rates in our analysis for several reasons. First, the type of goods for which the reduced rates apply is often not clearly defined and varies substantially across countries. Second, even if we can clearly separate certain goods, e.g., basic food, that are subject to a reduced rate, one can hardly identify the firm that sells goods at this reduced rate. Finally, Vegh and Vuletin (2015) document that the share of transactions associated with the standard value-added tax rate is on average 70 percent. Hence, it is unlikely that reduced consumption tax rate changes drive our results for standard rate consumption taxes.

[Insert Table 1 about here]

A common description of a consumption tax system features that firms do not bear the burden of consumption taxes. Consumers nominally pay the taxes. In other words, consumption taxes do not directly distort producer decisions. To illustrate this conventional wisdom, consider the following simple example in Figure 1 where there is only one intermediary between the producer and the final customer. A winery supplies wine worth 100 to a grocery that sells wine to final consumers for 150. The consumption tax rate is 10%. In this example, we abstract from any additional excise taxes on alcohol.

[Insert Figure 1 about here]

Under a value added tax system as displayed in the middle column of Figure 1, consumption tax is levied on each transaction: The winery receives the gross amount of 110 (100 for the wine and 10 consumption tax) from the grocery. The grocery receives the gross amount of 165 (150 for the wine + 15 consumption tax) from the final consumer. The value added tax system works through taxing the value added in each transaction in the supply chain until the final sale to consumers. The value added to the wine by the grocery amounts to 50. To ensure that only the value added is taxed, the grocery is granted an input credit on taxes paid on purchases. The grocery pays taxes of 10 on its purchase of wine from the winery and receives tax of 15 from final consumers. Taking into account the input credit of 10, the grocery will transfer 5 as value added tax to the tax authority. This equals the tax rate of 10% applied to the value added of 50. The winery, assuming it made no purchases from other firms, added a value of 100. Hence, the winery received taxes of 10 from the grocery, but has not paid taxes on purchases (i.e., tax credit is zero). Therefore, the winery transfers an amount of 10 to the tax authority.

Taken together, the tax authority receives value added taxes of 15, that is, 10 from the winery and 5 from the grocery. The value added to the wine throughout the production process until the final sale to consumers is 150, the net selling price to final consumers. Hence, 10% of the total

value added is received as value added tax. It is important to note that the tax is effectively levied on final consumers because final consumers do not receive a credit on paid taxes of 15. From the perspective of both the winery and the grocery the value added tax is a flow through item that has no mechanic effect on their profits. These are determined using net prices. The profit of the grocery is 50, the winery earns 100.

In a retail sales tax system as displayed in the right column of Figure 1, consumption taxes are only levied on the transaction between the grocery and the final consumer. The transaction between the winery and the grocery is not subject to taxes. Accordingly, the grocery would transfer the tax received from the final consumers of 15 to the tax authority. As under the value added tax system, final consumers bear the full burden of consumption taxes under the retail sales tax system. Hence, both value added tax and retail sales tax system are equivalent both from the perspective of the involved firms and the final consumers. They only represent alternative means of collecting consumption taxes and do not mechanically affect firms' profits. Since value added tax systems (or goods and services tax systems) and retail sales taxes have the same consequences on the profit of firms, we denote all these systems as consumption tax systems. Our analysis centers on general sales taxes and neglects excise taxes, for example, on cigarettes, alcohol, energy, or gasoline.

2.2 Corporate Investment and Value Added Tax

Our example illustrates the mechanism of a consumption tax system that is levied on consumers but it is silent on the incidence of the tax. It is not clear who really bears the consumption tax burden and how consumption tax rate changes affect firm policies. The simple example from Figure 1 cannot inform us how changes to consumption taxes affect equilibrium price and quantity and how these changes affect investment. We illustrate the introduction of a consumption tax relative to a regime without consumption taxes in a simplified partial equilibrium supply-demand framework (see, also, Atkinson and Stiglitz 1972). Changes to the equilibrium quantity would have a direct implication for expected changes in firms' investment policies.

In a regime without consumption taxes, supply and demand are in equilibrium, e_0, at a price P_0 and a quantity q_0. Figure 2 illustrates the underlying supply and demand curves. After the introduction of a consumption tax rate, τ, the price that consumers have to pay above what producers would charge increases by factor $(1+\tau)$. Accordingly, the quantity demanded by consumers after taxes will be lower than without taxes. Put differently, the introduction of a consumption tax rate results in a downward shift of the demand curve to D_1.[4] Consumers have a reduced willingness to pay and producers reduce the price they charge (i.e., their marginal cost).

[4] The equivalent result with respect to after-tax equilibrium prices and quantities obtains if the tax is levied on producers. In that case, producers would pass a portion of the tax representing additional cost onto consumers in the form of higher prices, resulting in an upward shift of the supply curve.

This leads to a reduction in the demanded and supplied quantity from q_0 to q_1. While consumers pay price P_c at q_1 producers receive P_P (equal to $P_c/(1+\tau)$) at q_1. Comparing the after-tax equilibrium to the equilibrium without consumption taxes, the price received by producers is smaller ($P_P<P_0$) and the price paid by consumers is larger ($P_C>P_0$). Consumption taxes thus drive a wedge between the price paid by consumers and that received by producers. In addition to the price effect, the quantity produced is lower ($q_1<q_0$). While the incidence of the introduction of a consumption tax rate is about evenly split in Figure 2, the actual incidence depends on the relative price elasticities of supply and demand. For example, for a given supply elasticity, the more elastic (inelastic) demand is, the more incidence of the tax falls on producers (consumers). Taken together, this illustration shows that in contrast to Figure 1, part of the consumption tax is borne by firms is perfectly inelastic.

[Insert Figure 2 about here]

With respect to potential investment responses, Figure 2 illustrates that consumption taxes reduce quantity as well as the consumers' and producers' surplus. The change in producer surplus reflects a change in profits which in turn reduces returns to capital investment. In our example, the producer surplus is reduced from $0.5\times P_0\times q_0$ to $0.5\times(P_0-\tau)\times q_1$. Hence, to the extent that producers can adjust their capital investments, we expect them to reduce their capital investments. This holds if tax increase has long-run effects, e.g., if it is not perfectly compensated by other concurrent or future regulatory actions such as labor or capital tax reductions. Consistent with our illustration in Figure 2, empirical research on the incidence of tax largely confirms that firms cannot fully pass the tax over to consumers (see, e.g., Poterba 1996, Kenkel 2005, or DeCicca, Kenkel, and Liu 2013). Further, there is ample evidence that higher taxes on consumption reduces consumption, supporting the illustrated effects on quantity (see, e.g., Ellison and Ellison 2009, Goolsbee, Lovenheim, and Slemrod 2010, Einav et al. 2014). Both results—producers bear part of the consumption tax and quantity decreases—contribute to our prediction that firms' profits decrease when consumption tax increases. This incidence reduces returns on investment and consequently, we predict a decrease in capital investments.

In addition to the average effect, the supply-demand illustration helps us to derive predictions about heterogeneity in producers' response to consumption tax changes. For example, to the extent firms have a low supply elasticity, that is, they have a limited flexibility and capacity to absorb demand shocks, the incidence of the consumption tax falls predominantly on the producer. To illustrate this, we use the extreme example of fully inelastic supply (Figure 3). In this case, the consumers do not experience a change in the price ($P_C = P_0$). Instead, the producer bears the burden of the consumption tax because of the inability to adjust investments to the consumption tax

change. Consequently, the producer surplus is reduced from $P_0 \times q_0$ to $(P_0-\tau) \times q_0$. As supply becomes more elastic, a larger proportion of the consumption tax is borne by consumers and producer surplus increases. We thus predict that the effect of consumption taxes on investment is a function of supply elasticity: The effect of consumption taxes on investment is stronger if supply is less elastic.

[Insert Figure 3 about here]

Further, we can derive predictions about heterogeneity in producers' response to consumption tax changes related to demand elasticity. In case firms face high elastic demand, that is, consumers can easily buy other products, the incidence of the consumption tax falls predominantly on the producer. To illustrate this, we use the extreme example of fully elastic demand (Figure 4). Again, the consumers do not experience a change in the price ($P_C = P_0$). The producer bears the burden of the consumption tax because consumers do not accept higher prices. Consequently, the producer surplus is reduced from $0.5 \times P_0 \times q_0$ to $0.5 \times (P_0-\tau) \times q_0$. As demand becomes less elastic, a larger proportion of the consumption tax is borne by consumers and producer surplus increases. We thus predict that the effect of consumption taxes on investment is a function of demand elasticity: The effect of consumption taxes on investment is stronger if demand is more elastic. In case of inelastic demand, the incidence of the tax falls on consumers and producers' surplus changes less. Hence, firms facing inelastic demand by consumers will reduce their investments less than firms facing high elastic demand.

[Insert Figure 4 about here]

3. Empirical Identification, Variation in Tax Policy, and Data

3.1 Variation in Tax Policy Tools

The key challenge of any study on tax policy is identifying variation in tax rates. With 68 countries over a 13-year period, we overcome this inherent challenge. Our largest sample comprises observations from 843 country-years including 95 changes in the consumption tax rate. Of these changes, 65 are tax increases and 30 are tax decreases. Our identification is based on a policy instrument (tax rates) as opposed to a policy outcome (tax revenues) because revenues respond endogenously to the business cycle (see, also, Vegh and Vultin 2015, Riera-Crichton, Vegh, and Vultin 2015). Figure 5 plots a world map highlighting countries with a consumption tax rate change that is larger than 0.5 percentage points in absolute terms in black. Countries with a constant consumption tax rate (i.e., no change of more than 0.5 percentage points in absolute terms) are highlighted in gray. Countries that are not included in our sample are in white shade. Two observations are important for our study. First, our sample comprises a substantial proportion of the

world with missing countries from Africa and the Middle East. Second, there are few countries without a change in the sales tax rate during our sample period (among others, the Brazil, Sweden, Denmark, or Japan).

[Insert Figure 5 about here]

Figure 6 summarizes changes in the sales tax rate of at least 1 percentage point and 2 percentage points, respectively over time. In total, value added taxes change by at least 1 (2) percentage points 59 (26) times in our sample. From these 59 (26) material consumption tax rate changes, 40 (17) are increases and 19 (9) are decreases. Further, change in tax rates occur in all sample years. To summarize, changes to consumption tax rates occur in different years, in different countries, and in opposite directions. Hence, the tax rate changes are staggered in time across countries. In any given year, some countries are "treated" while others are not.

[Insert Figure 6 about here]

3.2 Empirical Identification

We test the effect of consumption tax on investment using the following estimation equation:

$$Inv_{i,j,t} = \alpha_0 + \beta_1 Consumption\ Tax_{j,t} + \delta \mathbf{\Pi_{j,t}} + \gamma \mathbf{X_{i,j,t}} + \alpha_i + \alpha_t + \varepsilon_{i,t} \qquad (1)$$

where the investment of firm *i* in year *t* in country *j* ($Inv_{i,j,t}$) is the dependent variable. We define investment as capital expenditures over prior year's total assets. In Appendix A, we provide variable definitions and data sources of all variables. Our main variable of interest is $Consumption\ Tax_{j,t}$, which is the value added tax or sales tax rate on consumer goods by private households in the respective country.[5] For the U.S., we use the average state-level sales tax rates weighted by the states' inhabitants. Consistent with the supply-demand illustration above, we expect that a higher value added tax rate decreases corporate investments ($\beta_1 < 0$).

Our empirical strategy is based on a firm-level regression with firm and year fixed effects (α_t). Since we include firm fixed effects (α_i), all country level variables are only identified through changes over time. Hence, our estimates are not resulting from time-invariant cross-country differences. This also ensures that the identification of effects of tax policy variables stems from the difference in investment around tax rate changes in a given country relative to countries without such changes. Since our sample covers so many changes in different countries, in different years, and in different directions, our empirical approach with firm and year fixed effects is equivalent to a difference-in-differences design. Equation (1) effectively compares the difference in investments

[5] Even though Figure 1 presented earlier suggests that value added tax and retail sales tax systems merely represent alternative means of collecting consumption taxes, results presented in Appendix Table A.1 document that our inferences remain unchanged when excluding countries with retail sales tax regimes.

before and after a consumption tax change (*first difference*) and the difference in investments between firms in a country with a tax change and a country without a change (*second difference*). Importantly, our identification stems not only from one change but from over 95 staggered changes in tax rates that are unlikely to be driven by confounding events. This provides us with an extensive set of plausible counterfactuals (see, also, Ljungqvist and Smolyansky 2014).

