

Responses of Firms to Tax, Administrative and Accounting Rules: Evidence from Armenia

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Abstract

Using panel data on the population of corporate tax-returns of Armenian firms, we study the behavioral response of firms to three size-dependent regulations: i) a tax-notch created by the value added tax (VAT) registration threshold; ii) an administrative-notch below which the frequency of filing and paying VAT and corporate income taxes declines from monthly to quarterly; and iii) an accounting-notch where International Financial Reporting Standards become mandatory. We find strong bunching evidence at the latter treatment, a moderate response to the administrative-notch, and no response to the VAT-notch. Based on the results of tax-audits – performed at about every fifth firm each year – we provide evidence suggesting that the bunching-response of firms is almost entirely driven by income under-reporting.

Keywords: Small and medium enterprises, size-dependent regulation, value added tax, tax administration, tax accounting, tax evasion.

JEL codes: H25, H26, O12

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1 Introduction

Inadequate tax capacities and low tax revenues in many developing countries represent one of the main obstacles to economic development. Previous literature has mainly focused on the (optimal) design of tax reforms without paying much attention to issues related to the quality of tax administration.¹ However, tax administration and accounting rules play an equally important role as tax rates for the (optimal) design of a tax system (Slemrod and Gillitzer 2013). In order to design a fair and efficient tax system, policymakers need to have credible empirical evidence on the behavioral impacts of the tax system as a whole.

Our paper aims at contributing to this debate by studying whether and how firms – and particularly smaller firms – in a developing country respond to different incentives created by tax-, administrative- and accounting- rules and policies. We study the behavioral response of firms to these three sets of policies one-by-one and in a comparative-setting, and then show the mechanisms behind the response. In line with the “New Tax Responsiveness” literature for developed countries (Saez et al. 2012; Kleven 2016), we rely on administrative data from tax registers for our analysis.

The three policy-experiments that we study are: i) a tax-notch created by the value added tax (VAT) registration threshold; ii) an administrative-notch below which the frequency of filing and paying both VAT and corporate income taxes is quarterly instead of monthly for smaller firms; and iii) an accounting-notch where International Financial Reporting Standards (IFRS) become mandatory and replace the locally set simplified tax accounting rules for SMEs. These size-dependent regulations often play an important role in policy debates because they are one of the central policy-instruments in favoring small and medium enterprises (SME). However, thresholds where the policy-discontinuity is particularly large may also generate negative incentives on the part of firms, for example, to stay small, thus creating risks of distorting firm growth and productivity.

¹For surveys on taxation (and tax evasion) in developing countries, see, e.g., Slemrod and Yitzhaki (2002); Fuest and Zodrow (2013); Besley and Persson (2013, 2014).

We use the so-called bunching method² and exploit administrative panel data on the universe of corporate tax returns of Armenian firms over the 2007-13 period. Armenia is an interesting developing country to study firm response to taxation and tax administration not only because of the existence of these set of policy-experiments (combined with the availability of good administrative data), but also because of its environment with potentially high rates of tax non-compliance which has to do with weak tax administration. The tax administration in Armenia is ranked quite low by international comparisons (such as by the Doing Business report, see more in Section 2), while the shadow economy is said to comprise as much as half of the official economy (see, e.g., International Finance Corporation 2011). Such inefficiencies may seriously impede growth rates, for example, by significant costs to business development and economic competitiveness. They are also likely to undermine revenue-raising powers of the central government, thus adversely affecting public finances. Therefore, by exploiting data on tax-audits we, additionally, study how much of the potential response of firms is due to tax non-compliance.

We make several contributions to the literature. *First*, starting with the tax-notch, we observe that by now a rather universal feature of many VAT systems is the setting of a registration threshold. Firms with turnover above this threshold are obliged to register and collect the tax, and get the right of claiming back the tax on their inputs. On the other hand, small firms falling below the threshold may save considerably on costs related to collecting and remitting the VAT, while the tax authority may save on the administrative costs of VAT since the threshold reduces the number of filers. Following this intuition, the existing literature on optimal indirect taxation models the VAT-threshold as a trade-off between tax revenues and potential inefficiencies implied by the differential treatment of firms on one hand, and collection and administration costs on the other hand (Keen and Mintz 2004; Dharmapala et al. 2011; Brashares et al. 2014; Kanbur and Keen 2014).

²Saez (2010) and Kleven and Waseem (2013) introduced bunching at kinks and notches respectively. See, e.g., Chetty et al. (2011); Le Maire and Schjerning (2013); Bastani and Selin (2014) for applications of this method in the context of personal income taxation and Devereux et al. (2014); Best et al. (2015) for corporate taxation. Kleven (2016) provides a review of the method and the literature. Additionally, Slemrod (2013) discusses the different types of tax-notches and estimation of structural parameters using such notches

Recent studies by Onji (2009) for Japan, Harju et al. (2015) for Finland and Liu and Lockwood (2015) for the UK show that firms respond strongly to such notches by bunching below these thresholds. However, it is important to extend the literature and to study firm-response to VAT-thresholds in developing countries for two reasons. First, the tax systems in developing countries typically rely heavily on the VAT (Keen and Lockwood 2006; Keen and Smith 2006; Bird and Gendron 2007; Keen and Lockwood 2010). Armenia is no exception and collects almost half of total tax revenue from the VAT (Figure 1). Second, a simple policy-advice that follows from the theoretical arguments above is that developing countries should set a higher threshold than the more advanced countries due to their higher compliance costs. On the other hand, higher registration thresholds do not come without costs, as they imply lost tax revenues (especially so for the VAT-dependent countries) and more opportunities for informal activity related to a narrowed base for the VAT.

Extending the existing empirical literature on firm-response to VAT-notches to the case of Armenia – which has an unusually large VAT-threshold of 140 thousand USD that is higher than in any OECD country (see, Table A1 of the appendix for VAT-thresholds around the world in 2013) – allows us studying whether this intuitive policy-advice prevails in practice. We do not find evidence for significant irregularities or bunching in the distribution of firms around the VAT-notch. This result is in line with Boonzaaier et al. (2016) who show very small response to the VAT-threshold in South Africa (which also has a high threshold). Thus, we conclude that the VAT-registration-threshold in Armenia is set sufficiently high so that the compliance costs of firms of this size, on average, do not outweigh their benefits from registering as VAT-payers.

Second, and related to the administrative- and accounting-policies, our evidence points to the strongest response of firms to the administrative-notch where locally set simplified accounting rules can be used instead of having to comply with the IFRS. We find some, but much weaker, response to the administrative-notch where the frequency to file and pay taxes decreases three-fold for smaller firms. Both of these results are new to the

literature and have important policy-implications. While the literature seems to have ignored the question of whether the frequency of filing and paying taxes matters, a large body of accounting research studies the impact of IFRS (or US-GAAP) adoption on capital-markets (see, e.g., Daske 2006; Daske et al. 2008; Li 2010; Armstrong et al. 2010; Daske et al. 2013) such as firms' cost of equity capital and liquidity (for earlier reviews, see, Ball 2006; Leuz and Wysocki 2008). Our contribution to this literature is to show that firms – SMEs in our case – respond strongly to the mandatory adoption of IFRS by bunching below the size-threshold where the regulation bites. This result is in line with DeGeorge et al. (2012) which quantifies a significant and direct cost of IFRS-adoption on observable audit costs, increasing these by around 23% on average in the year of adoption.

Third, we contribute to the literature that tries to quantify tax-evasion on the micro-level.³ As discussed above, in a potentially high-risk environment of tax-evasion, it is crucial to understand the mechanisms behind firm responses. Our estimated parameter of bunching – i.e. the excess mass of firms in response to the notch compared to the counterfactual of no policy-distortion – is close to two. Whereas the evidence from audited tax-returns suggests that the responding firms have about twice – that is proportionally – higher evasion rates. Thus we conclude that the response is almost entirely driven by income underreporting (tax evasion) rather than real production response. Finally, by studying the number of audits performed by the tax authorities along the size-distribution of firms, we show that the evidence on tax-evasion is not driven by endogenous audits. This last point also has a clear policy-implication, which is that the tax authorities could make their audit strategies more optimal by targeting the firms which have higher incentives to under-report income due to these size-dependent regulations.

Fourth, and related to the last point, our paper adds to the recent and growing literature that extends the micro-econometric work on firm-response to taxes to developing

³For recent papers see, e.g., Kleven et al. (2011); DeBacker et al. (2013); Almunia and Lopez-Rodriguez (2014); Casaburi and Troiano (2015); Artavanis et al. (2016), and for general reviews see Slemrod (2007); Alm (2012)).

countries.⁴ As discussed above, this emerging field is especially valuable in that it has the potential to generate evidence-based policy-advice for developing countries.

The remainder of the paper is structured as follows: Section 2 describes the Armenian tax system in general and the size-dependent regulations in particular. Section 3 presents the sample and the data. Section 4 presents the results and Section 5 concludes.

