Size-Based Policies and Firm Growth: Evidence from Pakistan

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Abstract

Size-based regulations and taxation are ubiquitous. In this paper, we examine the impact of size-based taxation on firm growth by exploiting a large and permanent tax reform from Pakistan, where the VAT threshold was raised from PKR 5 million to PKR 10 million. Using a difference-in-differences framework and rich administrative data, we estimate the causal effects of this reform on firms whose growth was previously constrained by the size threshold. Our findings reveal substantial growth effects: treated firms saw their revenue increase by 32 log-points, costs by 19 log-points, and gross profits by 13 log-points. These effects are driven by real economic activity, as third-party reported outcomes, such as wages and imported inputs, also grew by similar margins. Treated firms paid higher taxes across various measures, highlighting their strong willingness to pay to get rid of the size-based taxation. The results emphasize the importance of carefully designing size-based policies, as they can lock firms into significantly slower growth trajectories.

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I Introduction

Size-based policies are common throughout the world. Under such policies, taxes, laws or regulations begin to bind or become more stringent as the firm reaches a particular size threshold.[1] Their primary aim is to shield small firms from costly compliance obligations while reducing administrative costs entailed by broader implementation. However, by distorting prices faced by individual firms such policies can lead to a misallocation of resources across firms, driving cross-country differences in income and productivity (Restuccia & Rogerson, 2008; Hsieh & Klenow, 2009). Importantly, they also incentivize firms to stay small and thus create dynamic inefficiencies, slowing and restricting firm growth. Despite their adverse impact on productivity and growth, size-based policies are becoming increasingly common, especially in the field of taxation. Bachas *et al.* (2019), for example, report that over the past 20 years more than 70 countries adopted special enforcement units for large taxpayers, mainly because international institutions encourage size-based segmentation of taxpayers (Kanbur & Keen, 2014).

In this paper, we examine the effects of size-based policies on firm growth focusing on a representative developing country, Pakistan. The policy we exploit exists in almost every country with a value-added tax.[2] Under it, firms below a set size threshold are not required to register and are not required to remit the tax. The policy means that both compliance costs and tax liability jump as the firm grows beyond the size threshold. In terms of economic incentives it creates and behavioral responses it will induce, the policy is very similar to most size-based policies observed in other contexts.

There are two key challenges in estimating the causal effects of size-based policies. First, firms choose their size taking into account compliance costs and other parameters of the system, thereby sorting across the threshold. The endogeneity of firm size means that unless one has access to plausibly exogenous variation in the

[1] Notable examples of size-based policies include the United States' Affordable Care Act; the United Kingdom's Small Business Rate Relief; the European Union's SME-focused "Think Small First" legislation (Small Business Act for Europe); Canada's Small Business Deduction and Employment Insurance Premium Reduction; and Australia's Small Business Entity Concessions. Such policies are even more common in developing countries in the shape of tax exemption thresholds, large and medium taxpayer units, alternative minimum taxes, and labor and environmental regulations.

[2] Aside from the United States and a few oil-rich Gulf countries, value-added tax (VAT) is implemented in nearly every country worldwide. Only a handful of countries, such as Sweden, have opted not to set an exemption threshold for VAT, making them exceptions to the global norm of size-based VAT policies.

size threshold, one cannot estimate the causal effects convincingly. Second, to estimate the causal effects of size-based policies one needs to observe outcomes on both sides of the threshold in a consistent manner. However, this is usually not feasible as firms smaller than the size threshold do not feature in the dataset one observes larger firms in because they are generally not subject to the same reporting or filing requirements. As a result, crucial data on smaller firms is often missing. Together, these two challenges mean that the evidence on growth effects of size-based policies is limited although they are found in almost all areas of public policy.

The Pakistani context allows us to overcome these challenges. We have access to administrative data comprising the universe of income tax returns filed between 2006 and 2020. During the first ten of these fifteen years, the VAT threshold was set at PKR 5 million. It was then moved to PKR 10 million from 2016. The motivation behind the reform was to avoid bracket creep: the threshold was set in nominal rupees and had to be moved from time to time to account for inflation (Saez, 2003). Since the timing of the reform was independent of the macroeconomic environment of the country, the reform was plausibly exogenous to non-tax forces impacting firm growth. We also consistently observe outcomes on both sides of the threshold in the same dataset. Income tax filing requirements, which generate our dataset, are not a function of the VAT threshold and hence we do not face any selection on this account. Our data are also incredibly rich, and we are therefore able to trace the impacts of the change on more than ten firm outcomes, thereby creating a complete picture of how size-based policies affect firm growth.

We first use our data to document five stylized facts on how firms react to size-based policies. In our first stylized fact, we show that firm behavior is significantly influenced by the size-based policy. There is a strong bunching of firms at the VAT threshold: bunching is visible for all years in our sample, is always significant, and moves as the threshold is moved. Our second stylized fact documents stickiness in firm outcomes close to the threshold. We show that growth stalls as firms approach the threshold so that a firm near the threshold stays there for many years. For example, of the firms within PKR 100k of the threshold more than ten percent stay there even after five years. This probability is around 90 percent lower in other areas of the distribution.

Our third stylized fact suggests that the standard bunching estimator or any other static framework will underestimate the inefficiency arising out of the distortion. We show that both the mean and median growth rates fall sharply near the threshold.

But importantly the range over which growth falls is significantly broader than the range over which bunching is observed. We use dynamic bunching approaches, developed by Marx (2024), Garbinti *et al.* (2023), and Bergstrom *et al.* (2022) to make this point formally. These approaches suggest that in the pre-reform years, when the VAT threshold was PKR 5 million, the growth begins to fall from PKR 3 million, whereas bunching is observed only close to the threshold. Our fourth fact shows that the fall in growth near the threshold is not driven by firms splitting up as they approach the threshold. Under this strategy, the owners of firms close to the threshold create new firms so that they could continue growing their businesses without the need to cross the threshold (see Onji, 2009 and Gyoshev *et al.*, 2023 for such a response in Japan and Bulgaria). Our data allows us to link firms to their owners and using the data we can convincingly rule out this response in the Pakistani context.

Our final stylized fact documents that firm productivity jumps at the VAT threshold. On average, firms above the threshold are significantly more productive than those at or below the threshold. The productivity jump manifests itself not only in the measures of productivity we use, such as value-added as a function of firm size, but also in firm characteristics that serve as proxies for efficient production technology. Firms above the threshold, for example, are discretely more likely to engage in manufacturing, have international connections, and adopt a corporate business structure.

To estimate the causal effects of the size-based policy on firm growth, we exploit the 2016 reform that raised the VAT threshold from PKR 5 million to PKR 10 million. Since the reform affected firms that were below the threshold before the reform but not those above the threshold, it lends itself naturally to a difference-in-differences framework. Our approach compares outcomes of firms that always remained below the VAT threshold in all pre-reform years with other firms to isolate the treatment effects of interest. The identification assumption underlying the approach is not random assignment into treatment and control groups. Indeed, in our fifth stylized fact we document that firms below the VAT threshold are less productive than those above it. But this difference does not affect the validity of our approach as long as the difference is restricted to levels rather than changes over time, meaning that treated and untreated firms would experience similar growth in the absence of a change in the VAT threshold. Our results are always supported by corresponding event studies and show that this is indeed the case in our setting as outcomes of treated and untreated firms evolve on a common trajectory throughout the pre-reform period.

In our headline result, we show that firm growth accelerates sharply as the VAT threshold rises. On average, the revenue of treated firms increases by 32 log-points, costs by 19 log-points, and gross profits by 13 log-points. These estimates are robust to alternative specifications that control for industry- and location-specific trends and regional enforcement variations by including industry-by-year and tax office-by-year fixed effects. Such a large increase in revenue and profit highlights the considerable growth potential locked in firms below the size threshold, highlighting how size-based policies can restrict firm growth.

A critical issue in our setup is whether the estimated effect reflects a genuine rise in economic activity or merely a reporting effect. Tax evasion is a fact of life in developing countries, and it is possible that at the baseline firms were already operating at a higher scale but were simply underreporting their output and related outcomes. Distinguishing between these two mechanisms is important, as each has vastly different welfare implications. We distinguish between the two mechanisms by exploiting that some variables in our data are subject to extensive third-party reporting and hence are less susceptible to misreporting (Kleven *et al.*, 2016; Pomeranz, 2015; Naritomi, 2019). These variables include turnover subject to withholding tax, wages, and imported inputs. We find a similar, sharp rise in these outcomes as well, with the third-party reported turnover increasing by 35 log-points, wages by 12.2 log-points, and imported inputs by 16.8 log-points. These large rises support the view that the growth effect we document is driven by real economic activity than misreporting. We also find that the treated firms' financial health improved considerably after the reform: their assets grew by 12 log-points, while their liabilities remained almost unchanged.

Since treated firms report higher profits following the reform, it is likely that they also pay higher income tax. We examine this question using four different measures of tax liability: direct income tax paid on profits; withholding and presumptive taxes; and minimum tax. We find sharp increases across all these metrics, with the rise in tax liability ranging from 11.1 to 75.1 log points. Note that this is one of the rare occasions when a tax change in a developing country has been found to result in government receiving significantly higher tax after the change. In most other contexts, response along one margin is canceled by a compensating response along other margin—for example both revenue and costs moving together— so that the tax liability remains unaffected and as a result taxpayers do not end up paying higher taxes (see, for example, Carrillo *et al.*, 2017). The tax increases across diverse measures of tax liability indicates an additional benefit of eliminating size-based taxation: not only does it

stimulate real growth, but it also causes a significant rise in tax payments. The higher tax paid by treated firms in our context also captures their minimum willingness to pay to get rid of the size threshold.

Our paper contribute to three different strands of literature. Small and medium-sized firms are the engine of economic growth in developing countries. They provide over 70 percent of jobs and contribute to nearly 35 percent of GDP in these countries (Bertanzetti *et al.*, 2024). A large body of literature examines barriers to growth of these firms, such as access to finance (Beck *et al.*, 2005); weak property rights (La Porta *et al.*, 1998); resource misallocation (Hsieh & Klenow, 2009); high fixed costs of entry (Djankov *et al.*, 2002); lack of managerial expertise (Bloom & Van Reenen, 2007); and limited market access (Atkin *et al.*, 2017). We contribute to this literature by showing that size-based policies could be a major barrier to growth. In fact, the magnitude of the effect we estimate is larger than that for any other barrier studied in the literature, showcasing how these policies can prevent firms from achieving economies of scale, thereby restraining economic growth.

The second literature we contribute to shows how distortions, especially size-based regulations, can affect aggregate productivity by misallocating resources toward less productive firms (see Restuccia & Rogerson, 2008; Hsieh & Klenow, 2009; and Bartelsman *et al.*, 2013). Exploiting a discontinuity from France where many labor laws start to bind on firms with 50 or more employees, Garicano *et al.* (2016), for example, show that these regulations act as a 2.3 percent tax on labor, imposing a welfare cost equivalent to 3.4 percent of GDP (see also Guner *et al.*, 2008 and Gourio & Roys, 2014 for other such examples). We contribute to this literature by showing how firm productivity jumps at the size threshold, with firms smaller than the size-threshold—which employ most labor in the economy—have far lower productivity than large firms. These large differences in productivity across both sides of the threshold capture how size-based policies lead to productivity losses, stifling economic growth.

Finally, we contribute to the literature that specifically examines the distortionary impacts of the VAT threshold (see Onji, 2009 for Japan; Liu *et al.*, 2021 for the UK; Harju *et al.*, 2019 for Finland; Asatryan & Peichl, 2017 for Armenia; Gyoshev *et al.*, 2023 for Bulgaria; Muthitacharoen *et al.*, 2021 for Thailand; and Choudhary & Gupta, 2024 for India). Another strand of this literature exploits size-based segmentation of taxpayers, a policy similar to ours, to estimate the effects of these distortions (see e.g. Basri *et al.*, 2019; Almunia & Lopez-Rodriguez, 2018). The closest papers in this

literature to us are Liu *et al.* (2022) and Choudhary & Gupta (2024), which examine the effects of the VAT threshold on firm growth in the UK and India. Like us, both papers find large negative impacts. Firm growth in the UK slows by up to 2 percentage points when firms get close to the threshold. Simulations in Liu *et al.* (2022) suggest that the the size of a typical UK firm treated by the policy can be up to 8 percent smaller than in the absence of the threshold, although the long-run fall in firm size could be only 0.5-1.0 percent. Similarly, Choudhary & Gupta (2024) find that firm growth slows down by around 14 percentage points as firms reach close to the threshold. We estimate a far larger effect of 32-log points ($\approx$ 38 percentage point). Our larger estimate could capture different environmental features of Pakistan relative to the UK and India, but unlike these papers we can draw on a large tax reform, which instituted a permanent 100 percent increase in the size threshold. Large, permanent reforms force firms to overcome optimization frictions and thus generate responses that correspond to the long-run effects of the distortion (Chetty *et al.*, 2011).

The paper proceeds as follows. Section II describes important features of our environment, providing details on the size-based policy we exploit and how the 2016 reform changed it. Section III describes our data. Section IV documents five stylized facts on how firms react to the size-based policy in the Pakistani context. The next section V present our causal estimates of the effects of size-based policies on firm growth. The final section VI concludes.