A primary concern in the literature on the effects of tax policy changes is that tax policy is not exogenously determined. For example, if tax policy anticipates or responds to changes in economic conditions, the changes in economic conditions affect firms' incentives to invest even in absence of a tax change. Hence, the identification of the treatment effect of tax rate changes hinges on the quality of the counterfactuals in our setting. That is, our control group needs to be subject to the same economic conditions. To further control for unobservable confounding variation in economic conditions, we also document the robustness of our primary inferences to the inclusion of different group-year fixed effects variants. This approach narrows down the difference-in-differences estimate to treated and control group firms from groups of countries following similar growth paths (e.g., emerging markets) or from the same region (e.g., Ljungqvist and Smolyansky 2014), for example, because prior literature documents that consumption tax related fiscal policies differ systematically between industrial and developing countries in cyclicality (Vegh and Vultin 2015). We further address this concern exploiting within-country cross-sectional variation using triple differences settings in Sections 4.3 to 4.5. In these settings, we can further limit the counterfactual to the same country.

To mitigate remaining differences in economic conditions in our research design, we include an extensive set of country-level control variables in our regression analysis ($\boldsymbol{\Pi_{j,t}}$) to ensure that our results are not driven by other country characteristics that correlate with tax policy changes and investment. As proxies for the economic development in a country, we include *GDP per Capita* and *GDP Growth*. As country-level risk proxy, we include the annual inflation rate (*Inflation*). Further, prior research shows that the institutional environment is an important determinant of economic development and corporate investments (e.g., Hall and Jones 1999, Djankov, McLiesh, and Ramalho 2006). To this end, we include the following six measures from the World Bank's Worldwide Governance Indicator data, namely *Voice and Accountability*, *Political Stability*, *Government Effectiveness*, *Regulatory Quality*, *Rule of Law*, and *Control of Corruption*. We expect that firms in a protected, reliable, and efficient regulatory environment are more likely to invest (e.g., Castro, Clementi, and MacDonald 2003).

Further, since tax policy comprises several instruments, we also include seven additional tax variables as country-level controls. For corporate tax variables, we use information from the PricewaterhouseCoopers *Worldwide Corporate Tax Summaries*, the KPMG *Corporate Tax Rate*

Survey, and the Ernst and Young *Worldwide Corporate Tax Guide*. For personal income tax, we use the PricewaterhouseCoopers *Worldwide Individual Tax Summaries*, the KPMG *Individual Income Tax Rate Survey*, and the Ernst and Young publications "*Global executive: Individual tax, social security and immigration*". We additionally cross-check tax rate information with the OECD corporate and individual tax database.[6] First, we use the statutory corporate tax rate (*Corporate Tax*). We use the corporate tax rate that is applicable in the top tax bracket. In case of local differences in applicable tax rates as, for example, in Germany with over 10,000 different municipalities, we refer to the average corporate tax rate across regions. We expect that higher corporate taxes reduce the propensity to invest. As personal tax measures, we use *Payout Tax* and *Wage Tax*. Since firms can use dividends and share repurchases to distribute cash to shareholders, we consider dividend taxes and capital gains taxation. *Payout Tax* is defined as the average of the dividend tax rate and the capital gains tax rate assuming an individual in the top tax bracket.[7] There are ambiguous predictions for the effect of payout taxes on investment. For example, if, on average, the marginal source of finance is external equity (internal equity), we expect that higher payout taxes reduce (increase or do not affect) corporate investments (see, e.g., Becker, Jacob, and Jacob, 2013, Alstadsæter, Jacob, and Michaely 2015, Yagan 2015). *Wage Tax* is the top marginal income tax rate on salaries and wages excluding social security contributions. Since the personal income tax rate on wages may lead to a substitution of labor with capital as labor input becomes more expensive, we might see an increase in capital investment following an increase in the wage tax.

In addition to these tax rate variables, we collect information on four additional features of the corporate tax system to account for differences in the tax base. While some countries have a progressive corporate tax such as the United States, several countries have proportional corporate taxes (e.g., Sweden, Norway, or Australia). Since the asymmetric treatment of less versus more profitable projects under progressive taxation can discourage corporate investments, we define a dummy *Progressive* which we set equal to one if the country has a progressive corporate tax schedule; and to zero if the corporate tax is proportional. We also include variables that account for differences in the asymmetric treatment of losses in a tax system. While profits are immediately taxed, losses do not lead to an immediate refund. Countries have implemented different rule to reduce such tax asymmetries, for example, through loss carryback provisions or group taxation regimes. For example, Bethmann, Jacob, and Müller (2015) show empirically that loss firms cut investments less when loss carryback provisions are available. We thus include a dummy variable *LCB* that is equal to one if the country allows firms to carry back losses. We set *LCB* to zero if this opportunity does not exist (and note that this identifies countries that only rely on loss

[6] Available at http://www.oecd.org/tax/tax-policy/tax-database.htm (last retrieved 23 February 2016).

[7] We additionally assume long-term capital gains and a non-substantial shareholding. Some countries tax short-term capital gains and/or capital gains from substantial shareholdings at higher tax rates.

carryforwards).[8] Likewise, we include a dummy variable *Group* that is equal to one if the country allows firms to form a tax group to offset losses across affiliated group members. We set *Group* to zero if this opportunity does not exist. Finally, we consider depreciation allowances and include a dummy variable *Accelerated* that is equal to one if firms in a country can use declining balance depreciation, and zero if only straight-line depreciation is permitted. Taken together, since these rules change frequently, we control for more than 300 changes in tax policy related variables over our sample period.

In all regressions, we include firm-level control variables $\mathbf{X}_{i,j,t}$ following prior investment literature (e.g., Cummins, Hassett, and Hubbard 1996, Baker, Stein, and Wurgler 2002). First, we include the ratio of cash holdings to prior year total assets (*Cash*). Second, we control for the profitability of the firm and include the ratio of operating profits to prior year total assets (*Operating Profit*). Both variables account for the availability of internal funds to finance investments internally. Third, we include growth in sales from *t-2* to *t*, denoted *Sales Growth*, to proxy for investment opportunities. Prior research also uses Tobin's q. However, we use Tobin's q only in a robustness test for two reasons. First, there is less coverage for variables necessary to compute *q*. Second and more importantly, there is a measurement error in *q*. Ideally, we would include marginal *q* but we can only observe average *q* (Erickson and Whited 2000).[9] Fourth, we include *Leverage* which we define as the ratio of total debt to total assets. Finally, we include the size of the firm defined as the natural logarithm of total assets. The effects of size are ambiguous. On the one hand, smaller firms may have more investment opportunities. On the other hand, larger firms have less financial constraints than smaller and younger firms (Hadlock and Pierce 2010).[10] Our statistical inference is based on robust standard errors clustered at the firm-level.[11]

3.3 Firm-Data Sample and Summary Statistics

We use a large dataset of publicly listed firms obtained from Compustat Global for Non-US firms and Compustat North America for US firms. We obtain country variables from the World Bank's World Development (GDP per capita, GDP growth, Inflation) and Governance Indicators (as previously discussed). From our sample, we exclude financial and utility firms. These sample

[8] We do not control for carry forward opportunities since all our sample countries allow for loss carryforwards.

[9] Our inferences remain unchanged when including Tobin's Q in Appendix Table A.2.

[10] Our inferences remain unchanged when using lagged firm-level controls in Appendix Table A.3 or including lagged investment as an additional control variable in Appendix Table A.4. The latter approach accounts for time-invariant characteristics influencing the level of investments (e.g., Detragiache, Tressel, and Gupta 2008).

[11] As tax policy variables vary at the country level over time, clustering at the firm-level might overstate statistical significance. One alternative is to cluster observations at the country-industry level, which is more conservative than firm-level clustering as it also allows firms in the same country and industry to be similarly affected tax policy changes (for similar approaches, see, e.g., Daske et al., 2008; Arnold and Schwellnus, 2008). Results reported in Appendix Table A.5 document largely unchanged inferences when clustering standard errors at the country-industry level. We also note that inferences remain unchanged when aggregating data to the country-year level by taking country-year firm averages or medians and clustering by country as discussed later in Table 6.

requirements result in 288,939 firm-year observations from 39,864 firms located in 68 countries in our primary analysis. Table 2 presents an overview of the 68 countries and the number of observations per country in our sample.

[Insert Table 2 about here]

Panel A of Table 3 summarizes descriptive statistics of our tax variables. Consumption tax rates are 10.6% on average and vary considerably in our sample from 5% (25^{th} percentile) to 17% (75^{th} percentile). The average corporate tax rate amounts to about 32%. We observe the highest tax rates in our sample in Pakistan (45% until 2002) and Japan (41%). Bulgaria has the lowest tax rate with 10% since 2007. The average payout tax is 15% but varies considerably. Several countries do not impose any payout taxes in some sample years (e.g., Norway 2002–2005, Latvia until 2008, or Ecuador 2006–2008) while other countries have a 0% tax rate throughout the sample period (e.g., Argentina, Malaysia, Singapore, or Mexico). The highest payout taxes are observed in Denmark (over 40%), Chile (about 40%, 2001–2002), or Ireland (over 36%, since 2010). In addition, personal income taxes vary considerably from low tax rates in Russia (13%), Czech Republic (15%), and Latvia (15% since 2009) to very high tax rates in Denmark (up to 62%) or Belgium (over 60% in 2001). In Panel B of Table 3, we summarize firm-level control variables. On average, firms have capital expenditures equivalent to 6.53% of their lagged total assets. On average, firms hold about 16% of their assets as cash and have a total debt to total assets ratio of 54%. Sales grow from *t-2* to *t* by about 20% and firms have average operating profits of 2.6% total assets on average. Panel C of Table 3 presents summary statistics on country-level variables.

[Insert Table 3 about here]

4. Empirical Results

4.1 Main results

Table 4 presents coefficient estimates from estimating equation (1). We use four different samples in our baseline test. In Column (1), we use the full sample. In Column (2), we additionally include a more extensive set of group-year fixed effects to account for differences between emerging markets and other economies that change over time. We do so to improve the quality of counterfactuals, that is, to eliminate the biasing effects of unobserved variation in economic conditions between emerging market and other countries in our difference-in-differences estimates. To this end, we interact a dummy variable for emerging markets with year fixed effects.[12] Since

[12] The definition of emerging markets is based on IMF categorization. According to this definition, the following countries are emerging markets: Argentina, Brazil, Bulgaria, Chile, China, Colombia, Hungary, India, Indonesia, Latvia, Lithuania, Malaysia, Mexico, Nigeria, Pakistan, Peru, Philippines, Poland, Romania, Russia, South

some countries have only few observations, we additionally exclude countries with less than 200 firm-year observations (Column (3)). Finally, from the sample from Column (3), we further exclude the smallest firms with total assets below USD 10 million in Column (4) (see, also, Baker, Stein, and Wurgler 2003 or Becker, Jacob, and Jacob 2013). This ensures that our results are not driven by regular investments appearing very large due to a smaller scale, i.e., due to low total assets in the preceding year.

Consistent with our prediction, we find that increases in the consumption tax rate affect investment negatively. Using the coefficient estimates from Column (2), we find that a one-percentage point increase in the consumption tax rate decreases investments by 1.76% of the sample average (= -0.1149 × 1% / 0.0653). As a one-percentage point increase in the consumption tax rate represents a consumption tax rate increase of 9.45% (= 1% / 10.58% sample average consumption tax rate), this implies an elasticity of corporate investment with respect to the changes in the consumption tax rate of -0.19 (=-1.76% / 9.45%). This is an economically significant effect.