2 Institutional Context

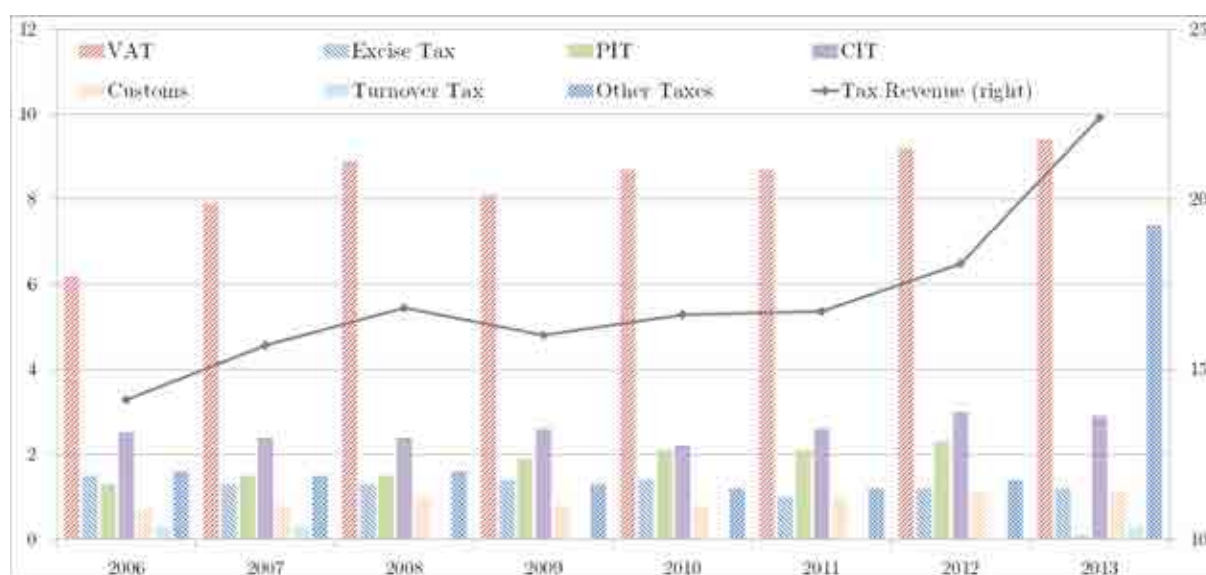
Taxes in Armenia: In Armenia, as in many other developing countries, VAT and corporate income taxes are a major source for tax revenue. This pattern can be seen in Figure 1 with the VAT generating over half of total tax revenue in most years (or around 9% of GDP), and corporate income taxes coming second with around 15 percent of tax revenue (or around 2% of GDP). Figure 1 also shows a generally low but increasing tax-to-GDP ratio of about 14-17 percent in 2006-2012. Although 2013 saw a large increase in the tax-to-GDP ratio, this was mainly due to some of the social security contributions being classified as taxes.

The VAT in Armenia has a two rate structure with a standard 20 percent rate on imports and the supplies of most goods and services by established firms, and a 0-rate on exports and several exempted goods and services (such as agriculture and financial services). The corporate income tax has a 20 percent flat rate on worldwide income for resident and on income that has a source in Armenia for non-resident entities.

Tax administration: As briefly discussed above, the quality of tax administration in Armenia is a serious concern for its development. According to the World Bank, in 2010 Armenia was ranked 84th in the world by the ease of doing business index with one of the weakest ranked areas being its taxation system at the 163rd place in the world. Although recent years have seen some progress with the overall ranking climbing to 50th in 2014,

⁴Among others, see Kleven and Waseem (2013); Best et al. (2015) on Pakistan, Carrillo et al. (2012, 2014) on Ecuador, Bachas and Soto (2015) on Costa Rica, Pomeranz (2015) on Chile, Boonzaaier et al. (2016) on South Africa.

Figure 1: TAX REVENUE TO GDP IN ARMENIA



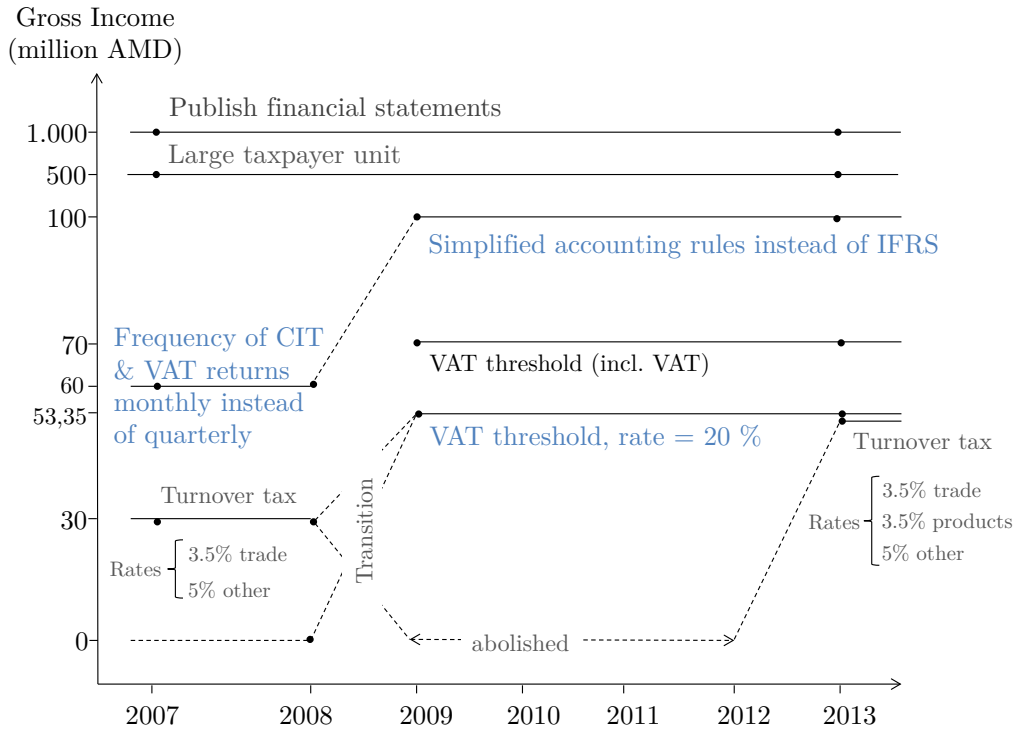
Source: Own compilation based on data from ArmStat.

Notes: The jump in tax revenue to GDP in 2013 is mainly due to a major reform of the PIT-system after which some of the social security contributions are classified as taxes. The PIT-revenue to GDP in 2012/2013 were 2,3/6,0%, and the social security contributions to GDP were 3,2/0,4%.

the paying taxes rank still lags behind at 74th in the world. This situation may have more to do with various inefficiencies inherent to the country's tax administration rather than to its tax rates. One survey conducted in 2013 among firms and entrepreneurs found that about 50 percent of responses prioritize issues of tax administration over other issues related to tax policy, while the responses most worried about tax rates made up about 30 percent (USAID 2014, p. 61). About 32 percent of respondents of the same survey also thought that a major reason for tax evasion is the inefficient tax administration along with the high tax rates at 32 percent and the deteriorating economic situation at 21 percent (USAID 2014, p. 82). An earlier survey finds that, indeed, these two types of taxes – VAT and CIT – are the most time-consuming taxes among all taxes firms paid in 2009, with an average of about 53 and 50 hours spent annually on accounting for VAT and corporate income taxes (International Finance Corporation 2011, p. 45).

The VAT-notch: Figure 2 summarizes the major reforms that took place in the Armenian corporate tax law in 2007-13. Among these we study, first, the VAT registration

Figure 2: TAX REFORM TIME-LINE, 2007-13



Source: Own compilation based on legal documents.

threshold: firms with VAT exclusive (inclusive) sales of above 58,350 (70) million AMD (or about 140,000 USD) are required to charge VAT on all sales thereby creating a notch (Republic of Armenia 2014b, Article 3, paragraph 1); firms below the threshold can voluntarily opt to register as VAT-firms in which case they can also claim VAT returns. As described above, Armenia is an interesting case since the VAT-threshold, increased almost twenty-fold in 2009 as one of the crisis prevention mechanisms (Government of the Republic of Armenia 2009),⁵ is one of the highest in the world and is higher than in any OECD member country (Table A1).

The administrative-notch: Second, we study firms' response to an administrative size-dependent threshold which aims to benefit smaller firms by creating favorable rules of tax administration for SMEs. The threshold is set at 100 million AMD of total annual gross income (60 before 2009) or about 240,000 USD. The thresholds applies to both

⁵Since 2015 the threshold for construction firms is raised further to 115 million AMD.

VAT and corporate income taxes. *First*, firms with turnover not exceeding the threshold are allowed to file tax returns and make the respective payments on a quarterly rather than monthly basis. *Second*, these small and medium-size enterprises can use simplified tax accounting procedures instead of having to comply with the International Financial Reporting Standards (Republic of Armenia 2014a, Article 2, paragraph 3). The lower frequency of tax returns is also applicable for firms employing not more than 5 employees independent of its income, which we can use to disentangle any potential responses to the two incentives.

Anecdotal evidence suggests that, in the view of businesses, this threshold significantly reduced the burden of tax compliance for small firms. Looking at the WB's 2013-survey of Armenian enterprises (i.e., BEEPS) also reveals a picture suggesting that this special treatment of SMEs might be beneficial in reducing their tax compliance costs. The 50 firms that have sales below the threshold on average report corruption as an obstacle to current operations to be 0.5 points less (on a 0-4 scale) than the average firm, and 0.75 points less than the 50 firms above the threshold.

Other notches: In Figure 2 we also show several other features of the tax systems, which are also of potential interest since there is not much evidence on firm response to these policy tools. We attempted to also analyze these, but could not arrive at conclusive evidence often due to data-limitations. First, there is a size-threshold below which firms qualify for a voluntary simple tax on turnover. This was set at 30 million AMD of turnover for 2007-08, abolished afterwards, then re-introduced again in 2013 at a higher level of 58,35 million AMD. The turnover tax is to replace the value-added and/or the corporate tax, while in our data we only observe the corporate tax return, therefore making the study of the turnover tax not straightforward. For an analysis of firm-response to a similar tax in Pakistan, see, Kleven and Waseem (2013). Second, firms larger than 500 million AMD are typically under the authority of the large taxpayer unit. This implies, for example, different enforcement rules such as higher audit rates. Although this is again

an interesting and policy-relevant issue, we cannot study this policy in our setting easily because of the few number of firms at this part of the size distribution of firms (there are about 250-300 firms that operate under the large taxpayer unit), but also because the tax authorities may choose to select firms into the unit which are smaller than the threshold. Instead, we refer to Almunia and Lopez-Rodriguez (2014) that studies the firm-level effects of the Spanish large taxpayer unit. Third and finally, firms with turnover exceeding 1 billion AMD are required to publish their financial statements. The low frequency of firms again prohibits us from studying this threshold. The size-distribution of these large firms is presented in Figure A1 of the Appendix. While there is also bunching visible, there are too few observations to derive significant effects.