II Context

To estimate the effects of size-based taxation on firm growth, we exploit a policy observed in many countries. Under this policy, the value-added tax applies only if the annual turnover (revenue) of the firm exceeds a set limit, known as the VAT threshold. This threshold is typically set in nominal terms, and firms are neither required to register for VAT nor remit payments if their annual turnover remains below this level, although they may opt to register voluntarily.

Figure I examines the relationship between a country's level of development and its VAT threshold. Using data from the IMF, we plot the VAT threshold for a sample of 113 countries against their GDP.[3] Panel A compares the threshold to the country's total GDP, while Panel B compares it to GDP per capita. Interestingly, a clear nega-

[3]The data used for this analysis are available at https://tinyurl.com/4d997pv8.

tive correlation exists between the two variables, as less-developed countries tend to set much higher VAT threshold relative to more developed ones. In choosing its VAT threshold, a country balances the revenue gain from marginally increasing the threshold against the compliance and administrative costs the higher threshold would entail (Keen & Mintz, 2004). The firm size distribution is heavily skewed to the left in developing countries, with a much higher proportion of small firms existing there relative to rich countries. A higher level of VAT threshold thus may be optimal for developing countries given the firm size distribution, but higher VAT threshold also means that any negative growth effects stemming from the threshold, such as firms deliberately limiting their size to avoid VAT registration, would be more severe there.

Like most other countries, Pakistan also maintains a VAT threshold. Firms below this threshold are not required to register or remit VAT, although they could do so voluntarily. Important elements of this size-based policy for our empirical framework are the following. First, the VAT threshold applies to manufacturers and retailers only. Other types of firms, such as importers, distributors, and service providers, must register and remit VAT regardless of their size. For manufacturers, the tax code specifies another criterion as well: firms with annual utility expenses (electricity, gas, and telephone) exceeding PKR 600k must register for VAT, irrespective of their turnover. This additional criterion along with the voluntary registration provision means that the turnover threshold may not be binding for some manufacturers in our sample. Our treatment effect therefore have an intention-to-treat interpretation, a point we come back to later in the paper. Second, the threshold remained at PKR 5 million in the initial years in our sample before it was raised to PKR 10 million in 2016. Third, the threshold creates a notch in the profit schedule of treated firms, as both their tax liability and compliance costs jump at the threshold. Since VAT is levied on value-added, the size of this notch is idiosyncratic to each firm, depending among other things on the proportion of taxable inputs used by it. Fourth, the size-based criterion for retailer was abolished from the tax year 2017. The new policies prescribed non-turnover based tests to ascertain whether a retailer should register for VAT. For our treatment effects, we therefore focus on manufacturing firms only.

To estimate the causal impacts of size-based taxation, we exploit the 2016 reform that raised the VAT threshold from PKR 5 million to PKR 10 million. A crucial assumption underlying our empirical framework is that the policy environment remained stable around the time of the reform. Firms in our sample are also subject to income tax, with corporate firms paying income tax under the corporate tax schedule

and the non-corporate firms paying income tax under the personal income tax schedule. Both these schedules remained stable around the time of the reform. However, a significant change occurred in the personal income tax schedule in 2018, when a fixed income tax was levied on firms with taxable income between PKR 400,000 and PKR 1.2 million.[4] This fixed income tax replaced the progressive tax rates that were previously applied under the standard tax schedule for this income range. Although this change was reversed after just one year, it could potentially affect our estimates from 2018 onward. This is particularly relevant if the treated firms in our setup were more affected by the change than the control firms. We run additional tests to show that our long-run estimates of the causal effects of size-based taxation are not confounded by the 2018 income tax reform.

III Data

We use administrative data from the Federal Board of Revenue (FBR), the revenue authority of Pakistan. The dataset includes the universe of income tax returns filed by both corporate and non-corporate firms between the tax years 2006 and 2020. We observe most line items on the return form, including the firm's balance sheet, profit and loss account, and tax computations. In addition to the returns data, we have access to the tax register, which contains firm characteristics recorded at the time of registration and updated periodically. The variables in this dataset include the firm's date of registration, industry classification, principal activity (manufacturer vs. non-manufacturer etc.), organizational structure (corporate vs. non-corporate etc.), and location. The 4-digit industry classification corresponds to the Harmonized Commodity Description and Coding System (HS Code) and classifies firms on the basis of goods or services they supply. Appendix A.1 provides a detailed description of the variables used in our empirical analysis.

IV Size-Based Taxation and Firm Growth: Five Facts

In this section, we present five facts on firm behavior to size-based taxation. While our primary focus is on Pakistan, we underscore that similar patterns exist in other coun-

[4]The fixed tax of PKR 1,000 was applied on taxable income $\in (400\text{k}, 800\text{k}]$ and PKR 2,000 on profits $\in (800\text{k}, 1200\text{k}]$.

tries. These facts inform our empirical strategy to estimate the effects of size-based taxation on firm growth and shed light on mechanisms underlying the response.

IV.A Size-Based Taxation Significantly Influences Firm Behavior

Figure II illustrates the distribution of annual turnover around the threshold. We pool observations from 2006–2015, when the threshold was PKR 5 million, and from 2016–2020, when it was PKR 10 million. There is significant bunching in both pre- and post-reform years. The density of firms drops sharply above the threshold, with the fraction of firms in a bin decreasing by more than 80 percent after crossing the threshold. Critically, the density to the left of the threshold remains high throughout the plotted region, suggesting that the response is dispersed over a broader range rather than being concentrated at the threshold, as is seen in most other bunching contexts (Kleven, 2016). This bunching pattern persists during all years in our sample (see Figure A.I for details).

IV.B Growth Stalls Near the Threshold

One striking feature of the data is that once firms approach the threshold, they tend to remain there for many years. Figure III plots the probability that a firm in a PKR 100k ($\approx$ US$ 1,000) bin k in year t will remain in the same bin in the next j years *i.e.* $\mathbb{P}\left[z_{it+j} \in b_k | z_{it} \in b_k\right]; \; j \in \{1, 2, 3, 5\}$. For this exercise, we use data from 2006 to 2015, a period during which the VAT threshold remained fixed at PKR 5million. The probability of staying in the same bin increases sharply at the threshold bin, rising nearly four-fold compared to adjacent bins on the left and more than eight-fold compared to adjacent bins on the right. For example, Panel A of the figure shows that around 40 percent of firms in the bin containing the exemption threshold remain in the same bin in the following year. This fraction is trivial for most bins on either side of the threshold, decreasing by nearly 90 percent just to the right of the threshold. Notably, the probability that a firm in the threshold bin will remain there even after 5 years exceeds 10 percent. The strong persistence of outcomes just below the threshold highlights—in an intention-to-treat sense—the perceived costs to firms of crossing the VAT threshold.

IV.C Distortion Not Fully Captured by Static Frameworks

The standard way to estimate the inefficiency created by size-based taxation, especially in cases where the marginal or average tax rate jumps, is through bunching induced by it (Saez, 2010; Chetty *et al.*, 2011; Kleven & Waseem, 2013). Figure II shows that bunching around the VAT threshold is quite sharp. Viewing the response through the lens of the static framework therefore may give the impression that the inefficiency arising from the size-based policy is local, concentrated only in small area around the threshold. However, this perspective changes when we examine the dynamics of the response. Below, we use strategies developed by Marx (2024), Garbinti *et al.* (2023), and Bergstrom *et al.* (2022) to show that the distortion extends over a much broader area than what the static framework suggests.

We set up this analysis by first illustrating in Figure IV the mean and median turnover growth around the VAT threshold. Specifically, we plot $\mathbb{E}\left[\log \frac{y_{it+1}}{y_{it}} | y_{it} \in b_k\right]$, which represents the turnover growth rate from year t to $t+1$ against turnover in the baseline year in 250k bins. We pool data from 2006 to 2014, when the VAT threshold remained fixed at PKR 5 million. The key feature of these plots is the sharp decline in turnover growth as firms approach the threshold. More importantly, the suppression of growth seems to extend far beyond the narrow bunching segment depicted in Figure II, indicating a much broader impact on firm behavior.

Figure V explores this point more rigorously. Using the methodology developed by Marx (2024), we compare the probability density functions (PDFs) of turnover growth among firms with similar baseline turnover. The first panel of the figure, for example, focuses on firms with baseline turnover in the range $(2m, 2.6m]$. We divide these firms into three equally-spaced groups in terms of the baseline turnover and compare their PDFs of turnover growth. Each panel also marks, with three vertical lines, the growth rate required for the typical firm in each group to reach the exemption threshold in the following year. The first panel shows that the three PDFs are almost indistinguishable from each other. They, however, begin to diverge as the turnover approaches 3 million, with the differences becoming starker the nearer one gets to the threshold. Remarkably, the PDFs converge again once the exemption threshold is crossed (see the last two panels). This exercise suggests that the VAT threshold starts distorting firm behavior when turnover reaches around PKR 3 million, a range not evident in the static bunching plots. For the sake of completeness, Appendix Figure A.III displays all PDFs over the complete turnover range from PKR

2m to 6.4m.

One challenge in examining the dynamics of a system like ours is that the growth rate distributions of various groups may have different means and shapes and thus may not be directly comparable to each other. To address this, Garbinti *et al.* (2023) develop a methodology that examines *normalized* rather than the actual growth rate.[5] The normalized growth rate is defined as the growth rate in excess of the rate required for firms to cross the size threshold

$$(1) \quad \tilde{g}_{i,t}(Z) = \underbrace{\frac{Y_{i,t+1}-Y_{i,t}}{Y_{i,t}}}_{\text{actual growth rate}} - \underbrace{\frac{Z_i-Y_{i,t}}{Y_{i,t}}}_{\text{growth rate required to reach the threshold}},$$

where Z_i is the size threshold causing the distortion in behavior. When $\tilde{g}_{i,t}(Z)$ is zero, firm i locates exactly at the threshold Z in the next period, and when it is negative, the firm locates below the threshold. More technical details of this approach are provided in Appendix A.2.

Figure VI applies this approach to our context. Panel A plots the normalized growth rate for three groups of firms, where the threshold Z is the upper bound of the interval for each group. Intuitively, if the dynamics of firm size is undistorted, the distribution will be symmetric around zero. Conversely, the distribution will be strongly skewed to the left, with significant bunching below zero and reduced mass above it, if firms tend to avoid crossing the threshold. Consistent with the previous evidence, the distribution shows signs of distortion starting from PKR 3 million and above, indicating a much larger affected range than suggested by the static bunching approach. Panel B formally estimates this dynamic bunching by comparing the distribution of normalized growth rate between treatment and control groups. The treatment group here comprises firms with baseline turnover in the range (3m, 5m], while the control group includes firms in the range (6m, 7m], a range not affected by the VAT threshold. Panel C replicates the analysis using an alternative definition of the treatment and control groups. We now exploit the 2016 reform and compare firms located in the same range (3m, 5m] in a pre- and a post-reform year. Both panels show very strong dynamic bunching at the VAT threshold. Compared to the control group, there is large excess mass just below zero and missing mass right above it. The

[5]Please also see Bergstrom *et al.* (2022) who develop a similar approach where one can estimate dynamic bunching responses by using regions of the distribution that are not impacted by the threshold movement as controls for the regions that are impacted by the threshold movement.

final panel validates the identifying assumptions underlying this approach, demonstrating that no such missing mass below or above the threshold is observed when we replicate the analysis on a placebo threshold of PKR 7 million.

Based on the above evidence, we can conclude that viewing size-based taxation solely through a static framework will lead to an underestimation of the inefficiency it creates.

IV.D Firms Do Not Split to Avoid Facing the Threshold

One response to size-based taxation observed in other contexts is that firms split by creating new firms as they approach the size cutoff (see, for example, Onji, 2009; Gyoshev *et al.*, 2023). This response mitigates the inefficiency created by size-based taxation, as firms continue to grow although the growth occurs in new firms rather than in the existing ones. Figure VII explores this response in the Pakistani context. Our data allows us to link firms to their owners and hence track how many firms each owner controls.

The top two panels illustrate the number of firms registered per owner, while the bottom two panels show the fraction of owners owning more than one firm, both as a function of firm size. We examine these patterns separately for the pre- and post-reform years. If owners were registering new firms as their existing firms approach the VAT threshold, we would expect to see spikes in all plots just before the threshold, with owners near the threshold owning multiple firms. But no such spikes are observed. In fact, both series remain flat across the size distribution. Nor do they change after the reform, when the exemption threshold increased from PKR 5 million to PKR 10 million. We can therefore rule out the splitting response in the Pakistani context, implying that any reduction in growth as firms approach the threshold is not offset by growth in new firms.

IV.E Productivity jumps at the VAT Threshold

The next fact we document is that firm productivity jumps at the size threshold. Figures VIII and A.V illustrate this for the pre-reform and post-reform years. We experiment with different measures of productivity. Panel A in both figures shows that on average firms above the threshold report discretely higher profits relative to their size, suggesting higher productivity for given firm size at least in the reporting sense.

Similarly, sharp and discrete rise is observed for the next two measures: reported tax liability, shown in Panel B, and reported tax liability inclusive of any presumptive tax, shown in Panel C. The latter measure, which includes third-party reported items, is less susceptible to pure reporting effects. Our preferred measure of productivity—value-added as a ratio of annual turnover—is shown in the last panels of both figures. This measure also features a sudden increase at the threshold.