We also document significant effects of the other tax rate variables on investment. Consistent with prior literature, we find that a higher corporate tax rate reduces corporate investments. The effect is statistically and economically significant. Using the coefficient estimates from Column (2), we find that a one-percentage point increase in the corporate tax rate reduces corporate investments by 1.17% of the sample average. The implied elasticity of corporate investment with respect to the statutory corporate tax rate is -0.37. This elasticity is significantly higher than the elasticity with respect to changes in the consumption tax rate. However, both estimates are with the range of corporate tax elasticity estimates of 0 to -0.5 reported in Chirinko, Fazzari, and Meyer (1999). This result is consistent with the notion that corporate income taxes directly affect firm profits (i.e., the returns to investment) as opposed to the consumption tax rate which indirectly affects returns to investment through its effect on prices and quantities. The extent to which the burden of consumption taxes is borne by firms primarily depends on the relative price elasticities of supply and demand and other factors that affect the elasticity of capital. Hence, the indirect nature of the effect of consumption taxes on capital investments is consistent with a lower elasticity of investment with respect to consumption tax rates as opposed to corporate income tax rates in Table 4.

[Insert Table 4 about here]

While not our primary research question, we also note two other interesting findings with respect to the effect of tax policy. First, we find a negative effect of payout taxation on the aggregate level of corporate investments. This result complements prior research (e.g., Alstadsæter,

Africa, Thailand, Turkey, Ukraine, and Venezuela. Our results are comparable when using the world bank grouping of seven regions and using region-year fixed effects.

Jacob, and Michaely 2015, Yagan 2015) and is consistent with the old view of dividend taxation (Harberger 1962, 1966, Feldstein 1970, Poterba and Summers 1985). Our coefficient estimate implies that a one-percentage point increase in the payout tax rate reduces corporate investments by 0.44% of the sample average. Second, wage taxes have an economically significant influence on corporate investments. Our coefficient estimate indicates that a one-percentage point increase in the top personal income tax rate on labor income increases corporate investments by 0.55%. This is equivalent to an implied elasticity of corporate investment with respect to wage tax rates of 0.22. This result is consistent with a substitution effect: On average, firms substitute capital with labor when the marginal price on labor input increases following an increase in the tax rate on wages.

We also note that the results on the control variables are in line with prior research and expectations. For example, firms with more cash holdings, firms with more growth opportunities (proxied with *Sales Growth*), or firms with more access to external debt (higher *Leverage*) have higher investments. Further, corporate investments are larger in countries with high growth rates (*GDP Growth*) as well as in countries with political stability, low corruption, and effective governments. These results are similar across the four primary specifications in Table **4**. We also find a negative effect of having a progressive corporate tax, consistent with the notion of a success tax deterring investment incentives. Loss carryback and group taxation provisions affect investment positively, consistent with more symmetric treatment of (expected) tax losses relative to profits incentivizing investment.[13]

In the next step, we document the importance of modeling the tax system more comprehensively even if our research question centers on one aspect, namely consumption taxes. The results presented in Table 4 document that the inclusion of other variables characterizing a country's tax system is important because they significantly and independently affect firms' investment. The results in Table 5 document that controlling for concurrent changes in the tax system is critical to identifying the effect of consumption tax rate changes. In Columns (1)–(3) of Table 5, we present results on the effect of consumption taxes on investment without controlling for concurrent tax system variables. In Column (1), we report estimates of a model without any other control variables. In Columns (2) and (3), we add either country- or firm-level controls. The coefficient on the consumption tax rate is insignificant and much lower in magnitude, consistent with considerable attenuation caused by failing to control for other tax system variables. In contrast, once we control for these concurrent tax variables in Columns (4)–(6), we note that the effect is significant, significantly larger in magnitude, and close to our main estimate from Table 4.

[13] The availability of accelerated depreciation methods shows a negative sign. Appearing spurious prima facie, a potential explanation is that 67% of our firm-year observations are characterized by a progressive corporate tax. Under progressive taxation, firms may be in lower tax brackets because of higher depreciation in the first years. This in turn decreases the present value of the depreciation allowances. Straight-line depreciation leads to smoother income and thus to a less convex tax structure.

In Column (4) of Table 5, we add the seven variables characterizing a country's tax system without any controls for other country or firm characteristics. While we add the latter respectively in Columns (5) and (6), the identification of the effect of consumption tax rate changes on investment critically hinges on controlling for concurrent changes in the tax system. The coefficient estimate on the consumption tax rate is largely insensitive to the inclusion of country or firm level control variables.

[Insert Table 5 about here]

We next address potential concerns about panel composition. While consumption tax rate changes do not appear to cluster around one specific point in time, we acknowledge that our panel of firm-year observations is not balanced across countries. Since our empirical strategy identified the coefficient on consumption tax using the average difference-in-differences in investments before versus after a tax policy change, one concern could be that our results are primarily driven by tax rate changes in a small set of countries that represent a large portion of observations (see Table 2). For example, five countries represent around half of the firm-year observations used in our sample (United States, Japan, China, India, and United Kingdom). Ultimately, this also raises the concern of a potential lack of generalizability. We try to address this concern with three different approaches.

First, to demonstrate that our results are not driven by consumption tax rate changes in one single country, we report coefficients from replicating our diff-in-diff as well as the triple difference analyses after excluding one country at a time in Figure 7. The gray lines represent the 95% confidence intervals. The upper left figure reports the coefficient on *Consumption Tax* obtained from the specification we used in Table 4 after excluding one of the 68 countries in our sample at a time. We find that our results are not sensitive to the exclusion of one country at a time. The coefficient estimates are always significant and there is no case where the coefficient is significantly different from other coefficients as the confidence bounds are always overlapping.

Second, we use a balanced sample by randomly selecting 50 firms per country that survive for at least 8 years. This effectively limits our sample to countries with at least 50 firms but does not weight large countries more than small countries. We select firms in 2007, the mid-point of our analysis. We then repeat the estimation of our primary findings on the effect of the consumption tax rate on investment and the heterogeneity in firms' responses 1,000 times. We present the distribution of the coefficients obtained from these estimations in Figure 8. Again, the upper left figure is the distribution of the coefficient on *Consumption Tax* obtained from the specification we used in Table 4. Each figure also reports the mean and median across the distribution of 1,000 coefficients. Results from all four figures indicate low skewness and few outliers as additionally

indicated by a low difference between the median and mean coefficient. Further, the results largely support our previous inferences. The average coefficient on *Consumption Tax* is -0.11 (and significantly different from zero) and is very close to the baseline coefficient of -0.1149 reported in Column (2) of Table 4. Overall, randomly selecting an equally sized number of firms per country does not change our inferences.

[Insert Figure 8 about here]

Finally, to achieve equal balancing of observations by country, we collapse our data to the country-year level by taking means or medians across all firm-level variables included in equation 1. We then rerun the model of our primary finding of a negative effect of consumption taxes on investment from Table 4 at the country-level. We do so because our treatment variable, the consumption tax rate, varies at the country-year level. Using country-year averages or medians, we obtain 843 observations to estimate equation (1) using country fixed effects. In this test, we cluster standard errors at the country level. Results are reported in Table 6. We continue to find a negative effect of consumption taxes on investment in seven out of eight specifications. While this approach attaches equal weighting to each country-year, the coefficient magnitudes and their standard errors indicate lower precision. One potential reason for this is the lower power and precision of averaging over only a few firms in some countries in some years. Consistent with this notion, as we limit the estimation to countries with at least 200 observations in Column (3), we obtain the strongest evidence of a negative effect of consumption taxes on aggregate investment. Overall, results from all three approaches largely support our main result. We conclude that our results are unlikely to be driven by our unbalanced sample. To be more precise, these tests rule out that our findings are explained by changes to consumption tax rates in only a few, overrepresented countries.

[Insert Table 6 about here]

4.2 Firm heterogeneity: Low versus High Supply Elasticity

While tax policy varies at the country-year level, our research design using the firm-level data allows us to examine testable predictions on cross-firm differences in the responsiveness to changes in consumption tax rates. This approach extends the scarce and inconclusive evidence from prior literature at the country-year-level (e.g., Alesina et al. 2002, Arnold et al. 2011) by decomposing the average response. Finding evidence consistent with theoretical predictions on differential responses to consumption tax rate changes corroborates a causal interpretation of the results in Table 4. It allows us to further address the concern that our primary result is driven by unobserved variation in economic outcomes at the country-year level by including country-year fixed effects.

Our theoretical framework in Section 2.2 and, particularly, Figure 3 suggests that firms with lower supply elasticity respond more to consumption tax changes because the incidence of the consumption tax falls on the firm. Our proxy for supply elasticity is the level of cash holdings because firms with low cash holdings have a lower flexibility and capacity to absorb demand shocks. Firms with financing frictions face a highly in inelastic capital supply curve (e.g., Stiglitz and Weiss 1981 or Farre-Mensa and Ljungqvist 2015) and, in particular, cash-poor firms have limited financial slack to fund all profitable investments internally and thus a limited ability to adjust investments (e.g., Duchin, Ozbas and Sensoy 2010).

Accordingly, we expect cash-poor firms to shift less of the price increase stemming from a consumption tax rate change to consumers relative to cash-rich firms. This decreases cash-poor firms' returns on investment and, accordingly, investment levels. To test this empirically, we define a dummy variable *Low Cash* which we set equal to one if a firm is in the bottom tercile of the cash to assets ratio distribution in a respective country-year. We add *Low Cash* and the interaction of *Low Cash* with each of our eight tax policy variables characterizing a country's tax system to equation (1). This approach is similar to a triple difference approach. The *first difference* again compares corporate investments before and after the tax rate change. The *second difference* compares investments in a country with a tax rate change to corporate investments in a country without a tax rate change. The *third difference* exploits differences in investment responses between cash-constrained firms and firms with excess cash. Table 7 reports the results, focusing on the main effect of *Consumption Tax* and its interaction with *Low Cash*.

As predicted, the results presented in Table 7 indicate that firms with low cash holdings invest significantly less following consumption tax rate changes. Firms with low cash-holdings decrease average investments by -2.12% (= 0.1387 × 0.01 / 0.0653) as captured by the sum of the main effect of *Consumption Tax* and its interaction with *Low Cash*. Cash-rich firms as identified by the coefficient on *Consumption Tax* experience a slightly muted negative response of -1.28% (=0.0839 × 0.01 / 0.0653) of average investment to a one-percentage point increase in consumption tax rates as compared to the earlier results in Table 4. As indicated by the significant and negative interaction between *Consumption Tax* and *Low Cash*, the elasticity of cash-poor firms (-0.22) with respect to consumption tax rate is significantly larger in absolute terms than for cash-rich firms (-0.14). The increase in the elasticity amounts to over 65% if firms have low cash holdings. We find similar results when limiting the sample to countries for which we have at least 200 observations (Columns (4) to (6)).

[Insert Table 7 about here]

The cross-sectional analysis also allows us to address another important concern: Our results may be driven by broader policy changes and/or other unobservable characteristics in a given year

in a certain country. In Column (3) of Table 7, we include country-year fixed effects to absorb any previously omitted, remaining unobservable country-year characteristics. This approach has the disadvantage that the main effect of *Consumption Tax* is not identified. However, the interaction term is still identified. Notably, the coefficient on the interaction term of *Consumption Tax* and *Low Cash* is very similar to the estimates in Columns (1) and (4). This increases confidence that our findings are robust to the influence of unobservable country-year variables correlated with the changes in consumption tax rates.

Furthermore, we allow for common economic trends in neighboring countries (Ljungqvist and Smolyansky 2014). For this purpose, we create for each firm a dummy variable that is equal to one for the host country as well as for each neighboring country. This results in 68 *Border-Country* dummy variables for each possible host country. We then interact these dummy variables with year fixed effects to allow for border-country-year fixed effects. Effectively, this eliminates all influence of unobservable factors of neighboring countries in a given year. Results are presented in Columns (3) and (6). Again, the coefficient estimate is very close to our baseline estimate from Column (1) and (4), respectively. Taken together, the results suggest that our findings indeed seem to be driven by a change in consumption tax rates and not by broader contemporaneous country-level changes.