3 Sample and Data

Our analysis is based on administrative data on the full population of corporate tax returns in Armenia covering the years 2007 through 2013. The data comes from the Central Bank of Armenia. It includes all the standard information from the tax returns such as gross income and deductible costs each with their detailed items, together with information on audits and detected tax evasion, as well as some basic firm characteristics. The annual number of entities filing for corporate taxes varies between 9,000 and 13,000 firms. Some of this variation is due to the abolishment of a simple tax on turnover for small firms in 2006-07 (that replaces the VAT and/or corporate income tax) and its re-introduction in 2013 (Figure 1).

Table 1 collects some basic statistics - frequency of firms, mean annual income and mean number of employees - per industry of the economy (top panel) and by type of firms' legal incorporation (bottom panel). The five largest industries by number of firms are trade (20%), services (17%), utilities (14%), manufacturing (10%), and construction (10%); and the most common types of firms are LLCs (71%), CJSCs (13%), State Enterprises (5%), OJSCs (3%), etc. Table 2 additionally presents the full summary statistics - including

Table 1: SAMPLE STATISTICS

<i>By</i> MAIN INDUSTRY	Observations	Mean Gross Income in thousand AMD	Mean Number of Employees
Trade (G)	14,015	590,439	16
Services (I, L, M, N, T)	11,701	127,149	23
Utilities (D, E, P, Q, R)	9,553	394,499	78
Manufacturing (C)	6,729	505,872	43
Construction (F)	6,724	292,734	22
IT (J)	2,546	693,493	43
Transport (H)	2,442	509,798	49
Finance (K)	2,196	1,321,816	59
Mining (B)	1,365	691,434	39
Public administration (P)	219	81,404	29
Missing	10,999	59,281	8

<i>By</i> LEGAL INCORPORATION	Observations	Mean Gross Income in thousand AMD	Mean Number of Employees
Limited Liability Company	50,670	272,968	15
Closed Joint Stock Company	8,883	1,233,848	100
State Enterprise	3,395	96,247	92
Open Joint Stock Company	2,125	497,549	46
Trade Cooperative	1,553	72,923	11
Local Government	1,194	25,141	21
Non-Governmental Organization	1,149	27,496	17
Foundation	729	129,922	50
Other	680	82,462	30

TOTAL	70,378	376,556	32
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Notes: NACE first-letter industry-codes in parentheses.

the main items of the tax-return, firm-characteristics and information on tax-audits - for the total sample.

4 Results

4.1 Response to VAT-Notch

Figure 3 plots the frequency of firms around the VAT-notch. The first horizontal line is the VAT-exclusive threshold (58,350 thousand AMD) which applies to non-VAT firms, and the second horizontal line is the VAT-inclusive threshold (70,000 thousand AMD)

Table 2: SUMMARY STATISTICS

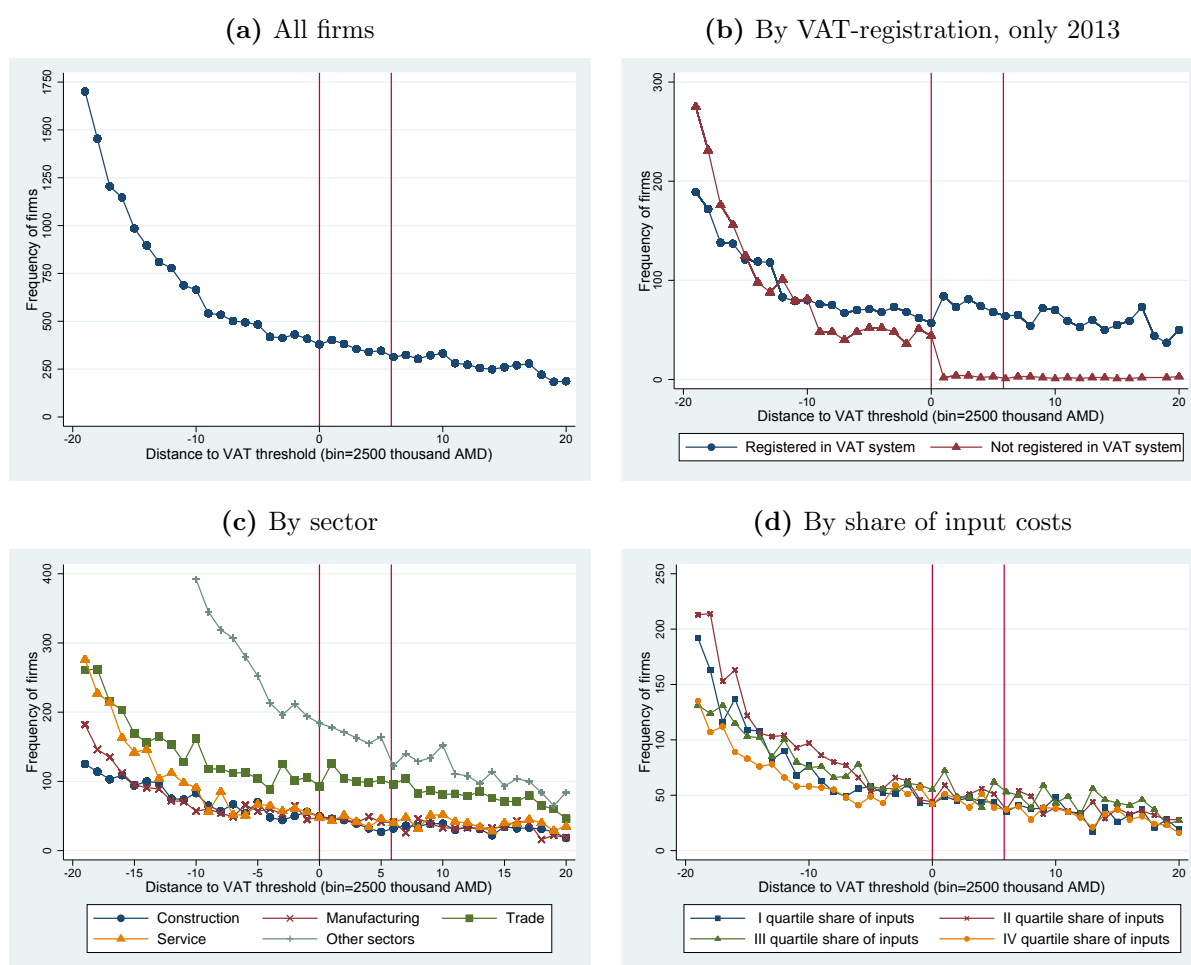
Variable	Obs.	Mean	SD	P25	P50	P75
<i>Tax-items:</i>						
Gross Income (thousand AMD)	70,402	376,446	4,897,106	5,210	27,731	120,345
Annual growth of gross income	40,307	0.23	0.96	-0.28	0.03	0.39
Total deductions / Gross income	67,344	0.98	0.78	0.84	0.93	0.99
Profit tax / Gross income	67,271	0.03	0.91	0.01	0.01	0.03
Additional income due audits / Gross income	8,805	0.06	0.15	0.01	0.02	0.04
Input costs / Gross income	26,143	0.62	1.70	0.35	0.70	0.86
<i>Firm-characteristics:</i>						
Number of employees	70,161	32.2	160.6	2.3	7.0	20.0
Age of firm (years)	90,854	7.28	5.22	3.00	7.00	11.00
<i>Tax-audits:</i>						
Audits announced in t+1 (dummy)	35,871	0.12	0.33			
Audits executed in t (dummy)	25,564	0.25	0.43			
Duration of audits (days)	25,564	3.62	11.43			

Notes: The first seven variables are available over 2007-2013 and come from corporate income tax returns (item numbers of the tax return in parentheses): Gross income (C0100), total deductions (C0200), profit tax (C1300), Additional income due audits (C0119), input costs or deductions related to the purchase of goods (C0201), number of employees (A). Data on Annual growth of gross income and Total deductions / Gross income is trimmed at top/bottom, respectively, 5 and 1 percentiles. Age of firm was extracted from the website of the Tax Service of the Republic of Armenia in July, 2014 (taxservice.am). The audit variables – audits planned, audits executed and duration of audits – are published at the same source and are available for the years 2012 and 2013.

applicable for VAT-registered firms. Generally we are unable to detect a strong response to the VAT-notch.

This result is also robust when looking at the heterogeneity of response per sector (Figure 3c) and according to the quartile of the share of input costs in turnover (Figure 3d). This distinction is motivated by the reasoning that firms with a higher share of input costs have higher incentives to register in the VAT system (therefore less incentives to bunch at the notch by shifting income) because only then can they claim back their VAT-inputs. Figure A2(d) of the Appendix demonstrates that trade firms have a much more right-skewed distribution of their input costs than, for example, construction (a), manufacturing (b), or service (c) firms. However, notable difference in the distribution of these different firms around the VAT-notch do not emerge.

Figure 3: RESPONSE TO VAT-NOTCH



Notes: Figures plot the frequency of firms per bin around the VAT-notch. The VAT-exclusive and -inclusive thresholds are denoted by, respectively, first and second vertical lines. All sub-figures use data from 2009-13 other than sub-figure (b) which relies only on 2013 data since the information on VAT-registration status is available only as of July 2014 (and therefore may not be correct if firms have decided to (de)register). The sectors in sub-figure (c) are aggregated using the NACE classification (first-letter industry-codes in parentheses: manufacturing (C), construction (F), trade (G), services (I, L, M, N, T), other (all other sectors including firms with missing industry-codes)). The share of inputs in sub-figure (d) refers to the ratio of deductions directly related to the purchase of goods in gross income (see also Figure A2).