In general, the productivity jumps for all four measures are more pronounced in the post-reform years (Figure A.V). This can be seen in Figure IX, which presents a formal test of the discontinuity, reporting a regression discontinuity estimate of the jump observed in Panel D of both figures. We fit local linear regression models on both sides of the cutoff and select the bandwidth using the framework of Imbens & Kalyanaraman (2012). The discontinuity at the threshold is statistically significant for both the pre- and post-reform years, with the latter being nearly double the size of the former. Note that these estimates are not causal since the running variable—annual turnover—is endogenous.

Figures A.VI and A.VII explore the productivity jump in more detail. We now examine how six important determinants of firm productivity evolve around the threshold, looking separately at the pre-reform (Figure A.VI) and post-reform years (Figure A.VII). All six firm observables change discontinuously at the threshold, with firms above the threshold being more likely to have superior organizational form (Panels A-B), more capital-intensive technologies (Panels C-D), and better international connections (Panels E-F).

There are two potential explanations for the productivity jump we document above. First, the jump could reflect a simple sorting of firms, whereby more productive firms select into the VAT. In this world, eliminating the VAT threshold will not translate into higher aggregate productivity. Instead, low-productivity firms would move up the size scale, increasing aggregate output but not necessarily aggregate productivity. Second, the productivity jump could be causal, meaning that firms below the threshold deliberately choose inferior production technologies and less-productive characteristics to avoid detection by the revenue authority. In this world, eliminating the VAT threshold would increase both output and productivity as firms would replace inefficient technologies and characteristics with more efficient ones. The evidence we present above is consistent with both explanations. In section V.B of the paper, we exploit tax reforms and utilize third-party reported variables to determine if some of the productivity jump documented here has a causal relationship

with the VAT threshold.

V Effects of Size-Based Taxation on Firm Growth

In this section, we present our estimates of the causal effects of size-based taxation on firm growth.

V.A Empirical Strategy

As documented above, firm growth slows down—and in some cases remains slow for many years—even when firms are at a considerable distance away from the threshold. To estimate this inefficiency, we leverage the 2016 reform that increased the VAT threshold from PKR 5 million to PKR 10 million. This reform effectively removes all constraints on growth and related choices for firms located below the old threshold, while leaving firms above it unaffected, thus creating a natural difference-in-differences setting. Identification in this setting does not rely on random assignment into treatment and control groups but rather on the assumption that outcomes in the compared groups would have evolved similarly in the absence of the reform. To support this assumption, we present results from the following event study specification

$$\log y_{it} = \alpha_i + \lambda_t + \sum_{t \neq 2015} \beta_t \, D_i \, . \, 1(\text{Year} = t) + \varepsilon_{it}. \tag{2}$$

Here y_{it} represents the outcome of interest for firm i in year t, α_i and λ_t are the firm and year fixed effects, and D_i is an indicator for firms affected by the reform. Specifically, D_i takes the value 1 if the turnover of the firm remained below the VAT threshold in all the pre-reform years, meaning that it was never legally required to register for VAT or to remit the tax. The coefficients β_t measure the impact of the reform in each year relative to the baseline year 2015. We estimate this equation using data from 2012 to 2020. The lead and lag coefficients in the model capture pre-existing trends among the treatment and control groups, as well as the dynamic effects of the reform.

Since the definitions of the treatment and control groups remain constant over time, our event study specification avoids the issues associated with two-way fixed effect models involving staggered treatment (see Roth *et al.*, 2023 for a survey of this literature). Our difference-in-differences specification is similar to the event study,

but instead of using treatment-year interactions, it includes a single treatment-after term to capture the average effect of the reform in the post-reform period.

The primary focus of our reduced-form analysis is to examine the growth of existing firms rather than the entry or exit of new firms. Consistent with our focus on the intensive margin, we measure our outcomes in logs. The log transformation implies that our estimates represent average treatment effect for firms with positive outcomes only. The approach while meaning that our treatment effects are partially identified offers three important advantages (please see Chen & Roth, 2023 for details). First, it allows us to express treatment effects in easily interpretable percentage terms. Second, it captures the concept of decreasing returns to outcomes, which is particularly relevant in our context. For instance, an increase in turnover from PKR 100,000 to PKR 200,000 is likely to contribute more to aggregate growth and welfare than a similar increase from PKR 1 million to PKR 1.1 million. The log transformation ensures that small firms are given more weight in the average treatment effect than large ones. Finally, using logs reduces the influence of extreme outcomes, which can distort results in linear models.

V.B Causal Impacts

Figure X presents results from our event study specification (2). Table I reports the corresponding difference-in-differences estimates. The sample consists of manufacturing firms only, covering the years from 2012 to 2020. The treatment group, as mentioned earlier, includes firms whose annual turnover remained below PKR 5 million in all pre-reform years. The left panels of the figure present results from our baseline specification, while the specifications in the right panels also include industry-by-year fixed effects. These fixed effects control for industry-specific shocks or trends, ensuring that the estimated treatment effects are not confounded by macroeconomic shocks idiosyncratic to particular industries. The table also contains results where we add tax office-by-year fixed effects. Tax offices are located in various cities of Pakistan and have varying levels of tax enforcement. Some of them are large and medium taxpayers units, while others are regional tax offices. It is known that the level of enforcement in the first two types of offices is stronger (see, for example, Basri *et al.*, 2019; Almunia & Lopez-Rodriguez, 2018). Including these fixed effects therefore allows us to control for location-specific shocks and differences in enforcement intensity across tax offices. We focus on three outcomes directly affected by the movement of the VAT

threshold from PKR 5 million to PKR 10 million in 2016: turnover (gross sales); cost of sales; and gross profits, the latter being the difference between the first two.

The analysis produces four important insights. First, the outcomes were evolving on a common trend between the treatment and control groups in the pre-reform years. The differences between the groups were statistically insignificant in all four pre-reform years for all three outcomes in both specifications, validating the key assumption underlying our empirical strategy. Second, the reform had a substantial impact on the growth of treated firms, with turnover increasing by more than 32 log-points following the removal of the size threshold at PKR 5 million. This significant increase underscores considerable growth potential locked in firms affected by the size-based taxation, highlighting how the threshold acts as a barrier to growth. Third, the impact is not limited to turnover but also reflects in firm profitability. In general, both turnover and costs increase after the reform, but the increase in turnover outpaces the rise in costs, leading to a nearly 13 log-points increase in gross profits. To the extent that this increase reflects real economic activity rather than a change in reporting behavior, the divergence between the turnover and costs suggests that the reform enabled firms to operate more efficiently, allowing them to produce more from the same inputs. Note that this differential response contrasts with findings from many recent studies, which often show that turnover and costs tend to move together, leaving the tax base—the difference between the two—largely unaffected even in the face of significant tax changes (see, for example, Carrillo *et al.*, 2017). Fourth, the results from specifications including industry-by-year and tax office-by-year fixed effects are very similar to the baseline specifications, highlighting the robustness of our results (see Table I). This consistency across specifications reinforces the conclusion that our estimates capture the causal economic benefits of eliminating the size threshold rather than being artifacts of industry- or location-specific trends or regional enforcement variations.

A critical issue in this setup is whether the observed response reflects a genuine rise in economic activity or merely a reporting effect. Tax evasion is a fact of life in developing countries, and it is possible that firms were operating at the same scale even before the reform but were simply underreporting their output and related outcomes. Distinguishing between these two mechanisms is important, as each has vastly different welfare implications. Figure XI and Table II address this distinction by exploiting that some line items in the tax return are subject to extensive third-party reporting, making them less susceptible to misreporting (Kleven *et al.*, 2016; Pomeranz, 2015;

Naritomi, 2019). Panel B of the figure focuses on the portion of turnover subject to withholding tax. This turnover includes transactions with large firms that act as withholding agents, deducting taxes on these transactions and providing third-party information to the government in the form of withholding statements. The next two columns analyze wages and imported inputs, both of which are also also subject to substantial withholding and third-party reporting, making them less prone to underreporting (see, for example, Keen, 2008). Finally, the last two panels examine the assets and liabilities of the firm to assess the overall impact of the reform on its financial position. Note that the additional variables used for this analysis are available in our data from 2013 onward, so that the sample for Figure XI and Table II is restricted to the years from 2013 to 2020.

The results support the view that the growth documented above is driven by real economic activity. To provide a benchmark for our new results, we reproduce the turnover response from our baseline model in both the figure and the table. Strikingly, the third-party reported turnover—a metric less prone to manipulation—shows an even larger increase than the total turnover, suggesting that the increase likely reflects genuine business expansion rather than creative accounting. Similarly, Columns 3 and 4 demonstrate significant increases in wages and imported inputs, with effect sizes of 12.2 and 16.8 log-points. The increase in wages indicates that firms were either expanding employment or paying higher salaries, while the rise in imported inputs suggests that firms were scaling up their operations by sourcing more raw materials from abroad. These changes are strong indicators of real, substantive growth following the reform. Lastly, Columns 5 and 6 shed light on the impact of the reform on firms' financial health. Assets increased by 12 log-points, signaling that firms were not just growing in terms of sales but also investing in their long-term capacity. On the other hand, liabilities remained almost unchanged, implying that this growth was not fueled by excessive borrowing.

Given that their turnover grew more than their costs, it is plausible that treated firms would pay more taxes after the reform. Figure XII and Table III explore this possibility by analyzing four different measures of tax liability. Panel A of the figure (Column 1 of the table) examines the normal income tax paid by firms on their profits. This is the only outcome in our setting where the assumption of common trends between the treatment and control groups does not hold. In fact, the tax payments of treated firms were declining relative to the control group in the pre-reform years. Another distinctive feature of this outcome is that the treated firms paid sig-

nificantly lower taxes in 2018—a point we address in more details below. Due to the differential pre-existing trends, we cannot draw any definitive conclusions for this particular measure, although it appears that the reform caused a reversal in the declining trend of tax payments, with treated firms beginning to pay higher taxes in subsequent years. This pattern is much clearer in the other tax liability metrics, all of which exhibit sharp and substantial increases ranging from 11.1 to 75.1 log points. These increases across diverse tax measures indicate that the reform not only stimulated real growth but also led to a significant rise in tax payments by treated firms.

One other question of interest in our setup is to relate observed responses to underlying price changes. It is important to emphasize that estimating a traditional elasticity in this context is not straightforward. The treated firms were operating below the old VAT threshold and remained below the new exemption threshold after the reform, meaning that they did not experience an actual tax change. However, we can notionally define a *price* as the tax firms would have remitted had there been no VAT threshold in place so that they were subject to tax like firms above the threshold. Firms restricted their growth out of the fear that crossing the VAT threshold would subject them to VAT obligations, implying their limited growth can be interpreted as a response to an implicit tax rate. To capture this, we simulate the implicit tax rate as the VAT and income tax the firm would have remitted in the pre-reform years if its turnover were to increase by one rupee.[6] We assume the pre-reform VAT rate as the standard VAT rate and the post-reform VAT rate as zero. Using this notion of an implicit price change, we estimate elasticities that capture how firms' behavior adjusted in response to the perceived tax burden that constrained their growth.

Table IV presents the estimated elasticities. We replicate the analysis from Table I, but now estimate an instrument variable version of our difference-in-differences model

$$\log y_{it} = \alpha_i + \lambda_t + e \log(1 - \tau_{it}) + u_{it}, \tag{3}$$

where e is the elasticity for outcome y. We instrument the log net of tax rate by the *treatment*×*after* term, with τ being the marginal tax rate the firm faces simulated un-

[6]We observe both revenue and costs of the firm and hence can simulate both the VAT and income tax liabilities. For VAT, we treat costs as net purchases, implicitly assuming that the firm sources all its raw materials from registered VAT suppliers, enabling it to claim input VAT on these purchases. For corporate income tax, we account for all deductible costs, including labor costs. This approach provides a more precise simulation of the tax liabilities that firms would have incurred if they had crossed the VAT threshold.

der the assumptions noted above. This approach avoids the endogeneity problem by using only the variation created by the tax reform and is commonly employed in similar contexts (see, for example, Gruber & Saez, 2002; Saez *et al.*, 2012). As expected, the elasticities for all outcomes are exceptionally large, with the turnover elasticity consistently exceeding 4 across all specifications. This implies that, on average, a firm's turnover would increase by 4 percent if the effective tax rate it experiences were reduced by 1 percent. These results emphasize the substantial sensitivity of firm behavior to perceived tax burdens and the significant role size thresholds play in constraining their growth.

A key assumption underlying our empirical framework is that no contemporaneous tax change occurred that could confound the effects of the 2016 VAT reform. While no major tax change occurred in 2016, there was a change in the personal income tax schedule in 2018 (please see section II for the details of this reform). This change may confound the dynamic effects of size-based taxation we estimate above. It is, however, important to note that this reform lasted only one year and was reversed in 2019. It also applied to sole trading firms only and did not apply either to partnerships or to corporations. Given that firms in our treatment group are smaller and more likely to be sole traders, they could have been affected more by this reform, which on average meant a temporary reduction in the income tax rate of affected firms. Indeed, Figure XII (Panel A) shows that the income tax liability of firms in our treatment group decreased in 2018 relative to the control firms before bouncing back to the existing trend in the next year. It is therefore possible that some of the response we document above for 2018 could be attributed to the income tax reform rather than the VAT reform. To assess this, Table V replicates our baseline specification dividing the post-reform period into three sub-periods: 2016–2017, 2018, and 2019–2020. If the 2018 response was driven solely by the income tax reform, we would expect to see a negative coefficient for the 2019–2020 period, when the income tax reform had been reversed. However, our results do not show any such reversal. In fact, the coefficients for 2019–2020 are consistently larger than those for 2018, suggesting that the higher 2018 coefficients likely reflect the increasing dynamic response to the 2016 VAT reform rather than a response to the temporary income tax reform.