4.3 Firm heterogeneity: Low versus High Demand Elasticity

We repeat this triple-difference analysis and examine differences in the investment response to consumption tax rate changes. As illustrated in Figure 4, the investment response is a function of demand elasticity. Firms facing more elastic demand can shift less of the consumption tax related price increase to consumers. Hence, we expect that firms facing more elastic demand decrease investments more than firms facing less elastic demand. To proxy for demand elasticity, we use the firm's profit margin since firms with lower market power, as measured by low profit margins, face more elastic demand (e.g., Lerner 1934). Mimicking the previous analysis for *Low Cash* firms, we define a dummy variable *Low Profit Margin* that is equal to one for firms in the bottom tercile of the profit margin distribution in a respective country-year. Importantly, profit margin and cash holdings are not substitutes capturing the same concept. Less than a third of firms with low profit margins are also firms with low cash holdings. In our regression analysis, we then interact *Low Profit Margin* with *Consumption Tax* and all other tax policy variables.

Results are reported in Table 8. As predicted, we find that firms with low profit margins react more negatively to consumption tax rate changes than firms with high profit margins. The coefficients imply that high profit margin firms decrease investment by -1.42% of average investment in response to a one-percentage point increase in consumption tax rates. Low profit margin firms decrease investment by -2 % of average investment. The difference in responsiveness

is statistically significant. The implied elasticities mirror these results: low profit margin firms react significantly stronger (-0.21) than high profit margin firms (-0.15). This is an increase by over 40%. While firms with a high profit margin cannot fully shift the consumption tax related price increase to consumers and still decrease investment, our results are consistent with the notion that they face less elastic demand than low profit margin firms.[14] Again, we find similar results when limiting the sample to countries for which we have at least 200 observations (Columns (4) to (6)). As for *Low Cash*, inclusion of country-year fixed effects (Columns (2) and (5)) or border-country-year fixed effects (Columns (3) and (6)) does not alter the magnitude and significance of the coefficient on the interaction of Low Profit Margin and *Consumption Tax*. This supports the argument that our primary results reported above are not driven by unobserved variation in economic outcomes at the country-level.

[Insert Table 8 about here]

Overall, these results have two main implications. First, the investment response to consumption tax rate changes varies in predictable ways with the relative elasticities of supply and demand that determine tax incidence of a consumption tax rate change on consumers vis-à-vis firms. Second, we obtain quantitatively similar results on the interactions of *Consumption Tax* with three firm characteristics when including country-year fixed effects. These results render it less likely that our primary finding of a negative effect of consumption taxes on investment is driven by unobserved variation in economic outcomes.

4.4 Exposure to Consumption Tax Rate Changes

The final cross-sectional tests center on the exposure of a firm's output to domestic consumption tax rate changes. We expect that firms selling most of their output internationally are less affected by domestic tax rate changes. Also, we expect that the effect of a shift of the demand curve of end consumers decays the more of a firm's output is not directly sold to end consumers. Ideally, we would like to know the exact location of each customer of a firm, the economic distance of the firm to its customers, the basket of goods, and the exact applicable tax rates for the sold basked of goods. Since we use consolidated financial accounts of listed firms, this information is usually not available. While this blurs the identification in our main analysis if, for example, firms sell predominantly across borders, we approximate the exposure of a firm's output to domestic consumption tax rate changes in two ways. First, we derive a proxy for cross-border sales using information on the fraction of international sales available in Datastream. This data item, however, is only available for a subset of firms and there is no information on the exact location of sales. We

[14] However, since we cannot measure supply and demand elasticities directly, this result is also consistent with an explanation similar to above finding for cash-rich firms: High profit margin firms may have a higher elasticity of supply and, hence, are better able to absorb demand-shocks.

define a dummy variable *High Domestic* equal to one if the firm's median ratio of domestic to total sales is above 80%.[15] For these firms, we expect a larger response to changes in the consumption tax. For the firms for which we have information on international sales, about 54% of firms predominantly make domestic sales. Second, Ozdagli and Weber (2016) develop an empirical proxy for the closeness to end consumers at the industry level using data from the Bureau of Economic Analysis by sorting industries into layers by the fraction of output sold directly and indirectly to end-consumers. We expect that the effect of consumption taxes is concentrated in firms that operate in industries that are closer to the final consumer, but acknowledge that this proxy based on the US economy is prone to measurement error in an international setting. Hence, we define a dummy variable *Low Distance* equal to one if firms are not in the two most remote layers. In our sample, *Low Distance* is equal to one for about 40% of firms.[16]

Table 9 presents the regression results of estimating our main model where we additionally include an interaction between *High Domestic* and *Consumption Tax*. Our results are consistent with the prediction that firms whose customers are more likely to be subject to the domestic consumption tax are most responsive. Firms with high domestic sales decrease investment by -3.17% of average investment following a consumption tax increase of one percentage point. The implied elasticity is -0.38 for these firms. Firms with low domestic sales do not respond to changes in the domestic consumption taxes. Importantly, the difference in responsiveness is statistically significant. These results are similar when we limit the sample to countries with at least 200 observations, when we include country-year fixed effects, or when we include border-country-year fixed effects.

[Insert Table 9 about here]

Finally, Table 10 presents the regression results of estimating our main model including an interaction between *Low Distance* and *Consumption Tax*. Our results are consistent with the prediction that firms with more output directly or indirectly sold to final consumers are most responsive to consumption tax changes. These firms decrease investment by -3.04% of average investment following a consumption tax increase of one percentage point. The implied elasticity is -0.32 for these firms. Firms with high distance to consumers do not respond to changes in the domestic consumption taxes. Importantly, the difference in responsiveness is statistically significant. Again, results are similar when we limit the sample to countries with at least 200

[15] We obtain similar results using other cutoffs such as 50%, 75% or 90%.

[16] Empirically, the measure groups industries into six layers based on the distance of their output from end-consumers. While this approach is intuitively appealing, it does not fully reflect the number of vertical supply chain linkages resulting in more than 50% of the firms classified as belonging to the most remote layer. That is, the last layer aggregates all firms belonging to industries that would be classified in more distant layers if the measure allowed for more distant layers.

observations, when we include country-year fixed effects, or when we include border-country-year fixed effects. Taken together, these two findings document that consistent with our predictions, the effect of consumption taxes are concentrated in firms whose output is most exposed to a shift in the demand curve of domestic end-consumers—to the extent our proxies capture the underlying concepts.

[Insert Table 10 about here]

4.5 Robustness tests

Finally, we present three further robustness tests for all our results that address the concern that our results are driven by unobserved variation in economic outcomes. We have dealt with this issue in our primary analyses by limiting the counterfactuals to firms from countries that follow similar growth paths by including emerging market-year fixed effects. We further control for country-year-level variation using control variables as well as country-year fixed effects when gauging the heterogeneity in investment responses to consumption tax rates across firms.

To further narrow down the set of counterfactuals in our baseline estimates, we replicate our primary findings using region-year fixed effects. For this purpose, we use the World Bank Region Classification, classifying countries around the world into seven geographical regions. To illustrate, this approach benchmarks a consumption tax rate change in a South Asian country against investments of firms from other South Asian countries that do not experience a concurrent consumption tax rate change. To the extent geographic regions such as South Asia are subject to similar variation in economic conditions, this approach assures that the identification of the difference-in-differences as well as triple difference coefficients are not driven by unobserved variation in economic conditions within geographic regions. Results reported in Appendix Table A.6 fully support our earlier inferences.

Further, Romer and Romer (2010) identify several examples of endogenous tax policy changes. While our sample includes 65 consumption tax increases and 30 consumption tax decreases, we further control for more than 300 changes to other variables characterizing the tax system, rendering the narrative approach infeasible for the purposes of this study. Given that around two thirds of the consumption tax rate changes are tax increases, a potential alternative explanation for our findings would be that policymakers increase consumption taxes when the economy is weak. Hence, investment opportunities would decrease irrespective of changes to the consumption tax rate. While many of the earlier tests are devoted to this concern of omitted variation in economic conditions, an ad-hoc way to gauge the sensitivity of our results to procyclical consumption tax rate changes during recessions is presented in Appendix Table A.7,

where we exclude country-years with negative GDP Growth. Our inferences from this test remain unchanged.

Finally, an alternative way to control for time-varying unobservable variation is to include the lagged investments as an additional control using the estimation procedure proposed by Arellano and Bond (1991). Empirical results using the Arellano-Bond estimator are qualitatively very similar and reported in Appendix Table A.8. Using a dynamic panel estimator we continue to find a negative effect of consumption taxes as well as for all three cross-sectional analyses.

5. Conclusion

This paper investigates the effect of consumption taxes on corporate investments using a sample of more than 39,900 firms from 68 countries over the 2001–2013 period. Our identification is based on 95 changes in consumption tax rates while controlling for over 300 changes in seven other tax variables to comprehensively model a country's tax system. We show that firms' investments are responsive to changes in consumption taxes. This effect is economically significant and stronger for firms with less elastic supply, more elastic demand, and less uncertainty. These results are robust to an extensive set of robustness tests.

Our results have important implications for the debate of tax policy design. The main tax revenue sources for governments are consumption taxes, personal income taxes on labor and capital, and corporate taxes. In contrast to the conventional wisdom that consumption taxes are not a burden to firms, we show that corporate investments indeed responds to changes in consumption as suggested by a simple partial equilibrium analysis. Hence, policymakers need to balance capital and consumption taxes because both adversely affect investments. Since capital taxes have a stronger investment impact than consumption taxes, a revenue-neutral tax reform that cuts corporate and payout taxes while increasing consumption tax rates might result in higher aggregate private sector investment. Hence, a more consumption-based tax system might increase investment activity of corporations while reducing other important distortions as well (e.g., Hubbard 1997). This is important for countries with low consumption taxes and high corporate taxes such as Japan and the United States. Several U.S. economists are actually in favor of a U.S. tax system with higher taxes on consumption and lower taxes on income.[17] However, our results imply that not only corporate taxes but also consumption taxes need to be taken into account when gauging aggregate investment responses. Increasing consumption taxes comes at the cost of lower investments and, in particular, at the cost of less investments by firms that face less elastic supply or more elastic demand.

[17] For example, N. Gregory Mankiw demands to "*tax consumption rather than income*" ("A Better Tax System (Assembly Instructions Included)", New York Times, January 22, 2012). Likewise, Alan Auerbach suggests to "*[a]dd consumption taxes*" as one of the four primary tax policy steps ("Tax Policies That Are Fair and Generates Revenue", New York Times, May 24, 2013).

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Appendix A:

Variable Definitions

Tax Policy Variable	
Source: Tax Handbooks published by Ernst & Young, KPMG, PwC, and Deloitte	
Primary Tax Policy Variables	
Corporate Tax	*Corporate Tax* is the top marginal corporate tax rate in country *j* in year *t*.
Payout Tax	*Payout Tax* is the average of the top marginal dividend tax rate in country *j* in year *t* and the top marginal income tax rate on capital gains in country *j* in year *t*. For capital gains, we assume long-term capital gains and a non-substantial shareholdings.
Wage Tax	*Wage Tax* is the top marginal individual income tax rate on labor income in country *j* in year *t*.
Consumption Tax	*Consumption Tax* is the value added tax (or sales tax) rate in country *j* in year *t*.
Other Tax Policy Variables	
Progressive	*Progressive* is a dummy variable equal to one if country *j* has a progressive corporate tax rate in year *t*
LCB	*LCB* is a dummy variable equal to one if country *j* allows tax loss carrybacks in year *t*
Group	*Group* is a dummy variable equal to one if country *j* allows for group taxation in year *t*
Accelerated	*Accelerated* is a dummy variable equal to one if country *j* allows for accelerated depreciation in year *t*
Firm-level variables	
Source: Compustat Annual North America and Global	
Investment	*Investment* is Capital Expenditures scaled by lagged Total Assets
Cash	*Cash* is Cash scaled by lagged Total Assets
Operating Profit	*Operating Profit* is Earnings Before Interest and Taxes scaled by lagged Total Assets.
Sales Growth	*Sales Growth* is the natural logarithm of the growth rate of Sales from t–2 to t.
Leverage	*Leverage* is Total Debt scaled by Total Assets
Size	*Size* is the natural logarithm of Total Assets
Profit margin	*Profit margin* is the Earnings Before Interest and Taxes scaled by Sales
Foreign Sales	*Foreign Sales* is the ratio of international sales to total sales.
Country-level variables	
Source: World Bank	
Ln(GDP_Cap)	*Ln(GDP_Cap)* is natural logarithm of GDP per capita in constant 2005 USD.
GDP Growth	*GDP Growth* is the annual percentage growth rate of GDP in constant 2005 U.S. dollars.
Inflation	*Inflation* is the rate of price change in a country as a whole as measured by the annual growth rate of the GDP implicit deflator.
Voice and Accountability	*Voice and Accountability* is the yearly estimate of a country's quality relating to voice and accountability.