A potential explanation of this result, which is opposite to recent evidence from Japan, UK and Finland (Onji 2009; Liu and Lockwood 2015; Harju et al. 2015), is that the VAT registration threshold in Armenia is sufficiently high so that the compliance costs of firms of this size, on average, do not outweigh their benefits (such as the right to claim back the tax on inputs) from registering as VAT firms. Not surprisingly, the data shows that approximately 40 percent of firms that were below the VAT-threshold in 2013 have

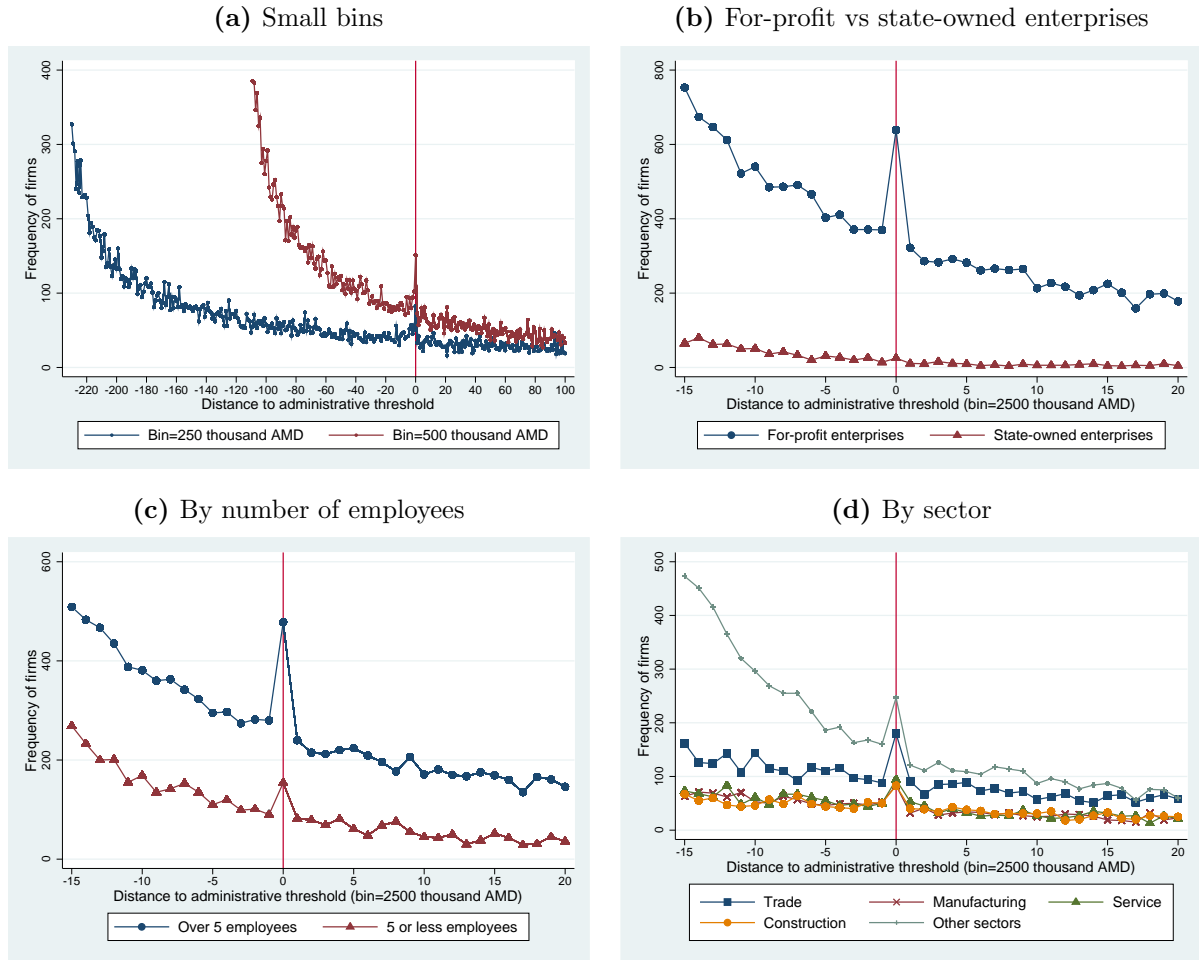
voluntarily registered for VAT (Figure 3-b). In a closer neighborhood to the notch, say 10 bins before it (equivalent to 25 million AMD), there are even more voluntarily registered VAT-firms than non-VAT-firms.

4.2 Response to Administrative-Notch

Unlike the VAT-notch, we find a strong response to the administrative-notch. In Figure 4(a) we normalize the threshold to 0 and then plot the frequency of firms over different bin sizes around the threshold. Figure 4b shows that for-profit enterprises bunch, but state-owned ones do not. Figure 4c allows disentangling the incentives created by lower frequency of tax returns and payments (which applies to firms with 5 or less employees independent of turnover) and the simplified tax-accounting regime (instead of IFRS). It seems that both rules matter, but the accounting rule generates a stronger response (we return to this issue below). This bunching evidence is also robust across industries (Figure 4d). In the latter we find that trade firms respond strongest to this administrative threshold, which can perhaps be explained by their higher evasion opportunities (again, more below).

Going one step further in Figure 5 we exploit the panel dimension of our data. Since the administrative threshold was changed substantially in 2009 increasing from 60 to 100 million AMD, we can test whether firms start to (de-)bunch at the (lower) higher threshold after the reform. Figure 5 shows that this is indeed the case, and that the response is not only persistent, but is also getting stronger by time. Looking at differences in bunching also allows to relax some of the identifying assumption. If before the assumption was that the size-distribution of firms around the threshold would have been flat absent the notch, now it is sufficient to assume that the change in the size-distribution of firms would have been flat absent the introduction of the notch. This helps to rule-out several biases, such as the potential concern of over-estimating the size of the firm response due to round-number bunching (or other, perhaps unobservable, factors that have not changed over time).

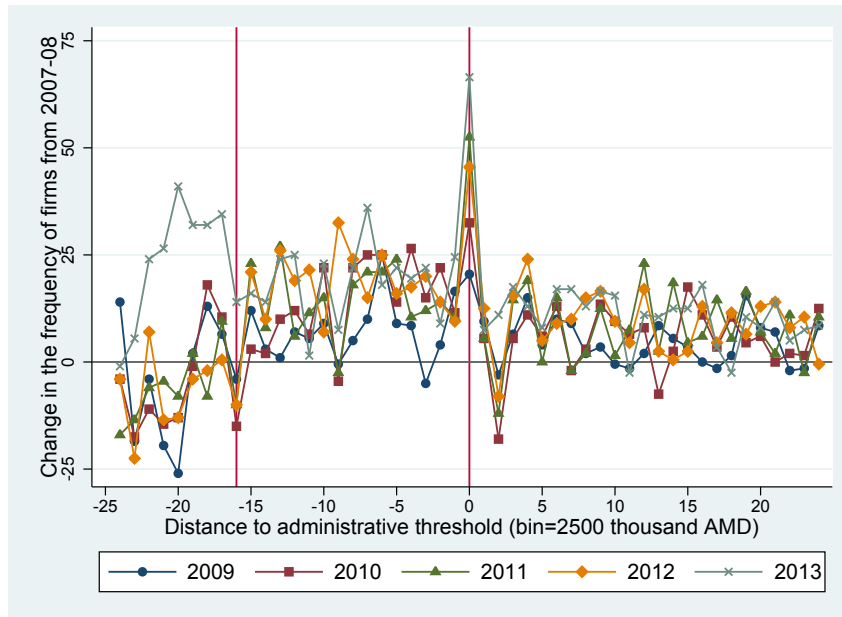
Figure 4: RESPONSE TO ADMINISTRATIVE-NOTCH



Notes: Figures plot the frequency of firms per bin around the administrative-notch. The administrative threshold is normalized to 0 and is denoted by a vertical line.

So far - in Figures 4 and 5 - we have studied the *frequency* of firms in response to the (change in) administrative-notch. It is, however, also of interest to study how the notch distorts the *total* amount of production. To do this in Figure 6 (a) and (b) we plot the total amount of, respectively, gross income and deductions (and their composition) for all firms in each income-bin. The figures show, very clearly, the amount of additional total income and deductions in response to the notch. This result obviously has to do with the extra mass of firms concentrated in the bin just before the notch, however looking at the composition of income and deductions gives additional hints of which items are more responsive. The underlying mechanism of these bunching behavior as well as the actual estimates of the size of the response are due in the next two sub-sections.

Figure 5: RESPONSE TO (CHANGE IN) ADMINISTRATIVE-THRESHOLD



Notes: Figure plots the change in the distribution of firms over time compared to the pre-reform period (2007-08). The pre- and post-reform administrative thresholds are denoted by, respectively, the first and second vertical lines.

4.3 Bunching Estimate for Administrative Threshold

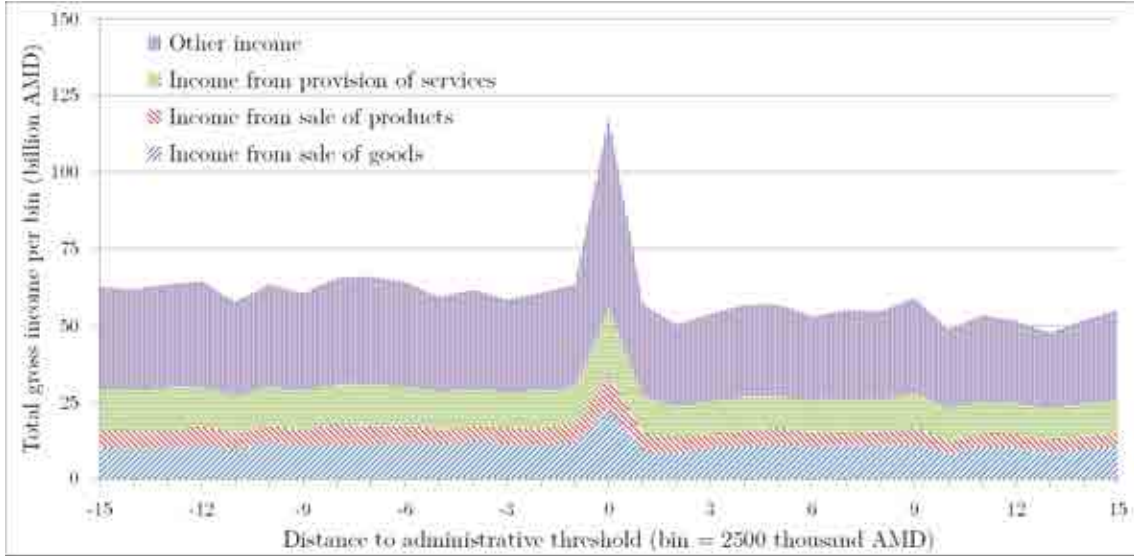
Next we follow the recent literature on bunching (Saez 2010; Chetty et al. 2011; Kleven and Waseem 2013) to estimate the size of the response at the administrative threshold.⁶ Kleven (2016) provides an excellent review of the bunching method and we focus on the key aspects for brevity. Under the assumption that firms have smooth and heterogeneous preferences over gross income y , firms would locate themselves smoothly along the gross income distribution in the absence of notches. When introducing the (administrative) notch, firms below or directly at the threshold do not change their behavior. Firms in a certain area above the notch have the incentive to relocate to the notch – either by generating less income or by under-reporting it.