VI Conclusion

Size-based taxes and regulations are ubiquitous. Governments use them to protect small firms from compliance costs and to save administrative costs associated with the need to enforce the policy on numerous small firms. Developing countries tend to rely on size based policies more than developed countries most likely because the firm size distribution is even more skewed to the left there (Bachas *et al.*, 2019). In addition to causing a misallocation of resources, these policies incentivize firms to remain small, thereby restricting firm growth. In this paper, we use a size based policy and administrative data from a representative developing country to estimate their effects on firm growth. The policy we exploit exists in more than 100 countries. Under it, firms smaller than a given size threshold are not required to register for VAT and are not required to remit the tax.

Our main results exploit a tax reform through which the VAT threshold in Pakistan was raised from PKR 5 million to PKR 10 million. Using the standard difference-in-differences framework we find that the change triggered a large growth in firms that were smaller than the old exemption threshold. Their revenue increased by 32 log-points, costs by 19 log-points, and gross profits by 13 log-points. These effects are likely driven by a real growth in economic activity because third-party reported outcomes of treated firms such as wages and imported inputs also grow by comparable amounts. Treated firms also paid higher taxes on their income after the reform. The results demonstrate that reforms aimed at relaxing size-based constraints can stimulate real economic activity without necessarily reducing tax revenue.

Our findings have important policy implications. The growth effects of size-based policies are substantial and governments must take them into account in deciding whether to implement size-based thresholds and where to set them. We show that even well-intentioned policies can create perverse incentives for firms to restrict growth, ultimately hindering economic development. Policymakers should reconsider the structure and design of these thresholds to reduce such inefficiencies. Future research could extend our analysis to other size-based regulations such as those related to labor laws or environmental regulations; to other outcomes such as employment, innovation, and investment; and to other developing countries with different institutional settings. Understanding the true impact of these size-based policies on firm behavior, growth, and other outcomes is critical for informing policy decisions that aim to foster economic growth without distorting incentives.

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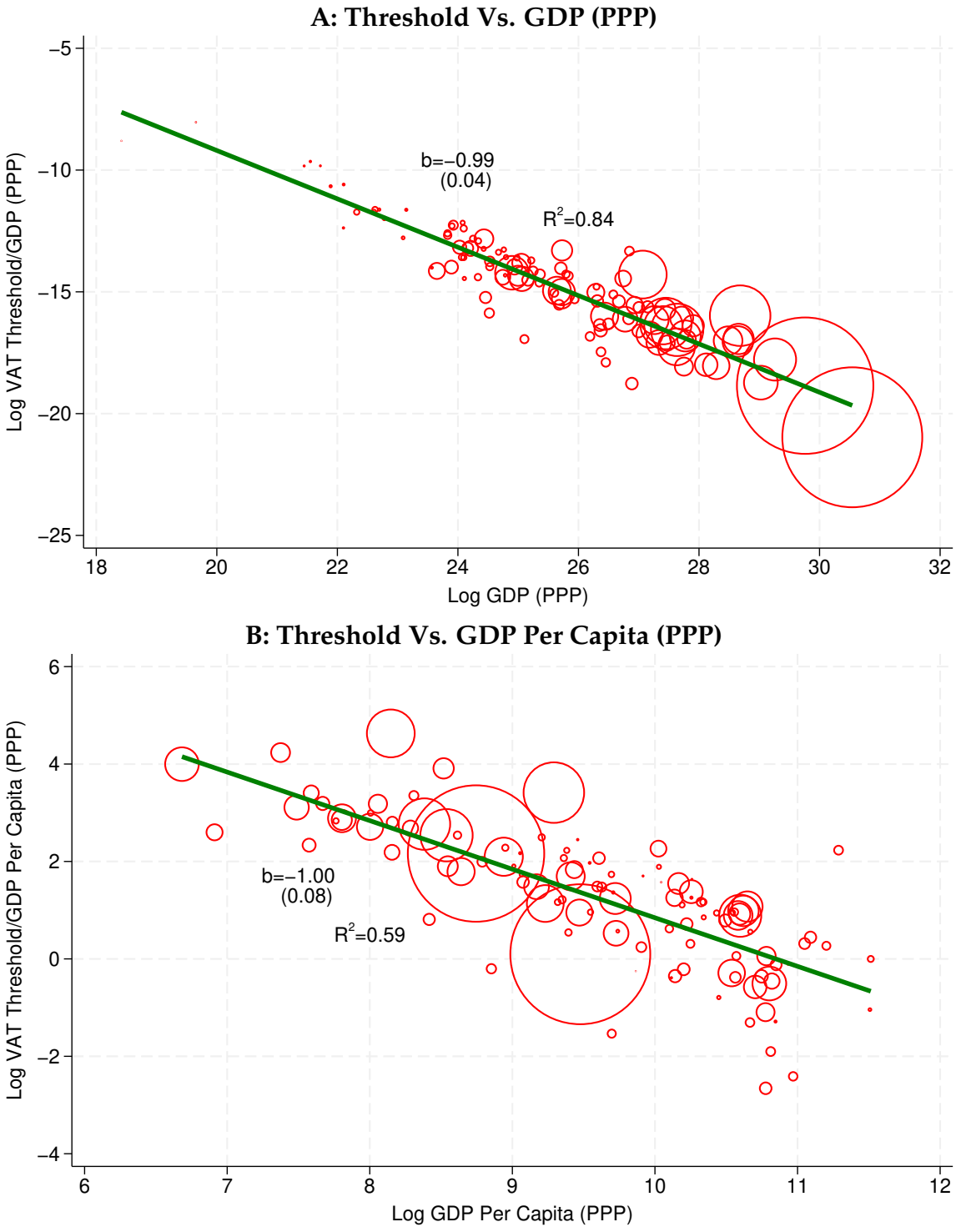
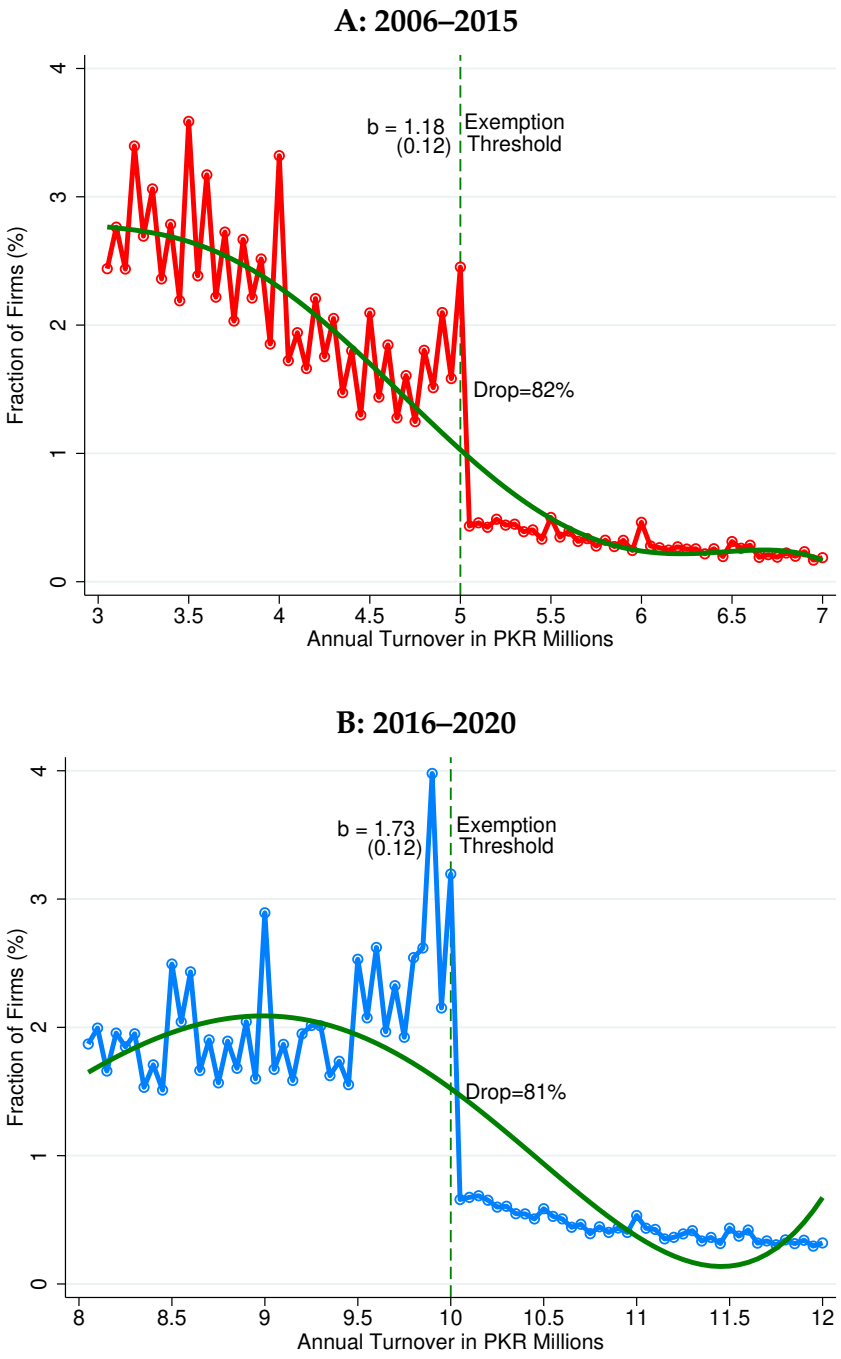
FIGURE I: **VAT THRESHOLD AROUND THE WORLD**



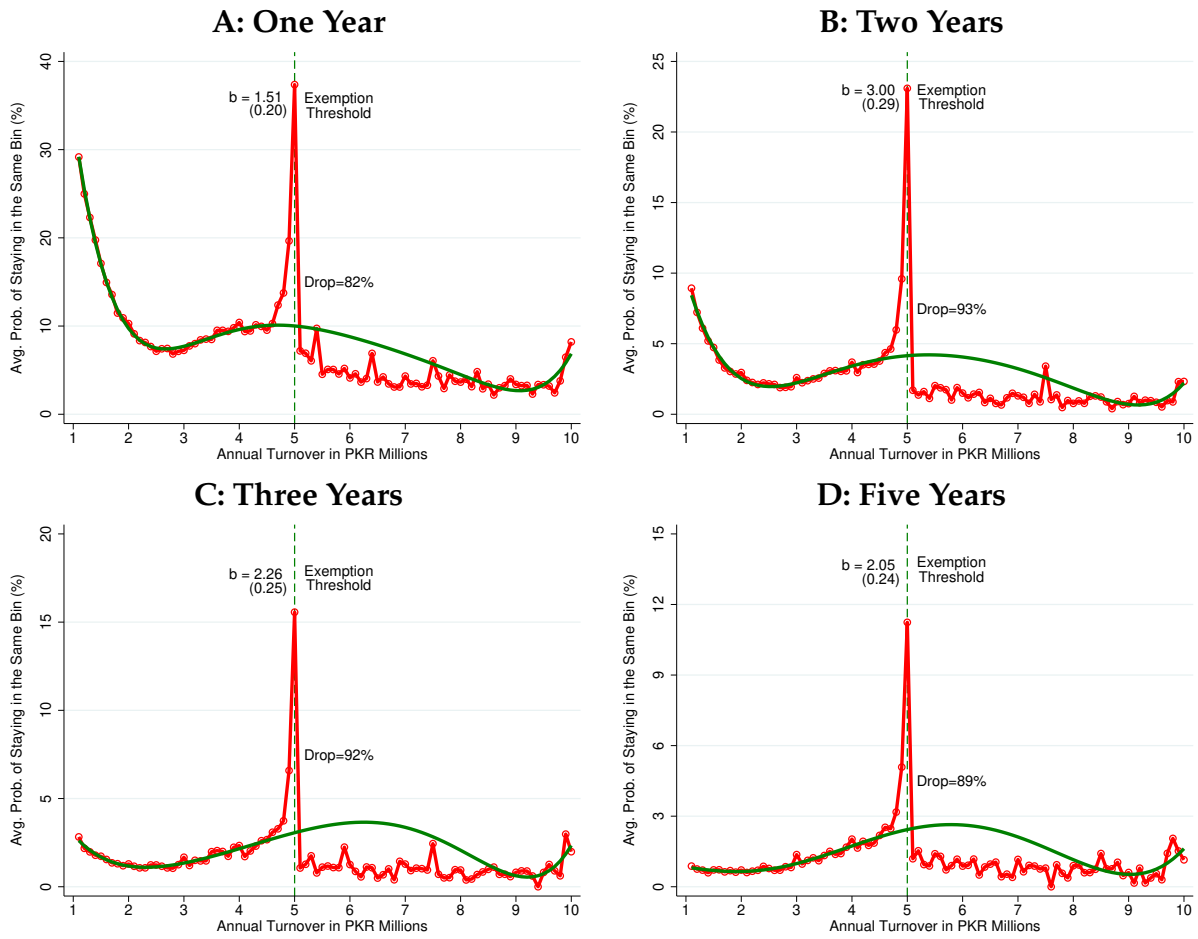
Notes: The figure illustrates the relationship between the VAT threshold and the level of development of a country. We use data from the IMF (please see https://tinyurl.com/4d997pv8 for the source). The data contains 113 countries where we observe both the VAT threshold and GDP of the country. The area of each marker in the scatter diagram is proportional to the population of the country. We fit a linear model on the scatter points and report the slope coefficient and R^2 from the corresponding regression. Panel A uses the log of GDP, whereas Panel B uses log of GDP per capita.