Political Stability	*Political Stability* is the yearly estimate of a country's quality relating to political stability.
Government Effectiveness	*Government Effectiveness* is the yearly estimate of a country's quality relating to government effectiveness.
Regulatory Quality	*Regulatory Quality* is the yearly estimate of a country's quality relating to regulatory quality.
Rule of Law	*Rule of Law* is the yearly estimate of a country's quality relating to rule of law.
Control of Corruption	*Control of Corruption* is the yearly estimate of a country's quality relating to control of corruption.

Figure 1: Example of a Value Added Tax and Retail Sales Tax System

This figure illustrates the mechanisms of a value added tax and a retail sales tax system using an example of a winery and a grocery. Both systems lead to the same cash to both, winery and grocery as before taxes.

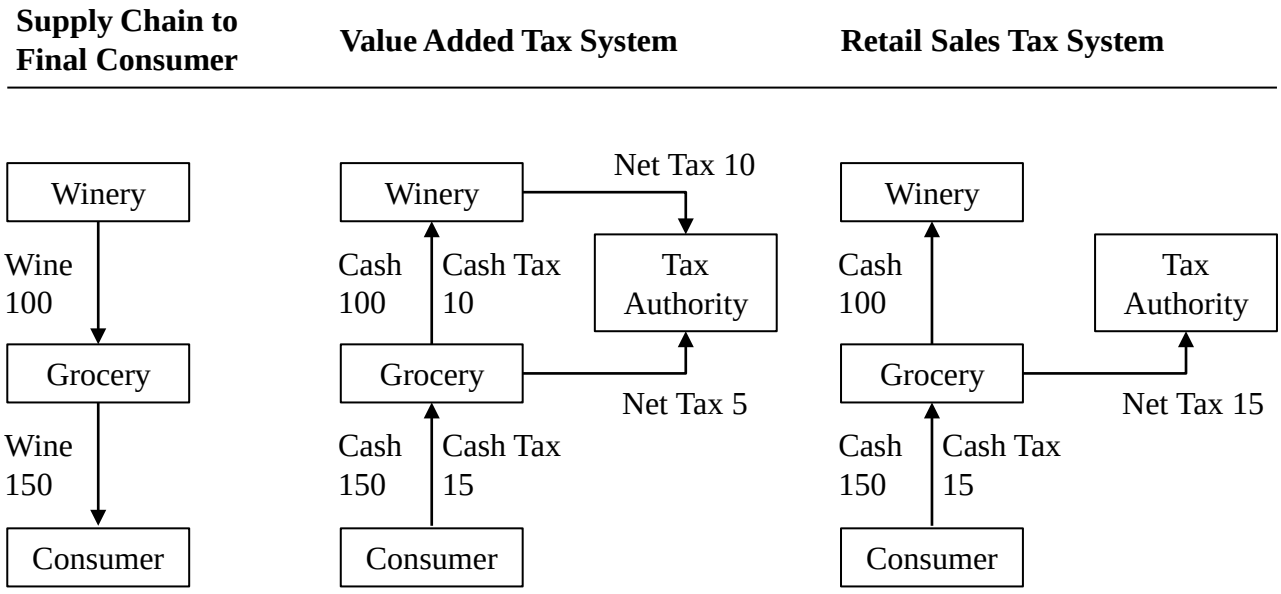

Figure 2: The Effect of Consumption Taxes on Supply and Demand

This figure illustrates the effect of a consumption tax on supply (S) and demand (D) with quantity on the x-axis and the price on the y-axis. The highlighted area represents the producer surplus.

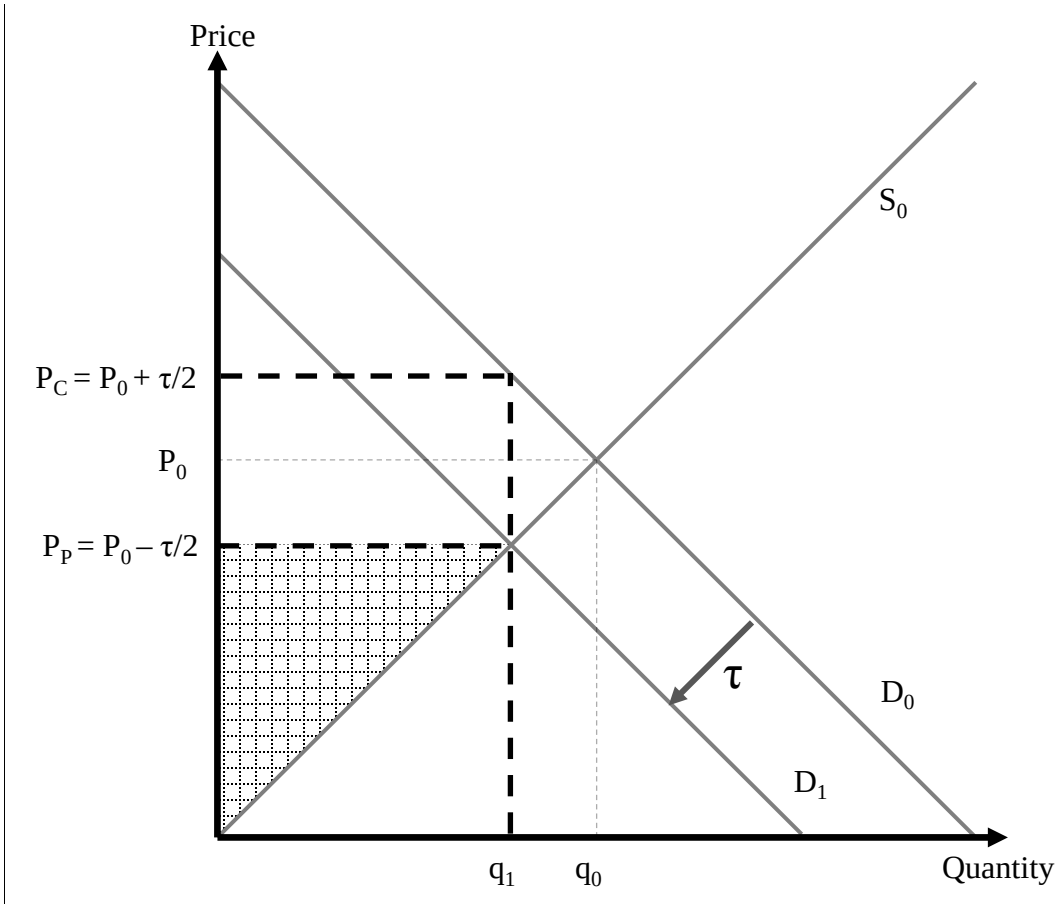

Figure 3: The Effect of Consumption Taxes on Supply and Demand: Fully Inelastic Supply

This figure illustrates the effect of a consumption tax on supply (S) and demand (D) with quantity on the x-axis and the price on the y-axis in case of fully inelastic supply. The highlighted area represents the producer surplus.

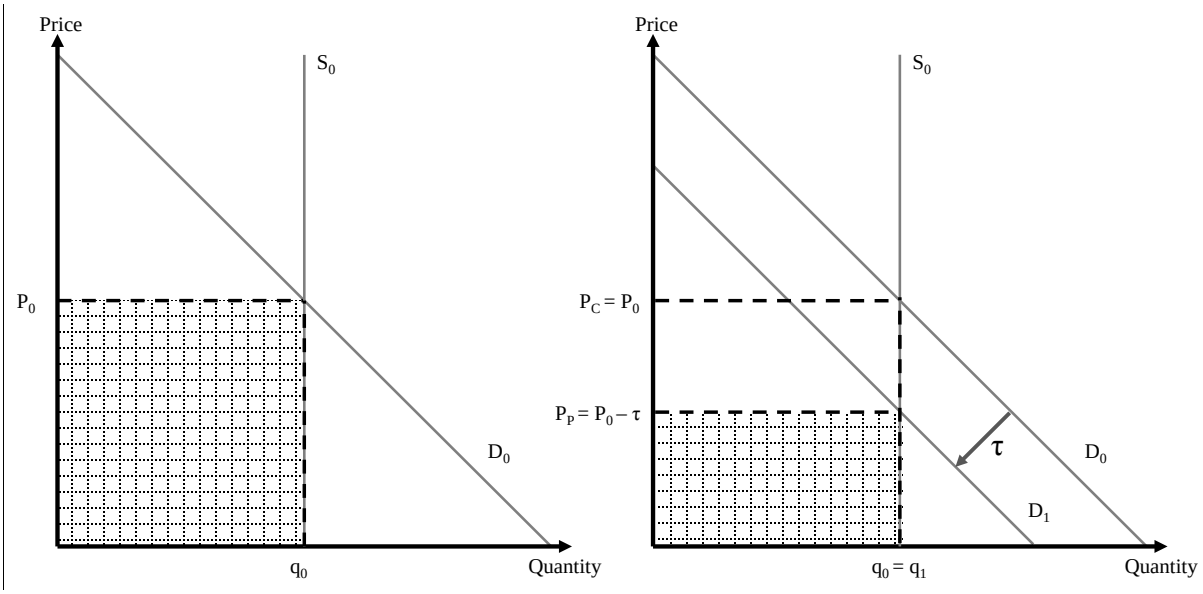

Figure 4: The Effect of Consumption Taxes on Supply and Demand: Fully Elastic Demand

This figure illustrates the effect of a consumption tax on supply (S) and demand (D) with quantity on the x-axis and the price on the y-axis in case of fully elastic demand. The highlighted area represents the producer surplus.

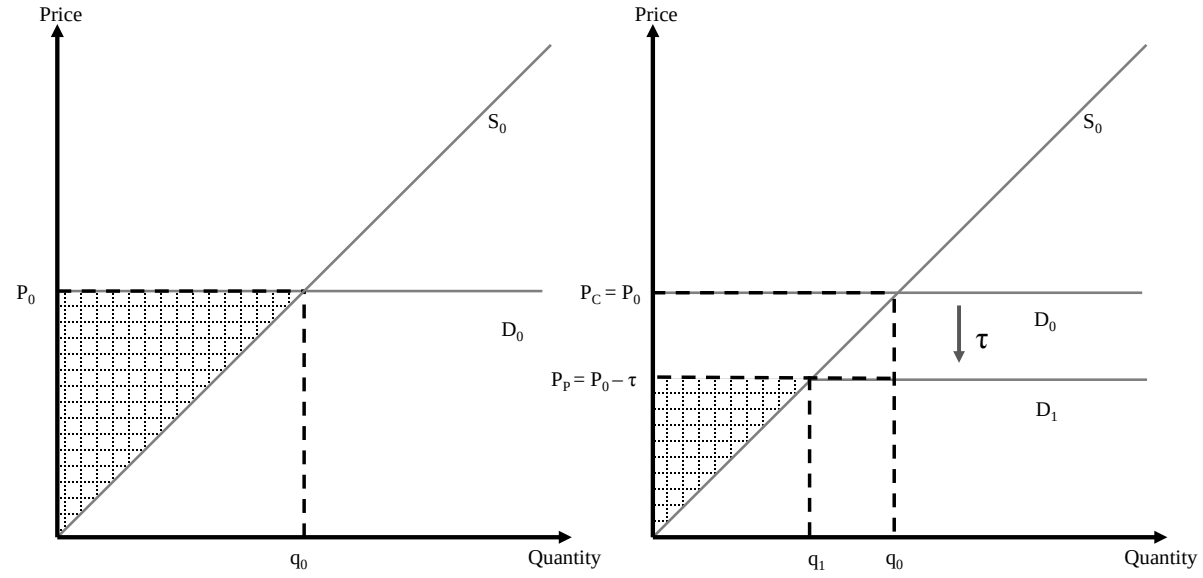

Figure 5: Changes in Consumption Tax Rates Around the World

This figure highlights countries with at least one 0.5-percentage point change in the value added / sales tax rate (*Consumption Tax*) over the sample period (highlighted in black). Countries highlighted in gray are in the sample but there was no change in consumption tax rates. Countries highlighted in white are not included in the sample.