We estimate the excess masses at the notch following the bunching literature in three steps. First, we center the gross income distribution such that the threshold is exactly at zero, and group firms into small bins. Second, we estimate the counterfactual density (how

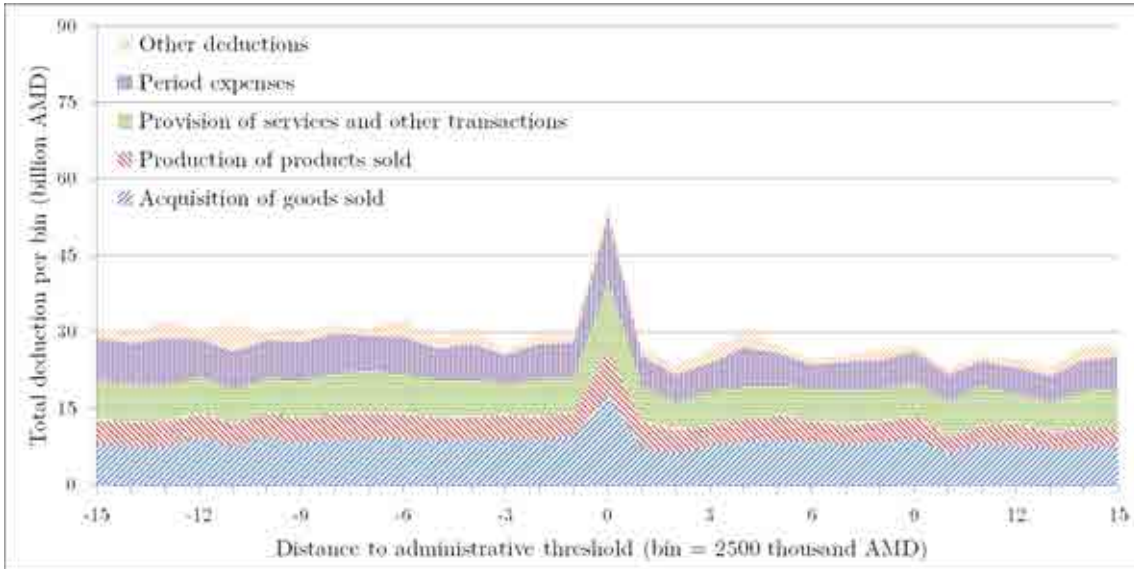
⁶Given that we do not observe any bunching at the VAT notch, the corresponding bunching estimates are zero.

Figure 6: TOTAL SIZE OF THE RESPONSE TO ADMINISTRATIVE-THRESHOLD

(a) TOTAL GROSS INCOME



(b) TOTAL DEDUCTIONS



Notes: Sub-Figures (a) and (b) plot the total amount of, respectively, gross income and deductions per bin around the administrative-notch. The administrative threshold is normalized to 0. Income and deduction categories correspond to the following items in the tax-return, in sub-figure a (from bottom to top): C0101, C0102, C0103, all else; and in sub-figure (b): C0201, C0202, C0203, C0210, all else.

the distribution would have looked like in the absence of bunching at the notch) by fitting a flexible polynomial function to the observed distribution, excluding an area $[y_L; y_H]$ around the notch threshold point from the observed distribution.⁷ Third, we estimate

⁷Due to imperfect control and uncertainty about gross income, it is likely that we do not observe sharp bunching exactly at the threshold but rather a cluster of firms in a region below it. As common literature, we determine the lower limit of the excluded region (y_L) based on visual inspection of the

the excess bunching by relating the actual number of firms c_i close to the threshold within the interval $[y_L; y^*]$ to the estimated counterfactual density \hat{c}_i in the same region:

$$\hat{b} = \frac{\sum_{i=y_L}^{y^*} (c_i - \hat{c}_i)}{\sum_{i=y_L}^{y^*} (\hat{c}_i / N_i)} \quad (1)$$

where N_i is the number of bins within $[y_L; y^*]$. As it is common in the literature, we calculate standard errors for all estimates using a bootstrap procedure.

Figure 7 shows that the the excess mass of firms bunching at the threshold is large economically and significant statistically. The underlying mechanism of these bunching behavior are studied in the next sub-section.

4.4 Do Firms Bunch Through Tax-Evasion?

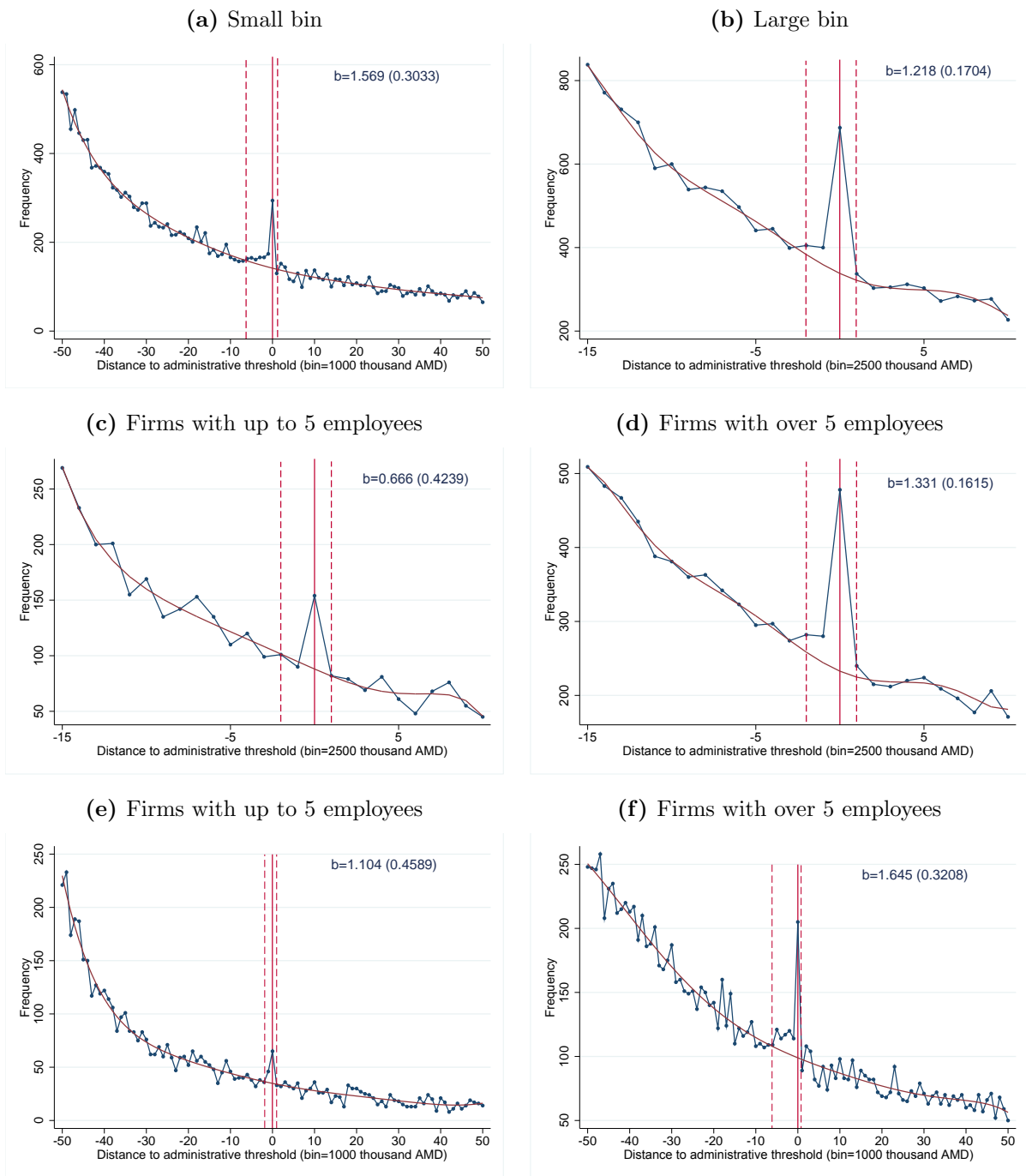
One advantage of this study is that we are able to make use of audited tax-returns to study the mechanisms of income shifting by firms, that is whether the large response found in the last sub-sections works through real response in supply or illegal under-reporting, i.e., tax evasion?

Figure 8(a) plots the additional income that was detected by the tax authorities averaged across bins. It demonstrates a clear spike in detected tax evasion just below the administrative threshold. The size of detected evasion is very large at about 10 percent of gross income and is about double the evasion rate further away from the threshold. Given that the estimated bunching rate is also close to two (see Figure 7a-b), this evidence suggests that the behavioral response is almost entirely driven by income underreporting.

Owing to the reduced number of observation the data gets noisy when studying audited firms by sector, however Figure 8(b) provides suggestive evidence that evasion rates and

distribution as the point in the distribution where the bunching behavior begins. We follow Kleven and Waseem (2013) to determine y_H such that the estimated excess mass equals the estimated missing mass above the threshold, i.e. assuming that firms who bunch at the threshold come from the region directly above it. This definition of y_H leads to a lower bound estimate for excess bunching (Kleven and Waseem 2013).