FIGURE II: **BUNCHING AT VAT THRESHOLD**



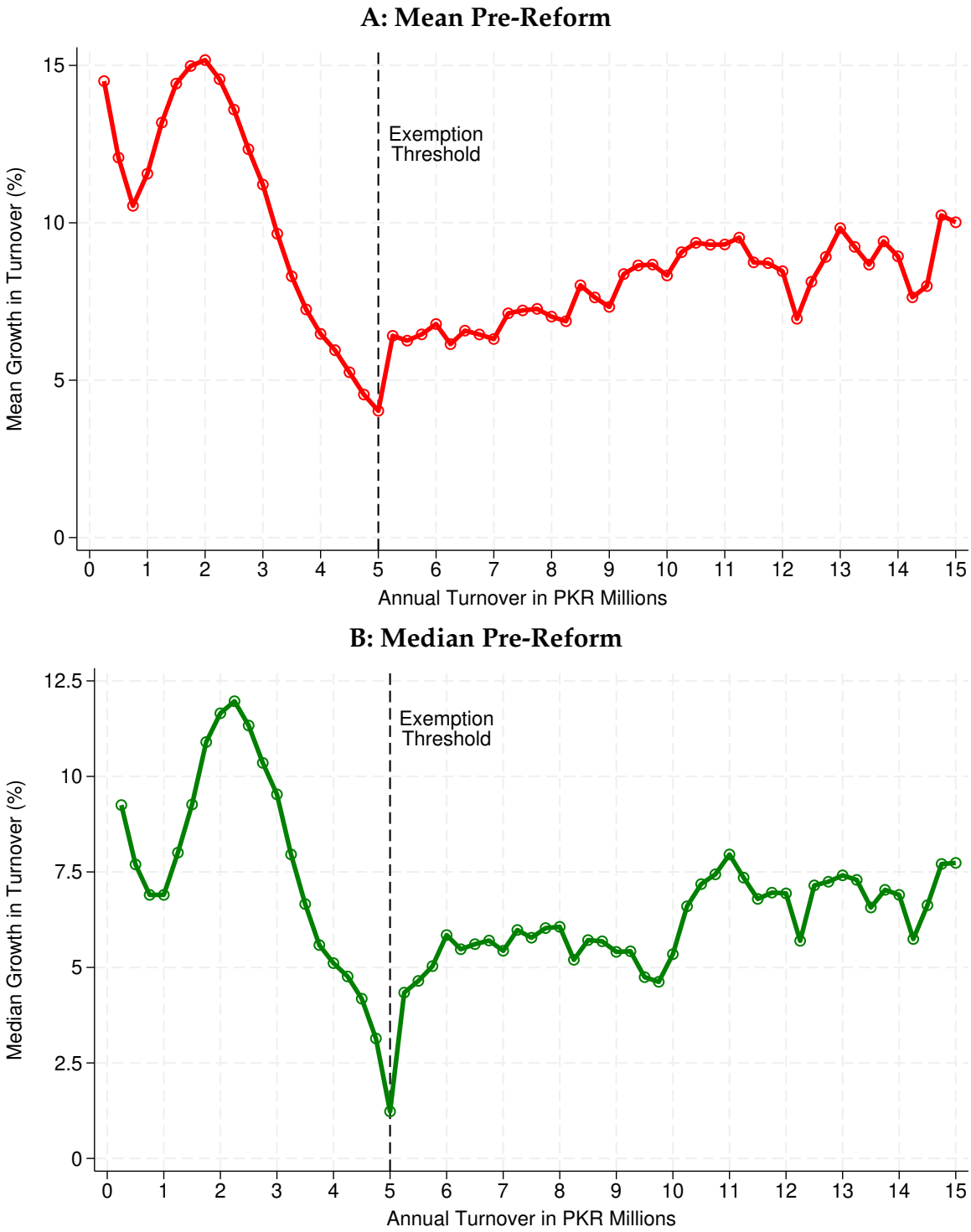
Notes: The figure shows the empirical and counterfactual distributions of turnover for firms around the VAT threshold. The sample for Panel A consists of years 2006–2015, when the VAT threshold was PKR 5 million, and for Panel B of years 2016–2020, when the VAT threshold was PKR 10 million. The counterfactual is estimated for each threshold separately by fitting a fifth-order polynomial to the empirical distribution, excluding data around the threshold. Bunching b is the excess mass in the excluded range below the threshold (in proportion to the average counterfactual frequency in the dominated range). Standard errors are shown in parentheses. Drop is calculated as the ratio of the number of firms in the threshold bin divided by the average number of firms in the next five bins. The bin size here is PKR 50,000 for both plots.

FIGURE III: **PERSISTENCE – VAT THRESHOLD**



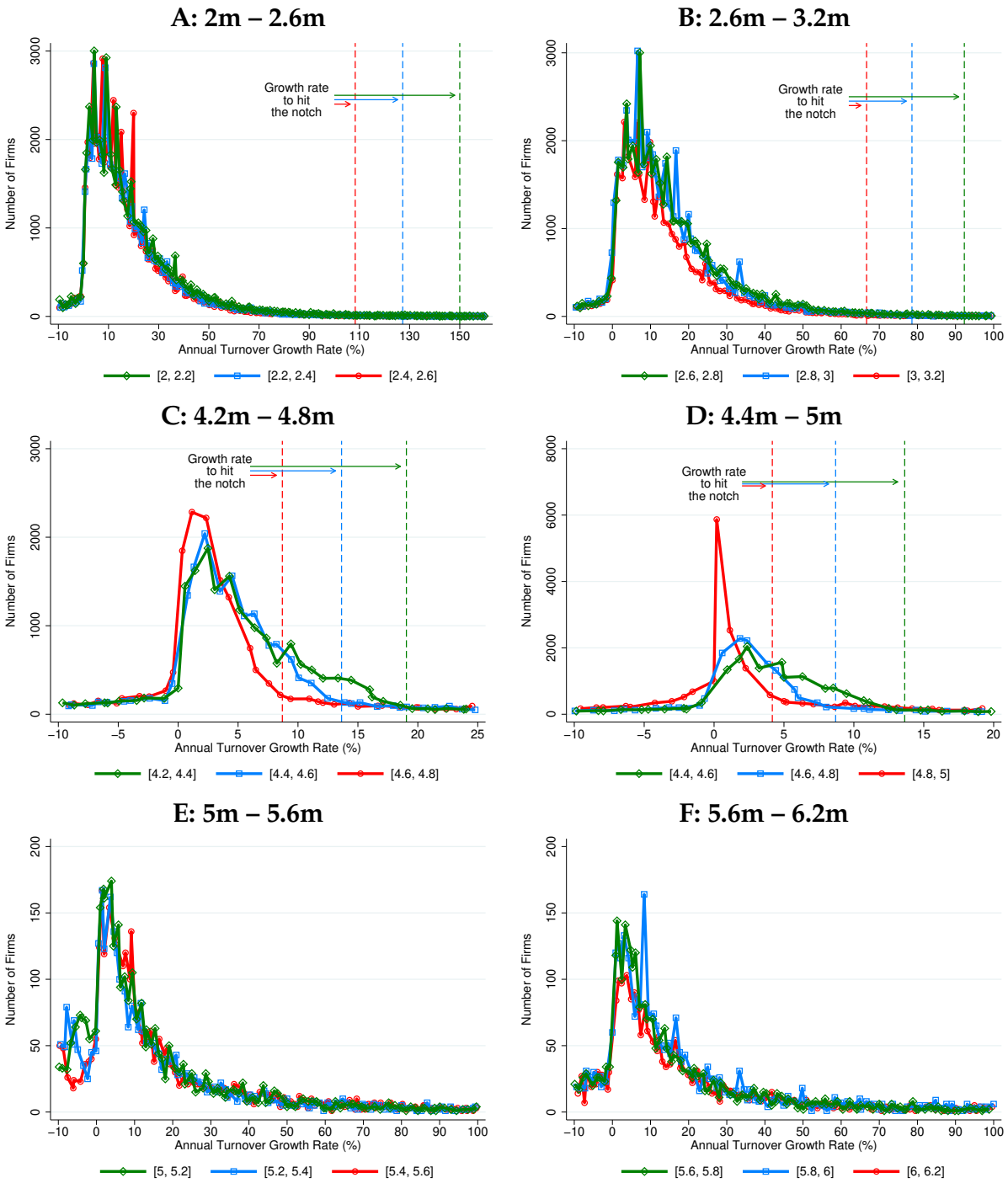
Notes: The figure illustrates that once firms reach the VAT threshold they tend to stick there for many years. The horizontal axis shows the annual turnover of firms, dividing them into bins of PKR 100,000. The vertical axis plots the average probability that a firm in the bin in year t is found in the same bin in the year $t+k$, where $k \in \{1, 2, 3, 5\}$ and is indicated in the title of each column. The sample consists of years $\in \{2006, 2015 - k\}$ for each panel. The VAT threshold remained fixed at PKR 5 million during all these years. The counterfactual distribution is estimated for each plot separately by fitting a sixth-order polynomial to the empirical distribution, excluding data around the threshold. Bunching b is the excess mass in the excluded range below the threshold (in proportion to the average counterfactual frequency in the dominated range). Standard errors are shown in parentheses. Drop is calculated as the ratio of the number of firms in the threshold bin divided by the average number of firms in the next five bins.

FIGURE IV: **GROWTH RATE AROUND THE VAT EXEMPTION THRESHOLD**



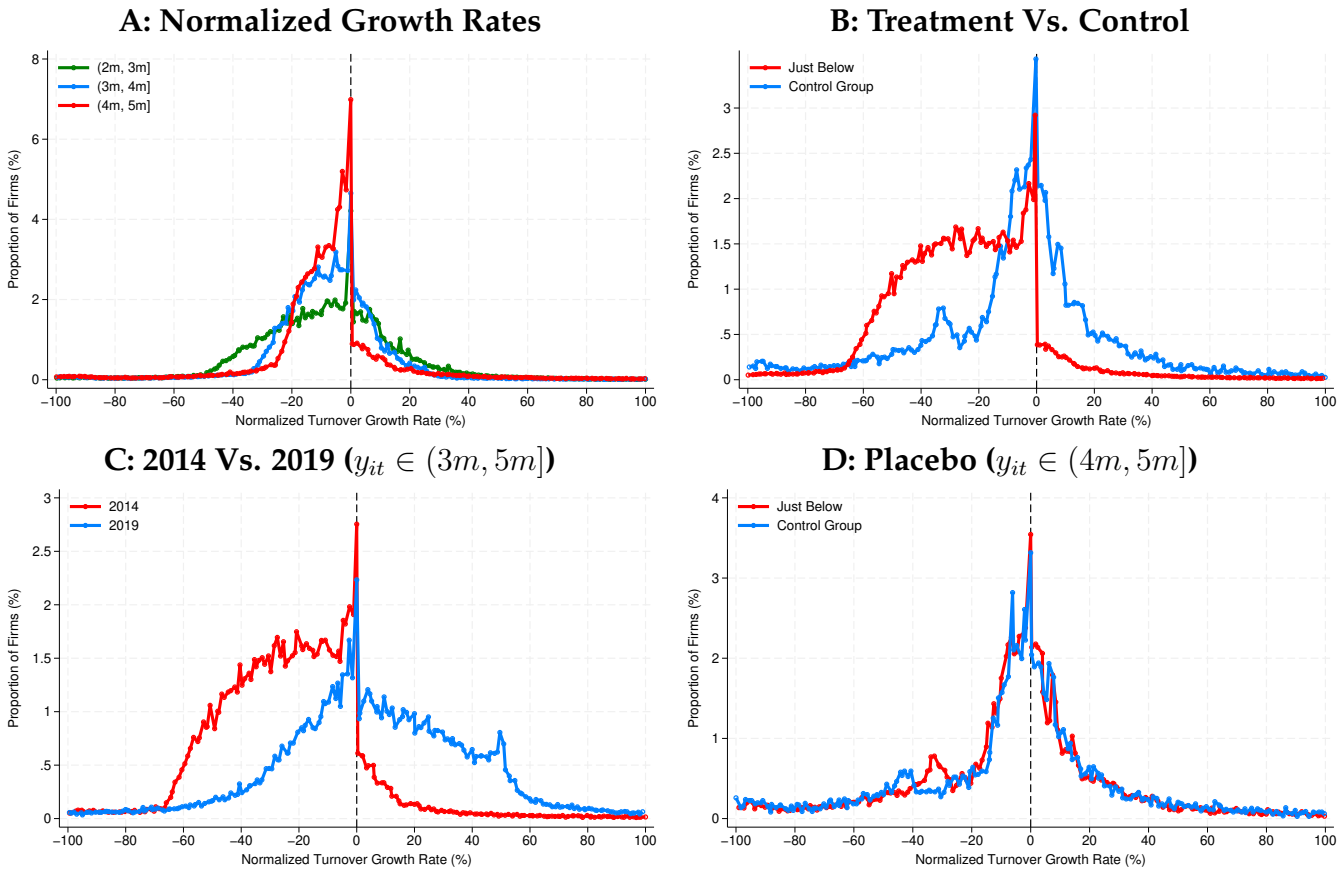
Notes: The figure plots the rate of turnover growth of firms in our data, illustrating that firm growth slows down sharply even at a considerable distance away from the VAT threshold. The horizontal axis in both plots shows the annual turnover of firms, dividing them into bins of PKR 250,000. The vertical axis plots the average growth rate of turnover of firms from year t to $t+1$ in Panel A and the median growth rate in Panel B. The sample here consists of years 2006–2014, when the VAT threshold remained fixed at PKR 5 million. The VAT threshold is indicated by vertical, dashed lines in the picture.