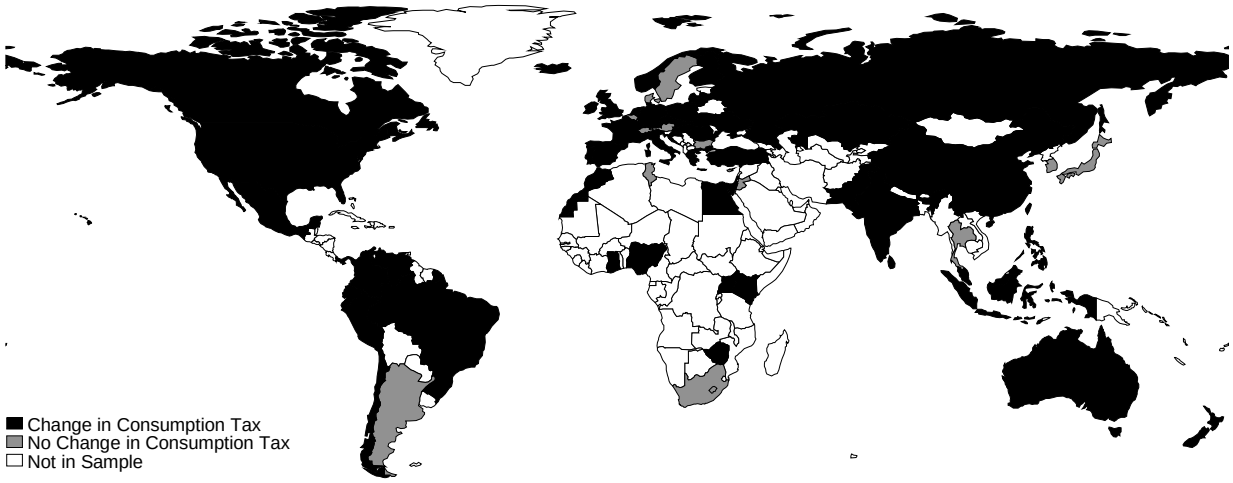

Figure 6: Changes in Consumption Tax Rates Over Time

This figure summarizes changes of consumption tax rates over time. We count how often the value added / sales tax rate changes by at least 1 percentage point (pp) and 2 percentage points changes respectively in each year.

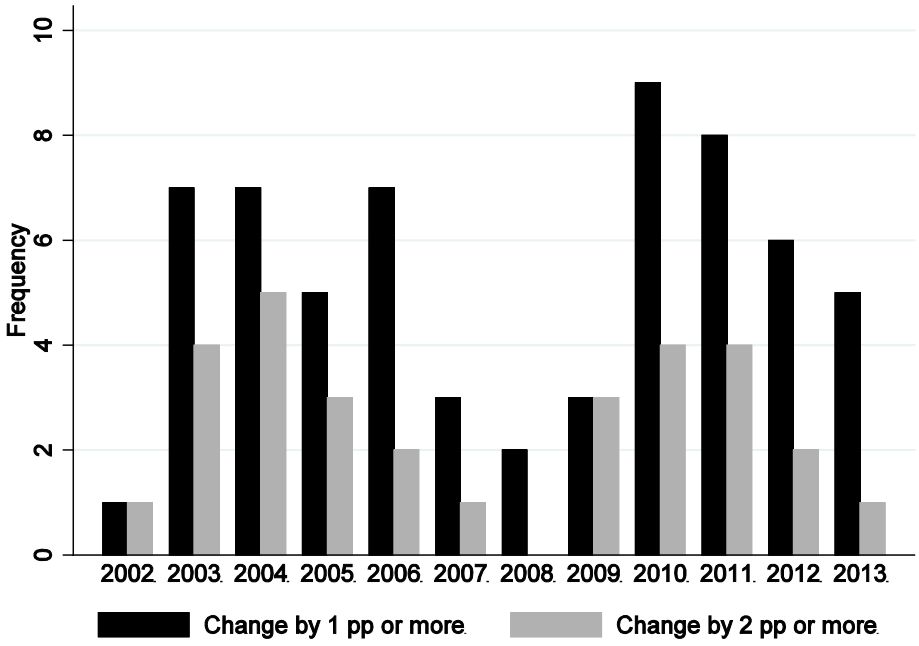

Figure 7: Robustness to Exclusion of Single Countries

This figure presents the coefficient estimates for Consumption Tax from estimating investment behavior over the 2001–2013 period with stepwise exclusion of each countries. We present the main coefficient from Table 4 (*Consumption Tax*). We use capital expenditures over prior year's total assets as dependent variable. Independent Variables are described in Table 3. The gray lines represent 95% confidence bounds based on report robust standard errors clustered at the firm-level in parentheses.

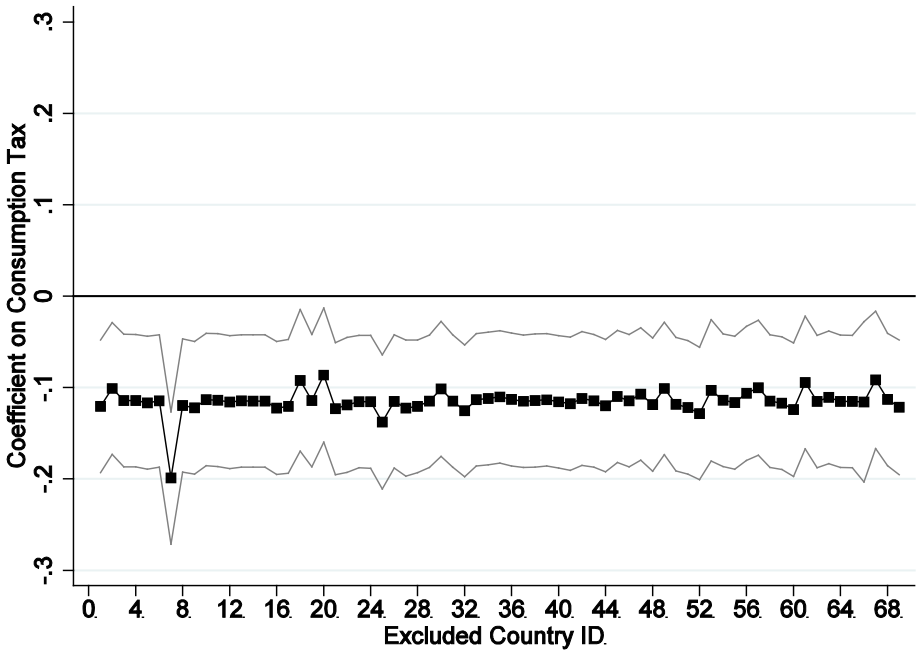

Figure 8: Randomly Selected Firms per Country – Distribution of Coefficient

This figure plots the distribution of Consumption Tax obtained from 1,000 estimations using 50 randomly drawn firms per country and iteration and investment behavior as the dependent variable over the 2001–2013 period. We present the main coefficient from Table 4 (*Consumption Tax*) We randomly select firms in year 2007 and require firms to survive at least 8 years. Countries with less than 50 observations per year are excluded from the regression. We use capital expenditures over prior year's total assets as dependent variable. Independent Variables are described in Appendix A.

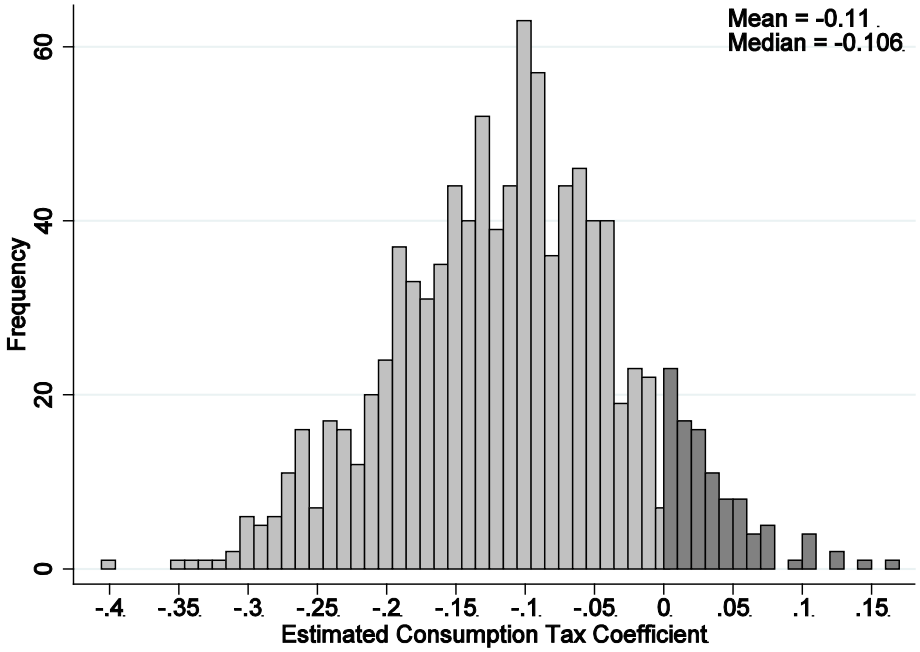

Table 1: Overview of Value Added and Sales Tax Systems

This table summarizes the value added / sales tax systems for our sample countries. We classify all general sales taxes / value added tax systems as a value added tax system (*VAT*) if firms receive an input tax credit on goods and services. Tax systems without a credit on input taxes are denoted sales tax (*ST*) systems. Zimbabwe switched from a sales tax to a value added tax system in 2004. *Rate* summarizes the average sales tax rate in the respective country over the sample period. We use the standard rate on goods and services.

Country	System	Rate	Country	System	Rate	Country	System	Rate
Argentina	VAT	21%	India	VAT	13%	Philippines	VAT	11%
Australia	VAT	10%	Indonesia	VAT	12%	Poland	VAT	22%
Austria	VAT	20%	Ireland	VAT	21%	Portugal	VAT	20%
Belgium	VAT	21%	Israel	VAT	17%	Romania	VAT	21%
Brazil	VAT	19%	Italy	VAT	20%	Russia	VAT	18%
Bulgaria	VAT	20%	Japan	VAT	5%	Singapore	VAT	6%
Canada	VAT	6%	Jordan	VAT	16%	Slovakia	VAT	20%
Chile	VAT	19%	Kazakhstan	VAT	13%	South Africa	VAT	14%
China	VAT	17%	Kenya	VAT	16%	Spain	VAT	17%
Colombia	VAT	16%	Korea	VAT	10%	Sri Lanka	VAT	13%
Croatia	VAT	23%	Latvia	VAT	20%	Sweden	VAT	25%
Czech Republic	VAT	20%	Lithuania	VAT	19%	Switzerland	VAT	8%
Denmark	VAT	25%	Luxembourg	VAT	15%	Taiwan	VAT	5%
Ecuador	VAT	12%	Malaysia	ST	10%	Thailand	VAT	7%
Egypt	VAT	10%	Mexico	VAT	15%	Tunisia	VAT	18%
Finland	VAT	22%	Morocco	VAT	20%	Turkey	VAT	18%
France	VAT	20%	Netherlands	VAT	19%	Uganda	VAT	18%
Germany	VAT	18%	New Zealand	VAT	13%	Ukraine	VAT	20%
Ghana	VAT	13%	Nigeria	VAT	5%	United Kingdom	VAT	18%
Greece	VAT	20%	Norway	VAT	25%	United States	ST	5%
Hong Kong	N.A.	0%	Pakistan	VAT	16%	Venezuela	VAT	15%
Hungary	VAT	23%	Panama	VAT	6%	Zimbabwe	ST/VAT	17%
Iceland	VAT	25%	Peru	VAT	19%			

Table 2: Sample Composition

This table summarizes the number of observations per country in our sample observations over the 2001–2013 period.