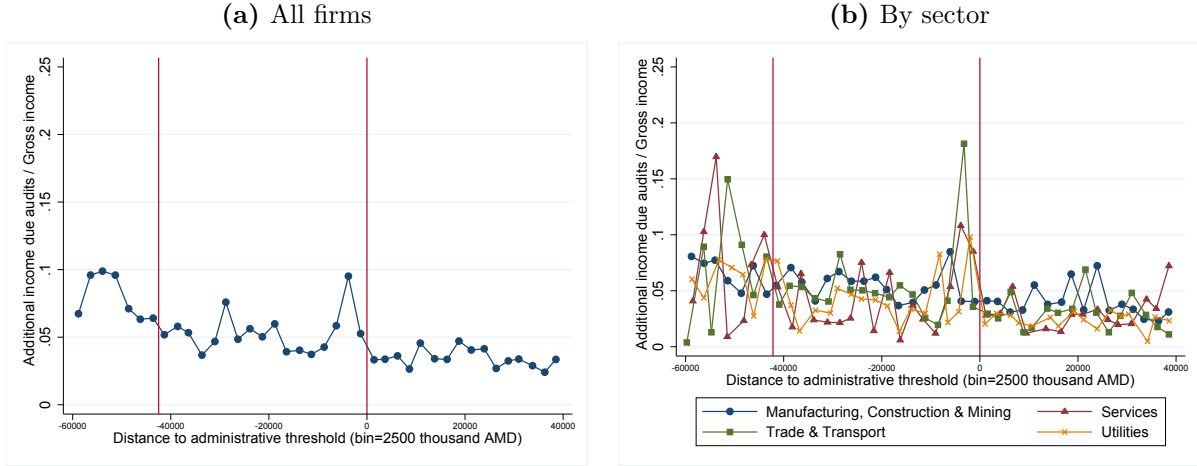
Figure 7: BUNCHING ESTIMATE AT ADMINISTRATIVE-THRESHOLD



Notes: Figures plot and estimate the size of bunching around the 0-normalized administrative threshold (i.e., the bunch-point) using the method developed by Chetty et al. (2011). The bunching estimate is reported in top-right corner for every sub-figure with standard errors in parenthesis. The counterfactual distribution is estimated by fitting a polynomial of 7th degree, and by considering 15 (50) bins on the left and right sides of the bunch point where a bin equals 2500 (1000) thousand AMD. The bunching windows on the left and right sides of the bunch point are denoted by dashed vertical lines.

opportunities maybe higher for firms operating in trade or services. This is consistent with our earlier result of Figure 4(d) that the response in these industries is stronger.

Figure 8: DETECTED TAX EVASION



Notes: Figures plot the additional unreported income detected during audits as a share in gross income per bin. First and second vertical lines denote, respectively, the VAT and administrative thresholds.

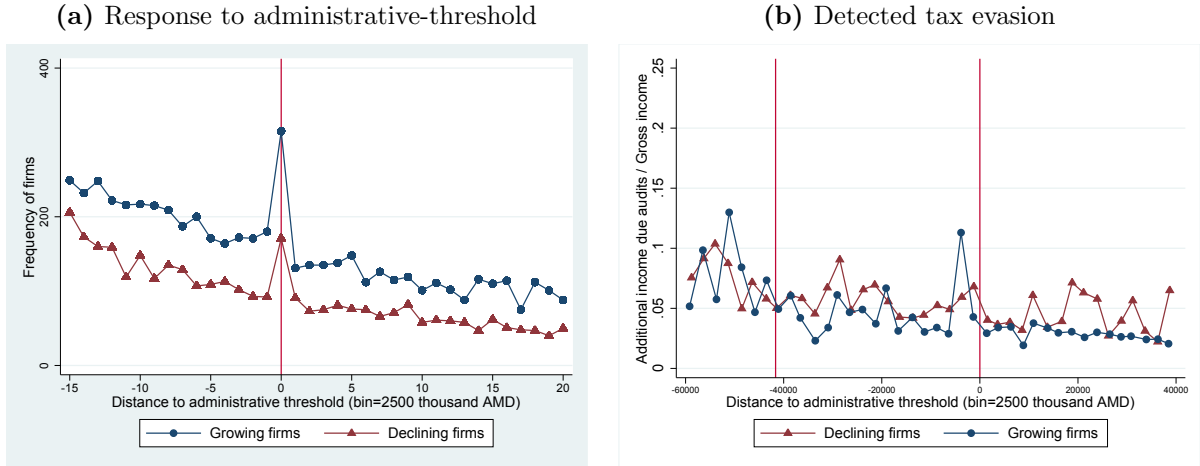
To further exploit any potential heterogeneities in firm-response, we divide the sample according to whether firms are growing or shrinking in output. The argument is that size-dependent tax (and other) policies that favor SMEs may distort the incentives of firms to grow beyond such thresholds. These regulations are often held responsible for the empirical regularity of a “missing-middle” which can be observed in the size-distribution of firms of some countries (see, e.g., Dharmapala et al. 2011).

Figure 9(a) shows that both growing and declining firms bunch at the administrative-notch, but, as expected, the response is stronger for the former. By plotting the mean amounts of the size of detected evasion per bin for these two groups in Figure 9(b) we additionally show that the response can be, again, largely explained by the under-reporting behavior of firms.

4.5 Do Tax Authorities Respond as Well?

Since 2011 the Armenian tax authorities are obliged to announce the firms that will be audited in the coming year and later publish the results of these tax-audits. These reforms

Figure 9: RESPONSE AND EVASION FOR GROWING AND SHRINKING FIRMS

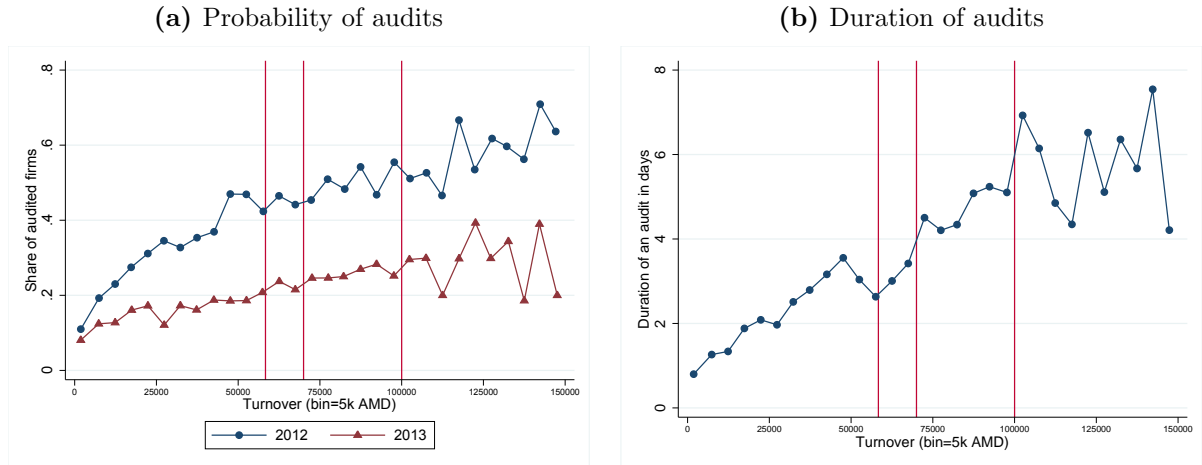


Notes: Sub-figure (a) plots the frequency of firms per bin around the administrative-notch. Sub-figure (b) plots the additional unreported income detected during audits as a share in gross income per bin around the VAT and administrative thresholds. In both sub-figures firms are divided according to whether nominal gross income has grown or declined compared to the last year.

were part of an effort to make the audit system more transparent and less corrupt. For our purposes these data is useful because we can study, first whether the evidence on evasion of the last sub-section is driven by selection, and second whether tax authorities also optimize their enforcement strategies by responding to notches and kinks of the tax system where firms' incentives to evade change discontinuously.

Figure 10(a) shows that neither of the above two seems to be happening, i.e., firms located just below the notch do not get audited more frequently. This suggests that, first, our tax-evasion explanation of firms' bunching behavior is not driven by endogenous audits and, second, tax authorities could make their audit strategy more efficient by targeting firms which have higher incentives to evade. We also demonstrate an increase in the duration of audits after the administrative-notch in Figure 10(b). This may be due to the administrative complexities created by more frequent tax-returns and more stringent accounting rules which create additional difficulties for tax authorities as well.

Figure 10: PROBABILITY AND DURATION OF AUDITS



Notes: Sub-figure (a) plots the share of audited firms per bin and year, and sub-figure (b) plots the mean duration of these audits. First, second and third vertical lines denote, respectively, the exclusive- and inclusive-VAT and administrative thresholds.

4.6 Determinants of Bunching

This section complements to the graphical evidence presented so far by estimating probit-regressions on the determinants to bunch. Results are collected in Table 3, where in columns 1-6 and 7-12 firms are defined to be “bunchers” if they are located within, respectively, 5% and 10% -window below the administrative-notch.

These estimates provide descriptive evidence that, first, bunching is persistent in a way that the bunching behavior in year $t-1$ is a significant predictor of bunching today. Second, the share of payed profit taxes (in some regressions also the total deductions) in gross income is also a positive predictor for bunching behavior, albeit not consistently significant for the latter. Assuming that taxes and expenditures are similar below and above the threshold, this result suggests that bunching at the threshold occurs through income under-reporting. Third, an additional result, that is plausible, is that the announcement in year $t-1$ of an audit in the coming year reduces the probability of firms to bunch (columns: 4 and 10).