FIGURE V: **GROWTH RATE AROUND THE VAT EXEMPTION THRESHOLD**



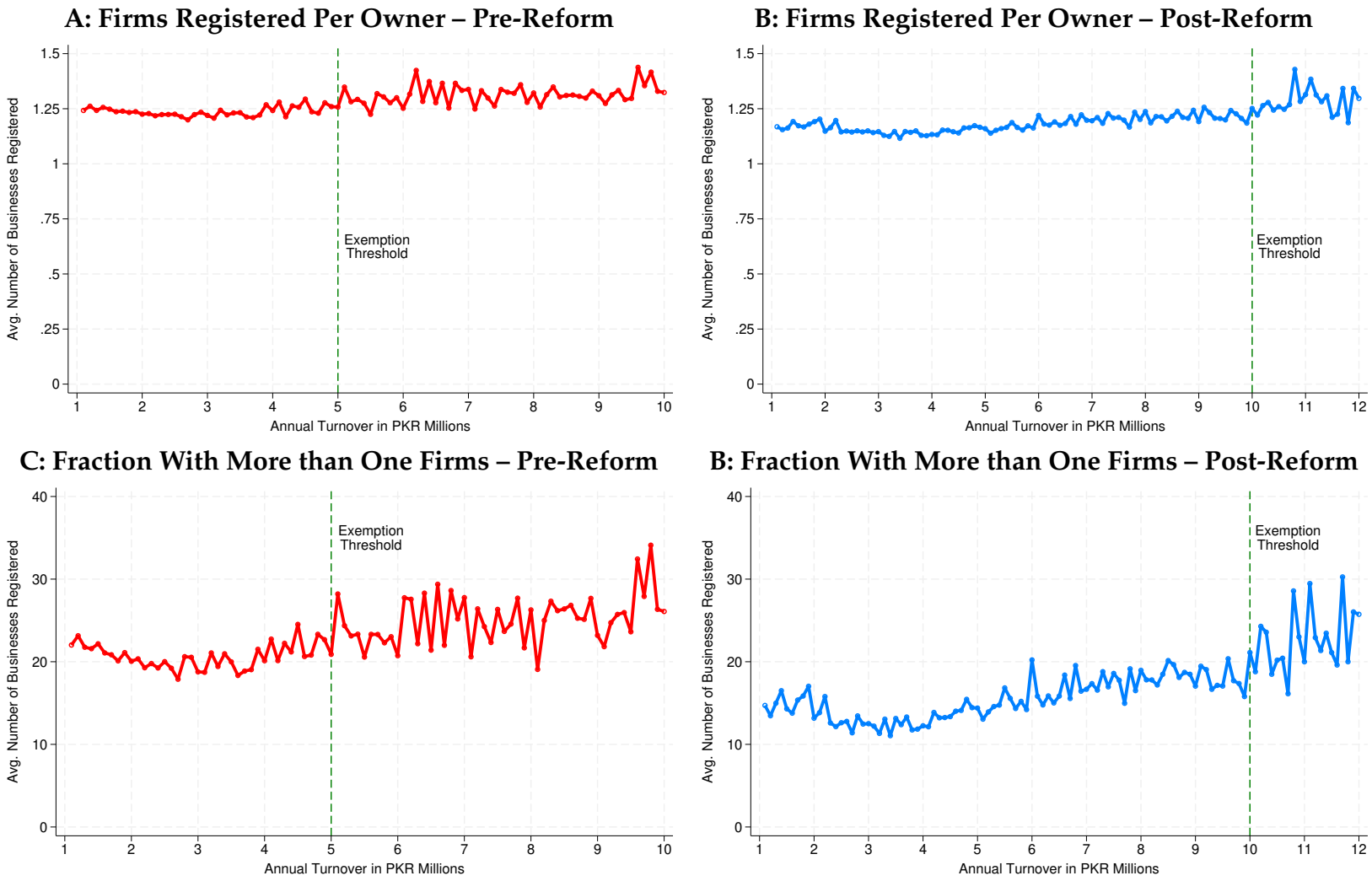
Notes: The figure uses the strategy developed by Marx (2024) to illustrate that the VAT threshold begins to distort firm growth from PKR 3 million onwards. The sample here consists of years 2006–2014, when the VAT threshold remained fixed at PKR 5 million. Each plot restricts the sample to firms with turnover in year t in the range indicated in the title of the plot. We then show the probability density function of the turnover growth of these firms. The turnover growth is defined as the percent increase in turnover from year t to $t+1$. We divide firms in each plot into three equal-sized intervals in terms of baseline turnover. The three vertical lines show the growth rate needed by the typical firm in each of these three groups to hit the VAT threshold in the next year i.e. in $t+1$.

FIGURE VI: **DYNAMIC BUNCHING**



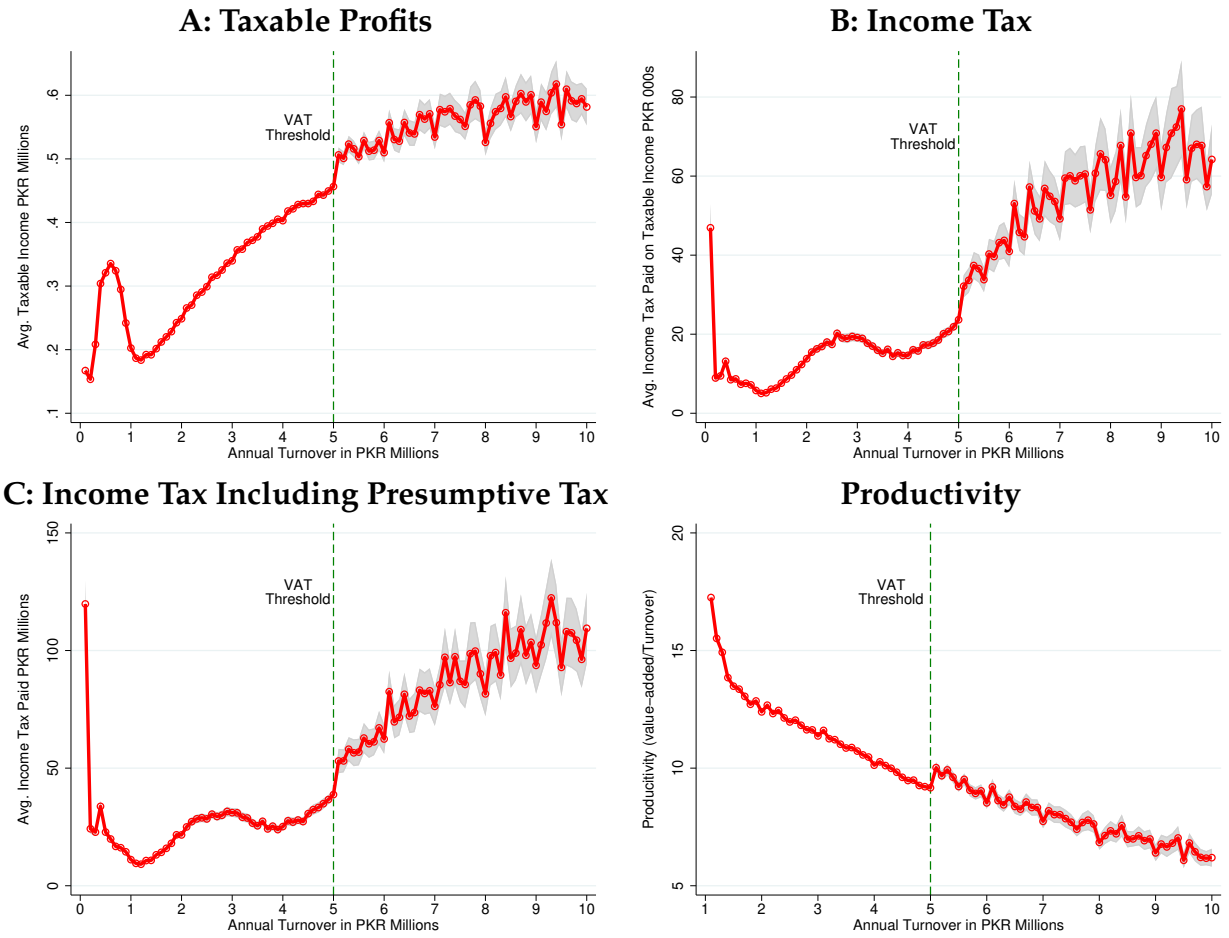
Notes: The figure uses the strategy developed by Garbinti *et al.* (2023) to illustrate that the VAT threshold begins to distort firm growth from PKR 3 million onwards. The technical details of this approach are provided in Appendix A.2. Panel A plots the distribution of the normalized growth rate for three groups of firms indicated in the legend of the plot. The normalized growth rate is defined as the growth rate in excess of the rate required for the typical firm in each group to cross the VAT threshold of PKR 5 million. The sample here consists of years 2006–2015, when the VAT threshold remained fixed at PKR 5 million. Panel B compares the distribution of normalized growth rate between the treatment and control groups. The treatment group comprises firms with baseline turnover in the range (3m, 5m], while the control group includes firms in the range (6m, 7m]. Panel C replicates the analysis using an alternative definition of the treatment and control groups. We now exploit the 2016 reform and compare firms located in the same range (3m, 5m] in a pre- and a post-reform year. The final panel conducts a placebo exercise, replicating the analysis in Panel B pretending that the VAT threshold is PKR 7 million rather than PKR 5 million.

FIGURE VII: **DO FIRMS SPLIT CLOSE TO THE THRESHOLD?**



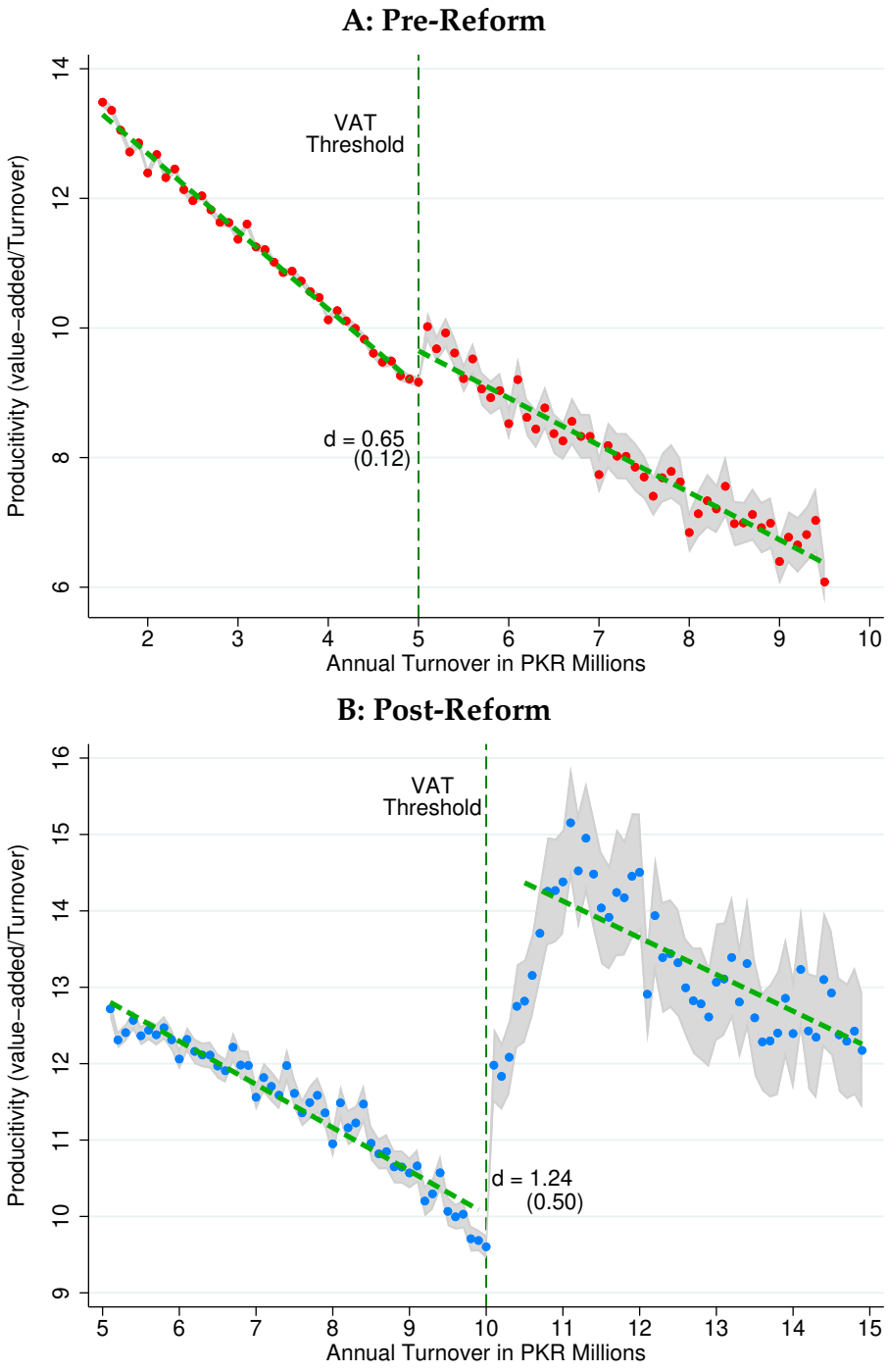
Notes: The figure explore if firms split up as they reach closer to the VAT threshold. The top two panels plot the average number of firms owned by the owner of each firm as a function of the firm's turnover, shown in the horizontal axis in bins of size PKR 100,000. The bottom two panels plot the average fraction of owners in each bin that own more than one firm. The sample for the left-hand side panels include pre-reform years (2006–2015) and for the right-hand side panels the post-reform years (2016–2020). The dashed vertical line in each plot indicates the VAT exemption threshold applicable to the corresponding sample.