Country	Obs.	Country	Obs.	Country	Obs.
Argentina	715	India	17,150	Philippines	1,398
Australia	12,066	Indonesia	3,000	Poland	3,069
Austria	760	Ireland	771	Portugal	516
Belgium	1,024	Israel	2,466	Romania	184
Brazil	2,754	Italy	2,598	Russia	1,579
Bulgaria	135	Japan	34,933	Singapore	6,256
Canada	10,354	Jordan	204	Slovakia	49
Chile	1,521	Kazakhstan	112	South Africa	2,687
China	24,025	Kenya	219	Spain	1,147
Colombia	265	Korea	6,585	Sri Lanka	1,177
Croatia	261	Latvia	262	Sweden	3,982
Czech Republic	169	Lithuania	293	Switzerland	2,445
Denmark	1,358	Luxembourg	310	Taiwan	13,821
Ecuador	10	Malaysia	8,780	Thailand	4,258
Egypt	270	Mexico	1,095	Tunisia	147
Finland	1,423	Morocco	380	Turkey	1,267
France	6,768	Netherlands	1,720	Uganda	26
Germany	6,928	New Zealand	1,189	Ukraine	46
Ghana	14	Nigeria	437	United Kingdom	14,947
Greece	1,794	Norway	1,893	United States	59,414
Hong Kong	10,297	Pakistan	1,851	Venezuela	39
Hungary	204	Panama	12	Zimbabwe	115
Iceland	102	Peru	893		
				Total	**288,939**

Table 3: Descriptive Statistics

This table presents descriptive statistics of our main variables for 39,864 firms and 288,939 observations over the 2001–2013 period. Panel A presents summary statistics for our tax variables. Panel B (Panel C) presents statistics on firm-level (country-level) variables. Variables are defined in Appendix A.

Variable	Mean	Standard Deviation	25th percentile	Median	75th percentile
Panel A: Tax Variables					
Consumption Tax	0.1058	0.0633	0.0522	0.1000	0.1700
Corporate Tax	0.3188	0.0735	0.2600	0.3300	0.3900
Payout Tax	0.1533	0.0969	0.1000	0.1500	0.2236
Wage Tax	0.3942	0.0942	0.3500	0.4000	0.4641
Progressive	0.6814	0.4659	0.0000	1.0000	1.0000
LCB	0.4520	0.4977	0.0000	0.0000	1.0000
Group	0.5983	0.4902	0.0000	1.0000	1.0000
Accelerated	0.8134	0.3896	1.0000	1.0000	1.0000
Panel B: Firm-Level Variables					
Investment	0.0653	0.0999	0.0130	0.0339	0.0752
Cash	0.1625	0.2528	0.0298	0.0862	0.1948
Operating Profit	0.0255	0.2511	0.0041	0.0532	0.1106
Sales Growth	0.2028	0.6269	-0.0493	0.1636	0.4134
Leverage	0.5400	0.3343	0.3383	0.5214	0.6876
Size	5.2676	2.1545	3.8739	5.1882	6.5820
Panel C: Other Country-Level Variables					
Ln(GDP_Cap)	9.7337	1.2792	8.8427	10.4513	10.6198
GDP Growth	0.0332	0.0351	0.0161	0.0267	0.0502
Inflation	0.0263	0.0351	0.0094	0.0205	0.0354
Voice and Accountability	0.6887	0.8865	0.4300	1.0300	1.3100
Political Stability	0.3189	0.7773	-0.0900	0.5500	0.9300
Government Effectiveness	1.1747	0.7270	0.6600	1.5000	1.7000
Regulatory Quality	1.0213	0.7500	0.5400	1.2300	1.6100
Rule of Law	1.0196	0.7962	0.4900	1.3500	1.6100
Control of Corruption	1.0137	0.9597	0.2400	1.3200	1.8350

Table 4: Consumption Tax and Corporate Investments

This table presents regression results on investment behavior over the 2001–2013 period. We use capital expenditures over prior year's total assets as dependent variable. Independent Variables are described in Appendix A. We report robust standard errors clustered at the firm-level in parentheses. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

	Baseline	**Extended Fixed**	**>200 Obs./Country**	**At least 10m Total**
	(1)	(2)	(3)	(4)
Consumption Tax	**-0.1260*** **	**-0.1149*** **	**-0.1378*** **	**-0.1108*** **
	(0.0365)	**(0.0370)**	**(0.0378)**	**(0.0390)**
Corporate Tax	-0.0741***	-0.0763***	-0.0810***	-0.0863***
	(0.0132)	(0.0135)	(0.0136)	(0.0138)
Payout Tax	-0.0154***	-0.0287***	-0.0286***	-0.0352***
	(0.0046)	(0.0049)	(0.0049)	(0.0050)
Wage Tax	0.0470***	0.0359***	0.0357***	0.0347***
	(0.0098)	(0.0098)	(0.0100)	(0.0103)
Progressive	-0.0140***	-0.0132***	-0.0133***	-0.0158***
	(0.0017)	(0.0018)	(0.0018)	(0.0019)
LCB	0.0029***	0.0018*	0.0018*	0.0009
	(0.0010)	(0.0010)	(0.0010)	(0.0010)
Group	0.0026**	0.0025**	0.0025**	0.0041***
	(0.0011)	(0.0011)	(0.0011)	(0.0011)
Accelerated	-0.0075***	-0.0072***	-0.0077***	-0.0083***
	(0.0013)	(0.0013)	(0.0013)	(0.0013)
Cash	0.0752***	0.0752***	0.0749***	0.0756***
	(0.0023)	(0.0023)	(0.0023)	(0.0025)
Operating Profit	0.0009	0.0006	0.0004	0.0341***
	(0.0029)	(0.0029)	(0.0029)	(0.0042)
Sales Growth	0.0176***	0.0174***	0.0173***	0.0175***
	(0.0006)	(0.0006)	(0.0006)	(0.0006)
Leverage	0.0031**	0.0032**	0.0031**	0.0030*
	(0.0014)	(0.0014)	(0.0014)	(0.0017)
Size	0.0055***	0.0058***	0.0059***	0.0039***
	(0.0006)	(0.0006)	(0.0006)	(0.0006)
Ln(GDP Cap)	-0.0139***	-0.0152***	-0.0158***	-0.0112***
	(0.0034)	(0.0041)	(0.0041)	(0.0041)
GDP Growth	0.1122***	0.0975***	0.0963***	0.0878***
	(0.0110)	(0.0113)	(0.0115)	(0.0117)
Inflation	0.0137	-0.0093	-0.0076	-0.0042
	(0.0088)	(0.0097)	(0.0096)	(0.0098)
Voice and	-0.0010	0.0025	0.0016	-0.0002
Accountability	(0.0028)	(0.0028)	(0.0028)	(0.0029)
Political Stability	0.0063***	0.0063***	0.0062***	0.0052***
	(0.0013)	(0.0013)	(0.0013)	(0.0013)
Government	0.0131***	0.0125***	0.0130***	0.0140***
Effectiveness	(0.0025)	(0.0026)	(0.0026)	(0.0026)
Regulatory Quality	-0.0143***	-0.0153***	-0.0157***	-0.0191***
	(0.0021)	(0.0021)	(0.0022)	(0.0022)
Rule of Law	0.0089***	0.0087**	0.0097***	0.0176***
	(0.0033)	(0.0034)	(0.0034)	(0.0035)
Control of Corruption	0.0084***	0.0071***	0.0072***	0.0075***
	(0.0017)	(0.0018)	(0.0018)	(0.0018)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	No	No	No
Year-EM FE	No	Yes	Yes	Yes
Observations	288,939	288,939	287,779	266,416
Adjusted R-squared	0.467	0.467	0.467	0.494

Table 5: The Importance of Controlling for Other Tax Policy Variables

This table presents regression results on investment behavior over the 2001–2013 period and replicates the results from Column (1) of Table 4 but include or exclude other tax variables (*Tax Controls*), non-tax country-level characteristics (*Country Controls*), and firm-level variables (*Firm Controls*). We report robust standard errors clustered at the firm-level in parentheses. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Consumption Tax	-0.0050	-0.0204	-0.0310	-0.0656*	-0.0864**	-0.0758**
	(0.0368)	(0.0367)	(0.0351)	(0.0377)	(0.0388)	(0.0359)
Tax Controls	No	No	No	Yes	Yes	Yes
Country Controls	No	Yes	No	No	Yes	No
Firm Controls	No	No	Yes	No	No	Yes
EM-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	288,939	288,939	288,939	288,939	288,939	288,939
Adjusted R-squared	0.429	0.431	0.466	0.430	0.431	0.466

Table 6: Robustness of Estimating Main Effect at Country-Year Level

This table presents regression results on investment behavior over the 2001–2013 period estimated at the country-year level. In Panel A, we use average firm variables in each country-year. Panel B uses the median. We report robust standard errors clustered at the country-level in parentheses. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

Panel A: Average Investment

	Baseline Regression	**Extended Fixed Effects**	**>200 Obs./Country**	**At least 10m Total Assets**
	(1)	(2)	(3)	(4)
Consumption Tax	-0.1551*	-0.1308	-0.2087***	-0.2099**
	(0.0927)	(0.0846)	(0.0722)	(0.0818)
Controls	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Year FE	Yes	No	No	No
Year-EM FE	No	Yes	Yes	Yes
Observations	843	843	692	692
Adjusted R-squared	0.638	0.637	0.768	0.760

Panel B: Median Investment

	Baseline Regression	**Extended Fixed Effects**	**>200 Obs./Country**	**At least 10m Total Assets**
	(1)	(2)	(3)	(4)
Consumption Tax	-0.2165**	-0.2045**	-0.1099**	-0.1557*
	(0.0996)	(0.0938)	(0.0531)	(0.0834)
Controls	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Year FE	Yes	No	No	No
Year-EM FE	No	Yes	Yes	Yes
Observations	843	843	692	692
Adjusted R-squared	0.648	0.650	0.769	0.722

Table 7: Consumption Tax and Corporate Investments, Low versus High Cash Holdings

This table presents regression results on investment behavior over the 2001–2013 period. We use capital expenditures over prior year's total assets as dependent variable. Independent Variables are described in Appendix A. We additionally interact each tax policy variable with a dummy variable equal to one if the firm is below the bottom tercile cash to assets ratio in the respective country-year (*Low Cash*). In Columns (2) and (5), we include country-year fixed effects. In Columns (3) and (6), we include border-countries-year fixed effects. In Columns (4) to (6), we restrict the sample to countries with at least 200 observations. We report robust standard errors clustered at the firm-level in parentheses. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

	Extended FE			**Extended FE & > 200 Observations per Country**		
	(1)	(2)	(3)	(4)	(5)	(6)
Consumption Tax	-0.0839**			-0.1061***		
	(0.0373)			(0.0381)		
Consumption Tax	-0.0548***	-0.0513***	-0.0516***	-0.0560***	-0.0525***	-0.0528***
× Low Cash	(0.0104)	(0.0104)	(0.0104)	(0.0105)	(0.0105)	(0.0105)
Joint Effect	-0.1387***			-0.1621***		
[t-stat]	[3.72]			[4.25]		
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
EM-Year FE	Yes	No	No	Yes	No	No
Country-Year FE	No	Yes	No	No	Yes	No
Border-Country-Year FE	No	No	Yes	No	No	Yes
Observations	288,939	288,939	288,939	287,779	287,779	287,779
Adjusted R-squared	0.468	0.468	0.547	0.468	0.473	0.546

Table 8: Consumption Tax and Corporate Investments, Low versus High Profit Margin

This table presents regression results on investment behavior over the 2001–2013 period. We use capital expenditures over prior year's total assets as dependent variable. Independent Variables are described in Table 3. We additionally interact each tax policy variable with a dummy variable equal to one if the firm is below the bottom tercile of profit margin (EBIT over sales) ratio in the respective country-year (*Low Profit Margin*). In Columns (2) and (5), we include country-year fixed effects. In Columns (3) and (6), we include border-countries-year fixed effects. In Columns (4) to (6), we restrict the sample to countries with at least 200 observations. We report robust standard errors clustered at the firm-level in parentheses. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