Table 3: Probit estimates: Determinants of bunchers

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Bunching below 5% of threshold					Bunching below 10% threshold						
Ln Employees	-0.028 (0.018)	-0.022 (0.021)	-0.020 (0.021)	-0.009 (0.029)	0.029 (0.033)	-0.022 (0.022)	-0.025* (0.014)	-0.019 (0.017)	-0.018 (0.017)	-0.009 (0.023)	-0.010 (0.027)	-0.018 (0.017)
Ln Turnover	0.115*** (0.009)	0.090*** (0.010)	0.095*** (0.011)	0.097*** (0.015)	0.053*** (0.017)	0.093*** (0.010)	0.123*** (0.007)	0.091*** (0.009)	0.094*** (0.009)	0.100*** (0.013)	0.073*** (0.015)	0.096*** (0.009)
Firm age	0.002 (0.004)	0.000 (0.004)	0.001 (0.004)	0.002 (0.005)	-0.003 (0.006)	0.000 (0.004)	0.001 (0.003)	0.001 (0.003)	0.001 (0.003)	0.002 (0.004)	-0.001 (0.005)	0.001 (0.003)
Profit tax/Turnover	0.442 (0.838)	1.246* (0.662)	1.384** (0.648)	1.046 (0.965)	0.009 (1.262)	1.316** (0.663)	0.738 (0.612)	1.268** (0.503)	1.363*** (0.501)	1.175* (0.692)	0.716 (0.800)	1.344*** (0.497)
Deductions/Turnover	0.166 (0.131)	0.075 (0.075)	0.069 (0.070)	0.163 (0.131)	0.191 (0.173)	0.079 (0.074)	0.154* (0.090)	0.053 (0.036)	0.050 (0.035)	0.090 (0.056)	0.104 (0.077)	0.054 (0.034)
Buncher dummy (t-1)		0.581*** (0.104)	0.580*** (0.104)	0.726*** (0.134)	0.630*** (0.157)	0.349** (0.151)		0.687*** (0.060)	0.686*** (0.060)	0.790*** (0.077)	0.719*** (0.093)	0.448*** (0.078)
Dummy positive evasion			-0.090 (0.059)						-0.063 (0.048)			
Dummy announced audit (t-1)				-0.153** (0.076)						-0.244*** (0.060)		
Dummy audit (t)					0.009 (0.072)						0.011 (0.059)	
Industry (base=Trade)												
Construction	0.120** (0.056)	0.111* (0.063)	0.122** (0.062)	0.101 (0.086)	0.081 (0.105)	0.111* (0.064)	0.087* (0.045)	0.044 (0.050)	0.051 (0.050)	0.058 (0.066)	0.061 (0.080)	0.038 (0.051)
Finance	-0.443*** (0.155)	-0.505*** (0.170)	-0.517*** (0.171)	-0.292 (0.180)	-0.355 (0.254)	-0.513*** (0.172)	-0.528*** (0.131)	-0.575*** (0.145)	-0.584*** (0.146)	-0.487*** (0.178)	-0.557** (0.272)	-0.583*** (0.150)
IT	0.195** (0.083)	0.164* (0.093)	0.156* (0.093)	0.195 (0.119)	-0.002 (0.158)	0.162* (0.094)	0.098 (0.075)	0.046 (0.084)	0.041 (0.084)	0.089 (0.104)	0.030 (0.127)	0.047 (0.084)
Manufacturing	0.155** (0.063)	0.147** (0.070)	0.148** (0.070)	0.183** (0.090)	0.215** (0.102)	0.149** (0.071)	0.102** (0.051)	0.061 (0.056)	0.061 (0.056)	0.086 (0.070)	0.135* (0.080)	0.060 (0.057)
Mining	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	-0.392*** (0.133)	-0.687*** (0.199)	-0.686*** (0.199)	-0.834** (0.332)	-0.679** (0.346)	-0.700*** (0.200)
Missing	-0.048 (0.074)	-0.004 (0.107)	-0.007 (0.107)			-0.000 (0.109)	-0.068 (0.056)	-0.031 (0.081)	-0.033 (0.081)			-0.023 (0.082)
Public administration	0.144 (0.404)	-0.004 (0.371)	-0.009 (0.370)	0.194 (0.423)	0.361 (0.457)	-0.016 (0.376)	-0.008 (0.317)	-0.370 (0.373)	-0.374 (0.373)	-0.194 (0.425)	0.020 (0.459)	-0.384 (0.375)
Services	0.057 (0.060)	0.015 (0.066)	0.010 (0.067)	0.049 (0.082)	0.046 (0.100)	0.018 (0.067)	0.002 (0.049)	-0.048 (0.054)	-0.052 (0.054)	-0.085 (0.068)	-0.025 (0.080)	-0.045 (0.055)
Transport	-0.020 (0.104)	-0.083 (0.127)	-0.090 (0.127)	-0.126 (0.163)	-0.055 (0.184)	-0.087 (0.129)	-0.008 (0.088)	-0.146 (0.109)	-0.150 (0.109)	-0.151 (0.127)	-0.115 (0.148)	-0.147 (0.110)
Utilities	0.070 (0.071)	0.100 (0.076)	0.097 (0.076)	0.066 (0.099)	0.032 (0.121)	0.102 (0.077)	0.011 (0.059)	-0.034 (0.064)	-0.037 (0.064)	-0.083 (0.086)	-0.060 (0.100)	-0.027 (0.066)
Legal Inc. (base=CJSC)												
Community Enterprise	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	-0.112 (0.267)	-0.190 (0.372)	-0.196 (0.372)	0.202 (0.438)	0.339 (0.455)	-0.192 (0.373)
Foundation	0.321* (0.183)	0.159 (0.199)	0.152 (0.199)	0.214 (0.283)	0.051 (0.398)	0.161 (0.204)	0.255 (0.158)	0.204 (0.166)	0.199 (0.166)	0.220 (0.258)	0.026 (0.303)	0.224 (0.170)
LLC	0.092 (0.059)	0.042 (0.065)	0.045 (0.065)	0.155* (0.092)	0.131 (0.108)	0.045 (0.066)	0.076 (0.048)	0.010 (0.052)	0.012 (0.051)	0.046 (0.072)	0.031 (0.084)	0.025 (0.053)
NGO	-0.164 (0.349)	0.012 (0.377)	0.009 (0.378)	0.463 (0.450)	0.542 (0.462)	0.011 (0.379)	0.104 (0.211)	0.032 (0.299)	0.028 (0.300)	0.174 (0.445)	0.272 (0.452)	0.057 (0.301)
OJSC	-0.013 (0.110)	0.028 (0.116)	0.032 (0.116)	0.226 (0.164)	0.148 (0.199)	0.026 (0.118)	-0.029 (0.095)	-0.038 (0.099)	-0.035 (0.099)	0.107 (0.136)	0.019 (0.160)	-0.030 (0.101)
Other	0.294 (0.219)	0.320 (0.208)	0.318 (0.209)	0.712*** (0.259)	0.839*** (0.283)	0.316 (0.210)	0.075 (0.200)	0.018 (0.207)	0.016 (0.207)	0.397 (0.255)	0.542** (0.275)	0.018 (0.209)
State Enterprise	0.039 (0.121)	-0.079 (0.142)	-0.085 (0.141)	0.140 (0.194)	0.035 (0.234)	-0.072 (0.145)	0.104 (0.103)	0.028 (0.114)	0.025 (0.114)	0.170 (0.163)	0.205 (0.185)	0.051 (0.117)
Trade Cooperative	0.218 (0.141)	0.243* (0.143)	0.249* (0.142)	0.418** (0.188)	0.314 (0.228)	0.251* (0.148)	0.204* (0.112)	0.202* (0.119)	0.205* (0.119)	0.332** (0.154)	0.265 (0.174)	0.221* (0.123)
Observations	42,669	28,187	28,187	14,310	9,974	28,187	45,846	30,965	30,965	14,669	10,207	30,965
Wald Chi2	1382	638.1	639.7	419.9	281.2	806.5	1387	748.7	746.2	554.4	355.5	855.9
Pseudo-R2	0.0298	0.0286	0.0291	0.0427	0.0384	.	0.0395	0.0514	0.0517	0.0514	0.0400	.
Firms						9,702						10,219

*** p<0.01, ** p<0.05, * p<0.1

Notes: Table presents probit (columns 1-5 and 7-11) and population-averaged probit (columns 6 and 12) estimates of the determinants of bunching firms. Dummy for bunching firms is defined to be 1 if firm size is below 5% and 10% of the administrative threshold in columns 1-6 and 7-12 respectively, and 0 otherwise. All regressions include year and region ("Marz") fixed effects (not reported). Standard errors are clustered at the level of firms.

5 Conclusion

This project studies the behavioral response of Armenian firms to incentives implicit in the tax schedule. The specific attention is on the VAT-registration-threshold which is

unusually high in Armenia, and two administrative thresholds that relax the tax compliance costs for SMEs. Our evidence points to the strongest response of firms to the administrative-notch where locally set simplified accounting rules can be used instead of having to comply with the International Financial Reporting Standards. We find some, but much weaker, response to the notch where the frequency to file and pay taxes decreases three-fold for smaller firms. Unlike the existing evidence from developed countries, we do not find a strong response to the large VAT-threshold. This battery of evidence suggests that in a developing country with weak enforcement environment tax administration may matter more for firms' decisions than taxes.

In such an environment with potentially high rates of tax-evasion, however, it is crucial to understand the mechanisms behind firm-response. We show that the administrative-notch distorts the incentives of SMEs to grow beyond the notch since it creates discontinuously higher tax-compliance costs for them. However, the evidence from audited tax-returns suggests that the response is almost entirely driven by income underreporting (tax evasion) rather than real production response. This empirical result is not entirely consistent with traditional tax-deterrence models where the probability to be caught along with penalties for evasion, marginal tax rates and risk-aversion predict the level of tax evasion. Such a puzzle occurs because in Armenia the audit rates are very high – about every fifth firm per year – while the other three parameters are probably somewhat standard. A potential explanation is that audits are not effective, or in other words highly susceptible to corruption.

These findings have direct policy-implications for designing an efficient and equitable tax system. First, it seems that the VAT-registration-threshold in Armenia is set sufficiently high so that the compliance costs of firms of this size, on average, do not outweigh their benefits from registering as VAT-payers. Second, regarding the administrative threshold, the evidence demonstrates that SMEs see a significant benefit from rules that relax their compliance costs. This means that cleverly-designed tax-administration rules may have a significant impact on bolstering the SME-sector. However, it is not

ex-ante clear whether such policies that grant SMEs preferential treatments are welfare-improving, since significant tax revenue is lost from evasion. Therefore, the third policy-implication is that such incentive-mechanisms should be accompanied by optimized audit strategies which should target firms (and sectors) which have higher incentives (and opportunities) to under-report income. Finally, our results – that firms are much more responsive to administrative than tax regulations and that their response is almost entirely driven by tax evasion – suggests that significant reforms have to be implemented to improve the tax administration.