FIGURE VIII: **PRODUCTIVITY JUMPS AT THE VAT THRESHOLD**



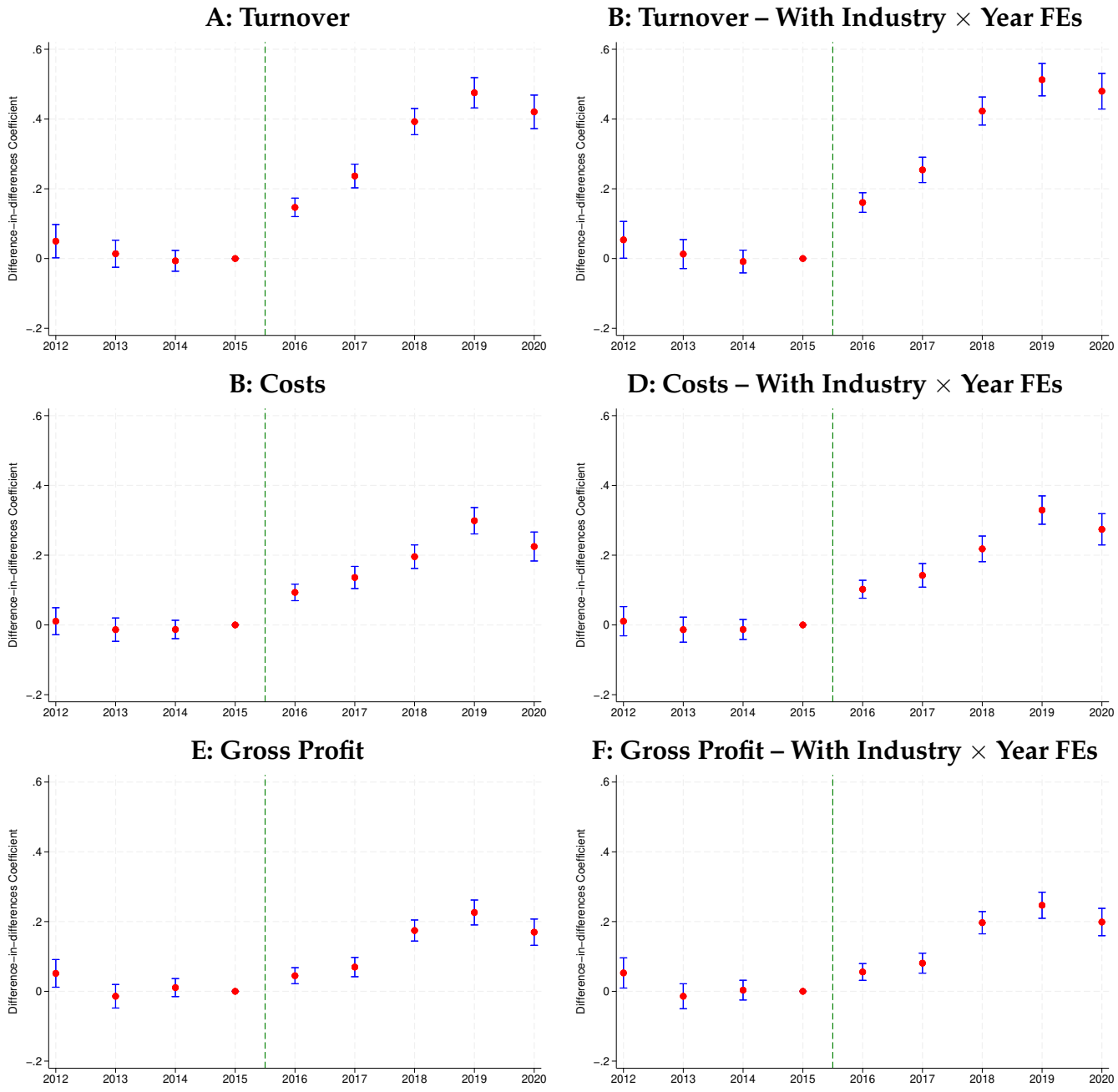
Notes: The figure plots the evolution of productivity around the VAT threshold. We examine four different measures of firm productivity. The sample consists of pre-reform years (2006–2015) only. Each marker in Panel A indicates the average taxable income reported by firms in each bin of size PKR 100,000. The gray surface plot around the curve shows the 95% confidence interval around the average. The green dashed line indicates the VAT threshold for the sample. Panel B replicates the analysis showing the average income tax paid by firms in each bin. Panel C also includes income tax paid under any presumptive tax scheme by the firm. The final panel uses the value-added of the firm normalized by its turnover as the measure of the productivity of the firm.

FIGURE IX: **PRODUCTIVITY JUMPS AT THE VAT THRESHOLD**



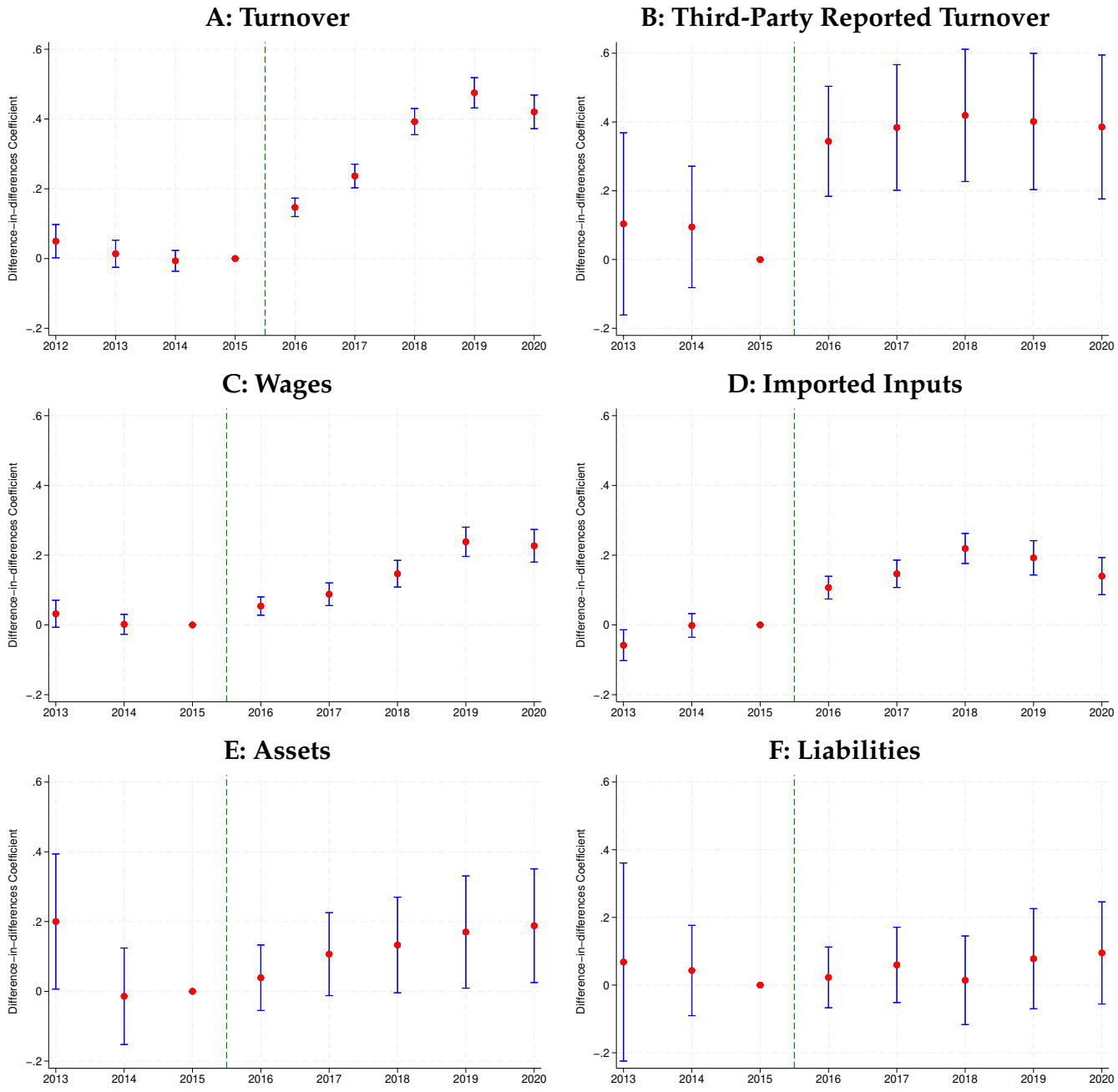
Notes: The figure documents the productivity jump at the VAT threshold. We use the value-added of the firm normalized by its turnover as the measure of the productivity of the firm. The sample for Panel A consists of pre-reform years (2006–2015) and for Panel B of post-reform years (2016–2020). We fit local linear regression models on both sides of the cutoff and select the bandwidth using the framework of Imbens & Kalyanaraman (2012). The estimates of the discontinuity d and its standard error are from the STATA package rd (please see Nichols, 2007 for details).

FIGURE X: **IMPACTS OF THE MOVEMENT OF THE EXEMPTION CUTOFF**



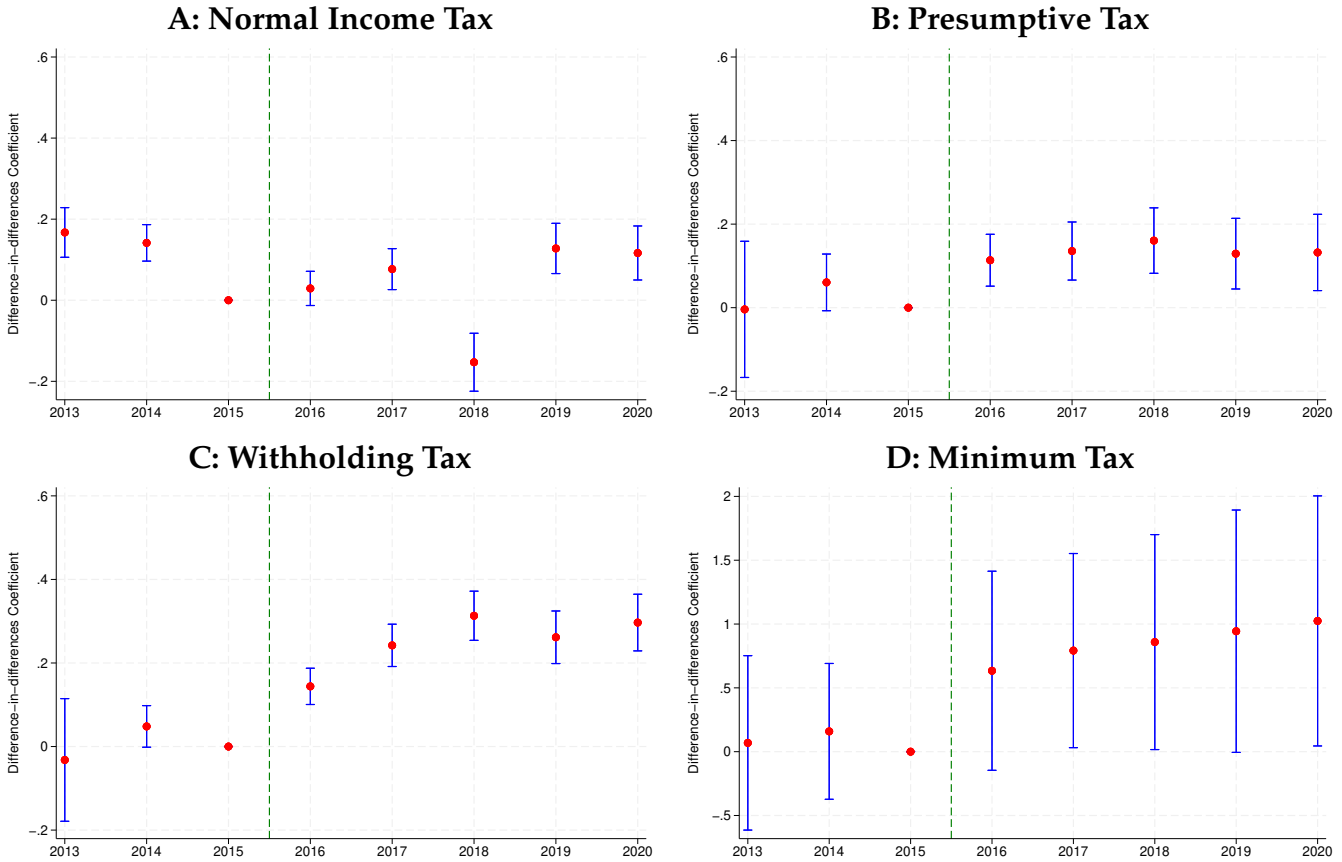
Notes: The figure plots the results from our event study specification (2). The sample consists of manufacturing firm for the years 2012 to 2020. The treatment group comprises firms that always reported turnover below the old exemption threshold of PKR 5 million. The control group comprises all other firms. The outcome is log turnover in top panels, log costs in middle panels, and log gross profits in the bottom panels. The right-hand side panels include industry × year fixed effects as additional controls. The vertical dashed line indicates the time from which the reform would begin to have effect. For precise definitions of the outcomes displayed here, please refer to section A.1.