	Extended FE			**Extended FE & > 200 Observations per Country**		
	(1)	(2)	(3)	(4)	(5)	(6)
Consumption Tax	-0.0930**			-0.1162***		
	(0.0372)			(0.0381)		
Consumption Tax	-0.0379***	-0.0391***	-0.0394***	-0.0392***	-0.0409***	-0.0411***
× Low Profit Margin	(0.0106)	(0.0106)	(0.0106)	(0.0107)	(0.0106)	(0.0106)
Joint Effect	-0.1309***			-0.1554***		
[t-stat]	[3.51]			[4.08]		
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
EM-Year FE	Yes	No	No	Yes	No	No
Country-Year FE	No	Yes	No	No	Yes	No
Border-Country-Year FE	No	No	Yes	No	No	Yes
Observations	288,939	288,939	288,939	287,779	287,779	287,779
Adjusted R-squared	0.468	0.469	0.547	0.468	0.473	0.547

Table 9: Consumption Tax and Corporate Investments, Domestic versus Foreign Sales

This table presents regression results on investment behavior over the 2001–2013 period. We use capital expenditures over prior year's total assets as dependent variable. Independent Variables are described in Appendix A. We additionally interact each tax policy variable with a dummy variable equal to one if the firm's median ratio of domestic to total sales is above 80% (*High Domestic*). In Columns (2) and (5), we include country-year fixed effects. In Columns (3) and (6), we include border-countries-year fixed effects. In Columns (4) to (6), we restrict the sample to countries with at least 200 observations. We report robust standard errors clustered at the firm-level in parentheses. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

	Extended FE			**Extended FE & > 200 Observations per Country**		
	(1)	(2)	(3)	(4)	(5)	(6)
Consumption Tax	0.0068			0.0161		
	(0.0488)			(0.0486)		
Consumption Tax	-0.1986***	-0.1635**	-0.1602**	-0.2065***	-0.1695**	-0.1639**
× High Domestic	(0.0757)	(0.0778)	(0.0777)	(0.0768)	(0.0788)	(0.0785)
Joint Effect	-0.1918***			-0.1905***		
[t-stat]	[2.96]			[2.86]		
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
EM-Year FE	Yes	No	No	Yes	No	No
Country-Year FE	No	Yes	No	No	Yes	No
Border-Country-Year FE	No	No	Yes	No	No	Yes
Observations	165,506	165,506	165,514	165,174	165,174	165,174
Adjusted R-squared	0.432	0.438	0.503	0.432	0.437	0.502

Table 10: Consumption Tax and Corporate Investments, High versus Low Customer Distance

This table presents regression results on investment behavior over the 2001–2013 period. We use capital expenditures over prior year's total assets as dependent variable. Independent Variables are described in Appendix A. We additionally interact each tax policy variable with a dummy variable equal to one if the industry has a low distance to customers (*Low Distance*). We use an empirical proxy by Ozdagli and Weber (2016) classifying industries into six layers based on their distance to end consumers. *Low Distance* identifies firms not belonging to the two most remote layers. In Columns (2) and (5), we include country-year fixed effects. In Columns (3) and (6), we include border-countries-year fixed effects. In Columns (4) to (6), we restrict the sample to countries with at least 200 observations. We report robust standard errors clustered at the firm-level in parentheses. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

	Extended FE			**Extended FE & > 200 Observations per Country**		
	(1)	(2)	(3)	(4)	(5)	(6)
Consumption Tax	-0.0424			-0.0585		
	(0.0461)			(0.0469)		
Consumption Tax	-0.1840***	-0.2172***	-0.2139***	-0.2061***	-0.2234***	-0.2262***
× Low Distance	(0.0699)	(0.0683)	(0.0683)	(0.0711)	(0.0701)	(0.0701)
Joint Effect	-0.2264***			-0.2646***		
[t-stat]	[4.03]			[4.61]		
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
EM-Year FE	Yes	No	No	Yes	No	No
Country-Year FE	No	Yes	No	No	Yes	No
Border-Country-Year FE	No	No	Yes	No	No	Yes
Observations	288,939	288,939	288,939	287,779	287,779	287,779
Adjusted R-squared	0.467	0.472	0.547	0.467	0.472	0.547

Online Appendix

Table A.1: Robustness of Main Results to Exclusion of Retail Sales Tax Countries

This table presents regression results on investment behavior over the period 2001–2013. We exclude country-years with a sales tax. Independent Variables are described in Appendix A. We report robust standard errors clustered at the firm-level in parentheses. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)
Consumption Tax	-0.1110***	-0.0872**	-0.0924**	0.0219	-0.0332
	(0.0399)	(0.0401)	(0.0400)	(0.0493)	(0.0492)
Consumption Tax × Low Cash		-0.0602***			
		(0.0110)			
Consumption Tax × Low Gross Margin			-0.0549***		
			(0.0117)		
Consumption Tax × High Domestic				-0.2099***	
				(0.0771)	
Consumption Tax × Low Distance					-0.2040***
					(0.0729)
Controls	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Year-EM FE	Yes	Yes	Yes	Yes	Yes
Observations	219,585	219,585	219,585	154,265	219,585
Adjusted R-squared	0.454	0.455	0.455	0.455	0.526

Table A.2: Robustness of Main Results to Inclusion of Q

This table presents regression results on investment behavior over the period 2001–2013. We additionally include Tobin's Q in the estimation equation. Other independent Variables are described in Appendix A. We report robust standard errors clustered at the firm-level in parentheses. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)
Consumption Tax	-0.1420***	-0.1271***	-0.1228***	-0.0015	-0.0304
	(0.0407)	(0.0409)	(0.0408)	(0.0518)	(0.0500)
Consumption Tax × Low Cash		-0.0329***			
		(0.0113)			
Consumption Tax × Low Gross Margin			-0.0546***		
			(0.0118)		
Consumption Tax × High Domestic				-0.1734**	
				(0.0825)	
Consumption Tax × Low Distance					-0.2857***
					(0.0769)
Q	0.0006***	0.0006***	0.0006***	0.0004***	0.0006***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Controls	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Year-EM FE	Yes	Yes	Yes	Yes	Yes
Observations	254,230	254,230	254,230	148,230	254,230
Adjusted R-squared	0.492	0.493	0.493	0.493	0.567

Table A.3: Robustness of Including Lagged Firm Controls

This table presents regression results on investment behavior over the period 2001–2013. We include lagged firm control variables. Other independent Variables are described in Appendix A. We report robust standard errors clustered at the firm-level in parentheses. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)
Consumption Tax	-0.1392***	-0.1183***	-0.1236***	0.0341	-0.0578
	(0.0387)	(0.0386)	(0.0387)	(0.0502)	(0.0483)
Consumption Tax × Low Cash		-0.0440***			
		(0.0108)			
Consumption Tax × Low Gross Margin			-0.0240**		
			(0.0115)		
Consumption Tax × High Domestic				-0.1458*	
				(0.0785)	
Consumption Tax × Low Distance					-0.2165***
					(0.0721)
Controls	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Year-EM FE	Yes	Yes	Yes	Yes	Yes
Observations	284,343	284,343	284,343	164,348	284,343
Adjusted R-squared	0.463	0.465	0.464	0.464	0.537

Table A.4: Robustness of Controlling for Lagged Investments

This table presents regression results on investment behavior over the period 2001–2013. We additionally include lagged investments as independent variable. Other independent Variables are described in Appendix A. We report robust standard errors clustered at the firm-level in parentheses. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)
Consumption Tax	-0.1298***	-0.1101***	-0.1117***	0.0325	-0.0555
	(0.0339)	(0.0340)	(0.0340)	(0.0432)	(0.0418)
Consumption Tax × Low Cash		-0.0494***			
		(0.0101)			
Consumption Tax × Low Gross Margin			-0.0468***		
			(0.0107)		
Consumption Tax × High Domestic				-0.2320***	
				(0.0677)	
Consumption Tax × Low Distance					-0.1939***
					(0.0635)
Controls	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Year-EM FE	Yes	Yes	Yes	Yes	Yes
Observations	279,649	279,649	279,649	161,690	279,649
Adjusted R-squared	0.489	0.491	0.490	0.490	0.560

Table A.5: Robustness of Main Results to Country-Industry Clustering

This table presents regression results on investment behavior over the period 2001–2013 but uses clustered standard errors clustered at the country-industry level in parentheses. Independent Variables are described in Appendix A. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)
Consumption Tax	-0.1386*	-0.1159	-0.1186*	0.0157	-0.0595
	(0.0740)	(0.0743)	(0.0700)	(0.0634)	(0.1031)
Consumption Tax × Low Cash		-0.0565***			
		(0.0167)			
Consumption Tax × Low Gross Margin			-0.0563***		
			(0.0187)		
Consumption Tax × High Domestic				-0.2080**	
				(0.0889)	
Consumption Tax × Low Distance					-0.2054
					(0.1308)
Controls	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Year-EM FE	Yes	Yes	Yes	Yes	Yes
Observations	287,700	287,700	287,700	165,174	287,700
Adjusted R-squared	0.467	0.469	0.468	0.468	0.541

Table A.6: Robustness to Inclusion of Region-Year-Fixed Effects

This table presents regression results on investment behavior over the period 2001–2013. We include region-year fixed effects using the World Bank Region Classification of countries into seven regions. Other independent Variables are described in Appendix A. We report robust standard errors clustered at the firm-level in parentheses. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)
Consumption Tax	-0.1452***	-0.1168***	-0.1218***	-0.0524	-0.0506
	(0.0428)	(0.0431)	(0.0430)	(0.0527)	(0.0513)
Consumption Tax × Low Cash		-0.0544***			
		(0.0105)			
Consumption Tax × Low Gross Margin			-0.0388***		
			(0.0107)		
Consumption Tax × High Domestic				-0.1401*	
				(0.0777)	
Consumption Tax × Low Distance					-0.2397***
					(0.0716)
Controls	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Year-EM FE	Yes	Yes	Yes	Yes	Yes
Observations	287,779	287,779	287,779	165,174	287,779
Adjusted R-squared	0.469	0.470	0.469	0.470	0.542

Table A.7: Robustness of Main Results to Exclusion of Crisis Years

This table presents regression results on investment behavior over the period 2001–2013. We exclude country-years with negative GDP Growth. Independent Variables are described in Appendix A. We report robust standard errors clustered at the firm-level in parentheses. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)
Consumption Tax	-0.1156**	-0.0920*	-0.0948*	0.0415	-0.0572
	(0.0485)	(0.0486)	(0.0486)	(0.0639)	(0.0612)
Consumption Tax × Low Cash		-0.0623***			
		(0.0116)			
Consumption Tax × Low Gross Margin			-0.0593***		
			(0.0124)		
Consumption Tax × High Domestic				-0.2725***	
				(0.1053)	
Consumption Tax × Low Distance					-0.1586*
					(0.0936)
Controls	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Year-EM FE	Yes	Yes	Yes	Yes	Yes
Observations	255,108	255,108	255,108	146,672	255,108
Adjusted R-squared	0.467	0.469	0.468	0.469	0.550

Table A.8: Robustness of Main Results, Dynamic Panel Estimator

This table presents regression results on investment behavior over the period 2001–2013 but uses the Arellano-Bond estimator. Independent Variables are described in Appendix A. We report robust standard errors clustered at the firm-level in parentheses. *, **, and *** denotes significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)
Consumption Tax	-0.1003**	-0.0868*	-0.0909*	0.0948	-0.0402
	(0.0465)	(0.0466)	(0.0467)	(0.0660)	(0.0585)
Consumption Tax × Low Cash		-0.0350***			
		(0.0124)			
Consumption Tax × Low Gross Margin			-0.0216*		
			(0.0127)		
Consumption Tax × High Domestic				-0.2702***	
				(0.1015)	
Consumption Tax × Low Distance					-0.1464*
					(0.0886)
Controls	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Year-EM FE	Yes	Yes	Yes	Yes	Yes
Observations	235,311	235,311	235,311	140,020	235,311