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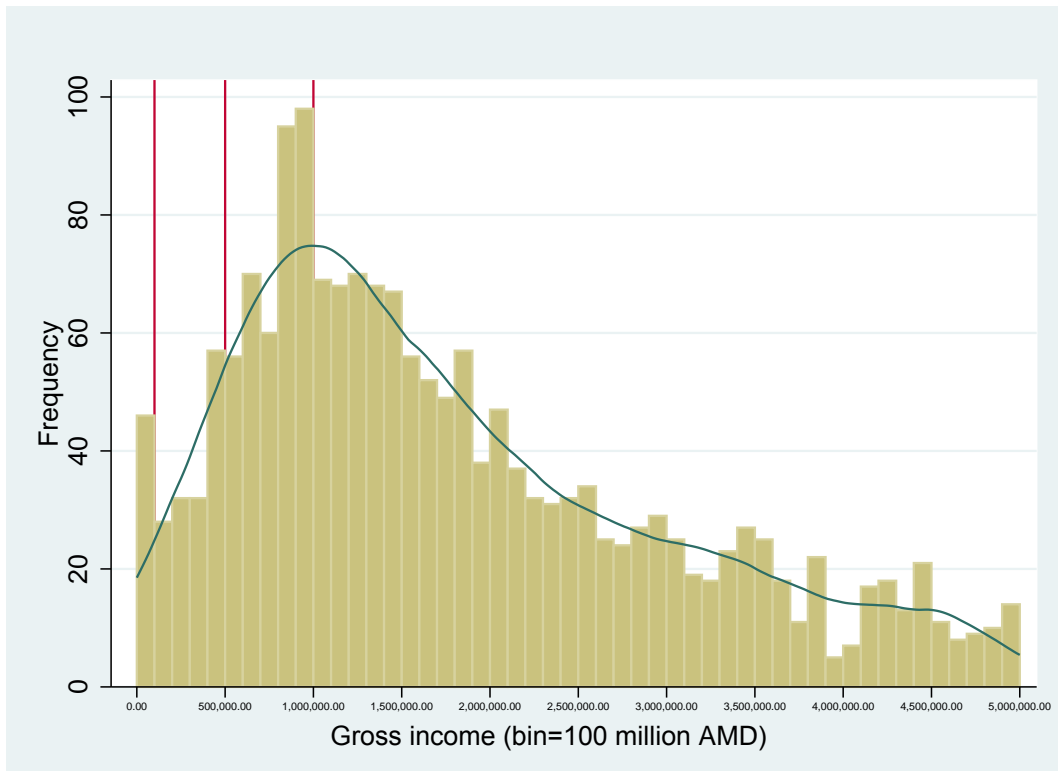
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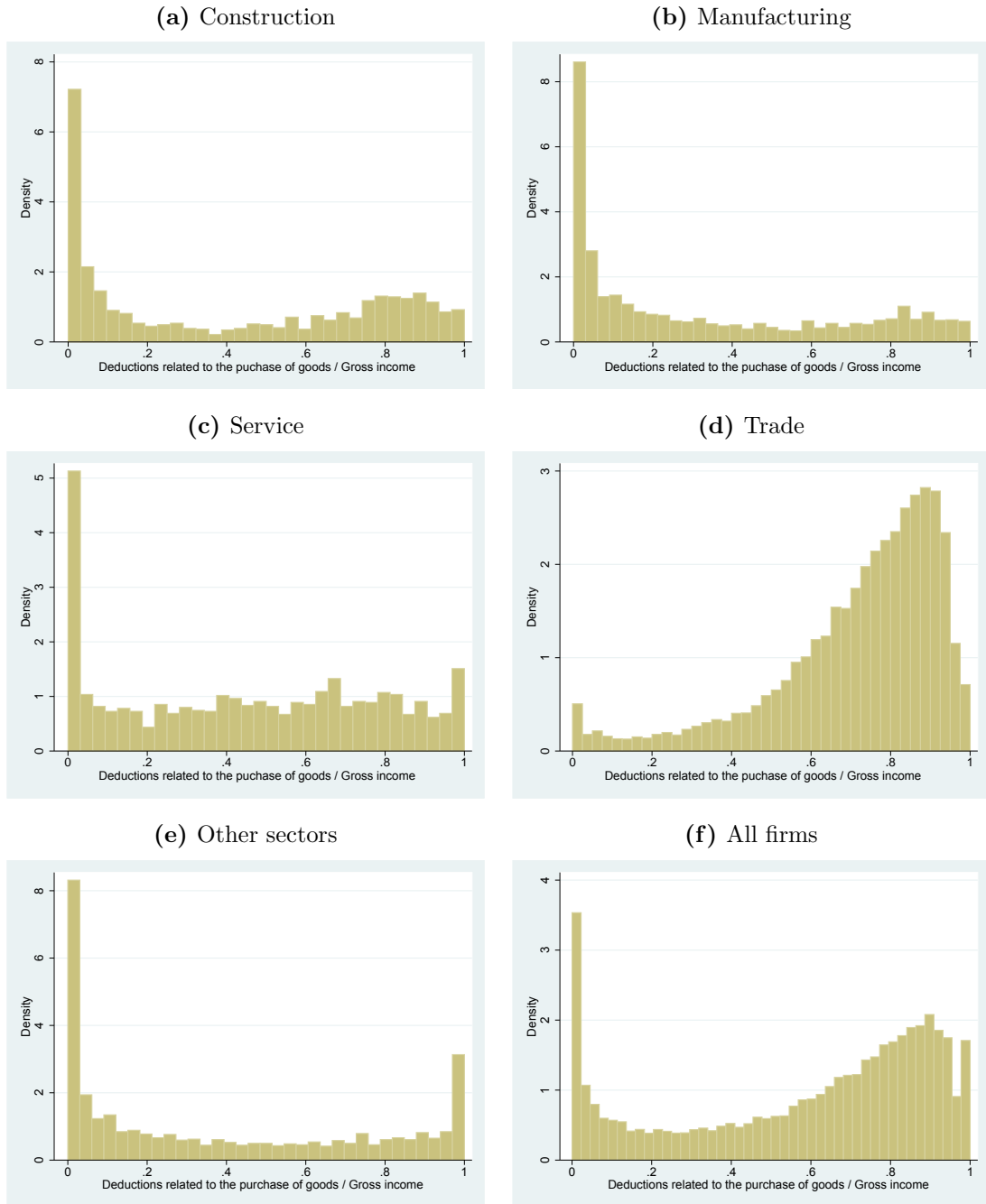
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Figure A1: SIZE-DISTRIBUTION OF FIRMS, 2007-13



Notes: Figure shows the size-distribution of larger firms in bins of 100 million AMD in the years 2007 to 2013. Data is trimmed below 100 (where most - about 72% - of observations are) and above 5,000 (where only about 1% of observations are) million AMD of gross income. First, second and third vertical lines denote three thresholds where, respectively, rules of tax-administration change, firms qualify to enter the large taxpayer unit, and firms are obliged to publish financial statements (for more details, see, Figure 2).

Figure A2: DISTRIBUTION OF INPUT COSTS TO TURNOVER BY SECTOR



Notes: Figures plot histograms of firms per industry (and in (f) for all firms) according to the ratio of deductions directly related to the purchase of goods in gross income.

Table A1: VAT REGISTRATION THRESHOLDS IN USD AROUND THE WORLD IN 2013

No	Country	Threshold	No	Country	Threshold	No	Country	Threshold
1	Singapore	799,169	36	Morocco	59,485	71	India	8,533
2	Jersey	468,999	37	Thailand	58,582	72	Norway	8,511
3	Seychelles	414,652	38	Kenya	58,057	73	Belgium	7,409
4	Kazakhstan	346,200	39	Indonesia	57,355	74	El Salvador	5,714
5	Azerbaijan	152,956	40	Trinidad & Tobago	55,878	75	Algeria	1,260
6	Zambia	148,261	41	Czech Republic	51,097	76	Belarus	0
7	Armenia	142,447	42	New Zealand	49,204	77	Bolivia	0
8	Isle of Man	123,503	43	Pakistan	49,199	78	Bonaire, S. Eust. & Saba	0
9	United Kingdom	123,503	44	Moldova	47,669	79	Chile	0
10	Gabon	121,448	45	Poland	47,459	80	Colombia	0
11	Papua New Guinea	111,383	46	Albania	47,318	81	Costa Rica	0
12	Argentina	109,903	47	Malta	46,471	82	Dominican Republic	0
13	France	108,211	48	Philippines	45,222	83	Ecuador	0
14	Switzerland	107,886	49	Macedonia	43,108	84	Greece	0
15	South Africa	103,573	50	Croatia	40,316	85	Guatemala	0
16	Japan	102,464	51	Austria	39,832	86	Honduras	0
17	Ireland	99,581	52	China	38,736	87	Iceland	0
18	Lebanon	99,502	53	Ukraine	37,533	88	Italy	0
19	Serbia	93,942	54	Panama	36,000	89	Korea	0
20	Madagascar	90,624	55	Bulgaria	33,931	90	Mexico	0
21	Romania	86,303	56	Luxembourg	33,194	91	Netherlands	0
22	Barbados	80,000	57	Malaysia	31,737	92	Nicaragua	0
23	Bangladesh	76,821	58	Rwanda	30,929	93	Nigeria	0
24	Australia	72,405	59	Canada	29,132	94	Paraguay	0
25	Jordan	70,423	60	Tanzania	24,993	95	Peru	0
26	Slovenia	66,387	61	Montenegro	23,899	96	Portugal	0
27	Latvia	66,114	62	Germany	23,235	97	Puerto Rico	0
28	Slovak Republic	66,108	63	Hungary	22,352	98	Russian Federation	0
29	Mauritius	65,144	64	Israel	21,293	99	Spain	0
30	Tunisia	61,551	65	Estonia	21,244	100	Sweden	0
31	Ghana	61,411	66	Namibia	20,715	101	Taiwan	0
32	Georgia	60,120	67	Cyprus	20,713	102	Turkey	0
33	Zimbabwe	60,000	68	Uganda	19,328	103	Uruguay	0
34	Lithuania	59,592	69	Finland	11,286	104	Venezuela	0
35	Botswana	59,532	70	Denmark	8,903	105	Vietnam	0

Notes: Source of data is Asatryan and Todtenhaupt (2016). Thresholds apply to goods (when different thresholds apply) and are typically set in local currency. Annual average nominal exchange rates are used for conversion to USD.