FIGURE XI: **REAL VS. REPORTING RESPONSES**



Notes: The figure explores if the response to the VAT threshold was a *real* response. We plot the results from our event study specification (2). The sample consists of manufacturing firm for the years 2013 to 2020. The treatment group comprises firms that always reported turnover below the old exemption threshold of PKR 5 million. The control group comprises all other firms. The vertical dashed line indicates the time from which the reform would begin to have effect. Panel A shows the turnover response for this sample. The next three panels display outcomes that are less likely to be affected by reporting responses. The final two panels show the effects of the reform on the financial health of the treated firms. For precise definitions of the outcomes displayed here, please refer to section A.1.

FIGURE XII: **IMPACTS ON REVENUE**



Notes: The figure explores the effects of the 2016 reform on the tax remitted by firms. We plot the results from our event study specification (2). The sample consists of manufacturing firm for the years 2013 to 2020. The treatment group comprises firms that always reported turnover below the old exemption threshold of PKR 5 million. The control group comprises all other firms. The vertical dashed line indicates the time from which the reform would begin to have effect. The four panels show tax remitted by the firm under different heads. Panel A shows the tax paid by the firm on its reported taxable income under the standard income tax system. Panel B and C show the withholding tax paid by the firm. The difference between the two measures is that the withholding tax in Panel B is deemed as a final discharge of the firm's tax liability and is not adjustable, whereas the withholding tax in Panel C is the conventional, adjustable type of withholding tax. Panel D shows the minimum tax liability of the firm. Firms pay a minimum tax if their tax liability under the standard regime is below a set fraction of their turnover (see Best *et al.*, 2015 for details). For precise definitions of the outcomes displayed here, please refer to section A.1.

TABLE I: **IMPACTS OF THE MOVEMENT OF THE EXEMPTION CUTOFF**

Outcome:	Turnover	Costs	Gross Profit	Turnover	Costs	Gross Profit	Turnover	Costs	Gross Profit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
treatment × after	0.315***	0.187***	0.124***	0.345***	0.209***	0.144***	0.331***	0.193***	0.144***
	(0.014)	(0.012)	(0.011)	(0.009)	(0.008)	(0.007)	(0.015)	(0.013)	(0.012)
Observations	136,643	102,129	131,935	134,350	100,606	129,691	136,643	102,129	131,935
Firm Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry × Year Fixed Effect	No	No	No	Yes	Yes	Yes	No	No	No
Tax Office × Year Fixed Effect	No	No	No	No	No	No	Yes	Yes	Yes

Notes: The table reports the results from our difference-in-differences model corresponding to specification (2). The sample consists of manufacturing firm for the years 2012 to 2020. The treatment group comprises firms that always reported turnover below the old exemption threshold of PKR 5 million. The control group comprises all other firms. The outcome in each column is the log of the variable indicated in the heading of the column. Columns (4) – (6) include industry × year fixed effects and columns (7) – (9) tax office × year fixed effects. For complete definitions of the variables used here, please refer to section A.1. ***, **, and * denote significance at the 1%, 5%, and 10% levels.

TABLE II: **IMPACTS OF THE MOVEMENT OF THE EXEMPTION CUTOFF**

Outcome:	Turnover	Third-Party Reported Turnover	Wages	Imported Inputs	Assets	Liabilities
	(1)	(2)	(3)	(4)	(5)	(6)
treatment × after	0.315***	0.350***	0.122***	0.168***	0.120**	0.028
	(0.014)	(0.064)	(0.013)	(0.015)	(0.050)	(0.048)
Observations	136,643	23,685	80,785	79,701	75,130	78,186
Firm Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table reports the results from our difference-in-differences model corresponding to specification (2). The sample consists of manufacturing firm for the years 2012 to 2020. The treatment group comprises firms that always reported turnover below the old exemption threshold of PKR 5 million. The control group comprises all other firms. The outcome in each column is the log of the variable indicated in the heading of the column. Columns (4) – (6) include industry × year fixed effects and columns (7) – (9) tax office × year fixed effects. For complete definitions of the variables used here, please refer to section A.1. ***, **, and * denote significance at the 1%, 5%, and 10% levels.

TABLE III: **IMPACTS OF THE MOVEMENT OF THE EXEMPTION CUTOFF**

Outcome:	Normal Income Tax	Presumptive Tax	Withholding Tax	Minimum Tax
	(1)	(2)	(3)	(4)
treatment × after	-0.049**	0.111***	0.225***	0.751**
	(0.020)	(0.026)	(0.019)	(0.315)
Observations	90,883	61,487	84,168	10,874
Firm Fixed Effect	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes

Notes: The table reports the results from our difference-in-differences model corresponding to specification (2). The sample consists of manufacturing firm for the years 2012 to 2020. The treatment group comprises firms that always reported turnover below the old exemption threshold of PKR 5 million. The control group comprises all other firms. The outcome in each column is the log of the variable indicated in the heading of the column. Columns (4) – (6) include industry × year fixed effects and columns (7) – (9) tax office × year fixed effects. For complete definitions of the variables used here, please refer to section A.1. ***, **, and * denote significance at the 1%, 5%, and 10% levels.

TABLE IV: **IMPACTS OF THE MOVEMENT OF THE EXEMPTION CUTOFF – ELASTICITIES**

Outcome:	Turnover	Costs	Gross Profit	Turnover	Costs	Gross Profit	Turnover	Costs	Gross Profit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Elasticity	4.121***	3.696***	1.652***	4.707***	4.372***	2.009***	4.419***	3.984***	1.959***
	(0.180)	(0.233)	(0.144)	(0.202)	(0.263)	(0.161)	(0.199)	(0.264)	(0.161)
Observations	136,643	102,129	131,935	134,350	100,606	129,691	136,643	102,129	131,935
Firm Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry × Year Fixed Effect	No	No	No	Yes	Yes	Yes	No	No	No
Tax Office × Year Fixed Effect	No	No	No	No	No	No	Yes	Yes	Yes

Notes: The table reports the elasticity estimates from our specification (3). The sample consists of manufacturing firm for the years 2012 to 2020. The treatment group comprises firms that always reported turnover below the old exemption threshold of PKR 5 million. The control group comprises all other firms. We simulate the implicit tax rate as the VAT and income tax the firm would have remitted if its turnover were to increase by one rupee. We assume the pre-reform VAT rate as the standard VAT rate and the post-reform VAT rate as zero. We instrument the log net of tax rate by the *treatment*×*after* term, with τ being the simulated marginal tax rate. Columns (4) – (6) include industry × year fixed effects and columns (7) – (9) tax office × year fixed effects. For complete definitions of the variables used here, please refer to section A.1. ***, **, and * denote significance at the 1%, 5%, and 10% levels.

TABLE V: **IMPACTS OF THE MOVEMENT OF THE EXEMPTION CUTOFF**

Outcome:	Turnover	Costs	Gross Profit	Turnover	Costs	Gross Profit	Turnover	Costs	Gross Profit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
treatment $\times \mathbb{1}$(year $\in$ {2016,2017})	0.181***	0.118***	0.048***	0.197***	0.126***	0.062***	0.195***	0.128***	0.067***
	(0.014)	(0.011)	(0.010)	(0.011)	(0.010)	(0.009)	(0.014)	(0.012)	(0.011)
treatment $\times \mathbb{1}$(year=2018)	0.382***	0.199***	0.165***	0.413***	0.222***	0.190***	0.388***	0.201***	0.178***
	(0.018)	(0.015)	(0.014)	(0.015)	(0.013)	(0.012)	(0.018)	(0.016)	(0.014)
treatment $\times \mathbb{1}$(year $\in$ {2019,2020})	0.439***	0.268***	0.190***	0.487***	0.308***	0.217***	0.464***	0.272***	0.217***
	(0.020)	(0.016)	(0.015)	(0.012)	(0.011)	(0.009)	(0.021)	(0.018)	(0.016)
Observations	136,643	102,129	131,935	134,350	100,606	129,691	136,643	102,129	131,935
Firm Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry $\times$ Year Fixed Effect	No	No	No	Yes	Yes	Yes	No	No	No
Tax Office $\times$ Year Fixed Effect	No	No	No	No	No	No	Yes	Yes	Yes

Notes: The table explores the dynamics of our treatment effects. We reports results from our difference-in-differences model corresponding to specification (2). We partition the $after$ dummy into three parts, adding one dummy each for three sub-periods: 2016–2017, 2018, and 2019–2020. The sample consists of manufacturing firms for the years 2012 to 2020. The treatment group comprises firms that always reported turnover below the old exemption threshold of PKR 5 million. The control group comprises all other firms. The outcome in each column is the log of the variable indicated in the heading of the column. Columns (4) – (6) include industry $\times$ year fixed effects and columns (7) – (9) tax office $\times$ year fixed effects. For complete definitions of the variables used here, please refer to section A.1. ***, **, and * denote significance at the 1%, 5%, and 10% levels.

A Online Appendix

A.1 Definition of Variables

- **Earnings.** Taxable income reported by a firm on its tax return.
- **Turnover.** The total sales or revenue generated by a firm from its principal business activities during a given year.
- **Turnover Growth.** The rate at which a firm's turnover increases or decreases over a given year, expressed as a percentage of the previous period's turnover.
- **Taxable Profits.** The portion of a firm's profits that is subject to income tax, calculated by subtracting allowable deductions and exemptions from the firm's gross profits.
- **Income Tax.** A tax imposed on the taxable profits of a firm, which is calculated based on the applicable tax rates as stipulated by the Pakistani tax code.
- **Presumptive Tax.** Withholding taxes that are deemed as the final discharge of a firm's tax liability. Presumptive tax collected form the firm is not adjustable.
- **Productivity.** A measure of a firm's efficiency, calculated as the value added divided by turnover. Value added is defined as the firm's output minus intermediate consumption.
- **Costs.** The variable is also from the profit and loss account, and denotes what in accounting is referred to as the cost of sales. The cost is calculated by adding opening stock, net purchases, and manufacturing and trading expenses, and then taking away the closing stock.
- **Gross Profits.** The difference between turnover and the cost of goods sold, before accounting for operating expenses, taxes, and interest.
- **Wages.** Payments made by a firm to its employees for their labor, which includes salaries, bonuses, and other forms of compensation.
- **Assets.** Resources owned by a firm that have economic value and are expected to provide future benefits, including both tangible and intangible items such as property, equipment, and intellectual property.

- **Imported Inputs.** Imports are costs net of import duties and taxes that are incurred on imported inputs / investment goods.
- **Liabilities.** Financial obligations or debts that a firm owes to external parties, which must be settled in the future through the transfer of assets or provision of services.
- **Third-Party Reported Turnover.** The firm's revenue from transactions that are subject to withholding of income tax by the buyer and third-party reporting by it. These transactions include supplies against contracts to large firms.
- **Withholding Tax.** Pakistani tax code stipulates withholding on many transactions besides the payment of wages. These transactions include the payment for goods and services, utility bills, cash withdrawal from banks, and imports from other countries. The withheld tax can be adjusted against the tax liability at the time of filing of returns. The firms which withhold tax are required to file a statement with the FBR indicating the transactions and the tax withheld thereon.
- **Minimum Tax** The minimum tax paid by a firm if its tax liability under the standard regime is below a set fraction of its turnover.
- **Sole Trader** An individual who owns and operates a business on their own, without forming a corporate entity.
- **Company** A corporate body formed by or under any law in force in Pakistan.
- **Manufacturer.** A firm whose principal business activity is the manufacture of goods. Manufacturing is the process whereby a firm converts inputs into a distinct article capable of being put to use differently than inputs and includes any process incidental or ancillary to it.
- **Retailer.** A person, supplying goods to general public for the purpose of consumption.
- **Importer.** Any person who imports any goods into Pakistan.
- **Exporter** A person who exports goods and services to foreign customers outside of Pakistan.

A.2 Dynamic Bunching Approach

As established in Section IV, the static bunching framework may underestimate the distortions caused by size-based policies. Therefore, we utilize a dynamic bunching framework to identify the true distortions of the policy. Following the approach of Garbinti *et al.* (2023), we analyze the distribution of growth rates of reported turnover over time, rather than the reported turnover itself, as in the static bunching analysis.

Since firms at different parts of the revenue distribution may exhibit varying shapes and means of growth rates, we normalize these growth rates to a common reference threshold to make their distributions comparable. While the static framework plots the distance of reported revenue from the exemption threshold, the dynamic framework plots the distance of the growth rate of reported revenue from the growth rate required to reach the threshold. Specifically, for each firm, we calculate its actual growth rate in reported revenue in period $t+1$ (actual growth rate), the required growth rate to reach the exemption threshold (reference growth rate), and the difference between these two rates (normalized growth rate). This difference quantifies the distortion induced by the exemption threshold in the growth rates of firms, thus identifying dynamic bunching. Mathematically,

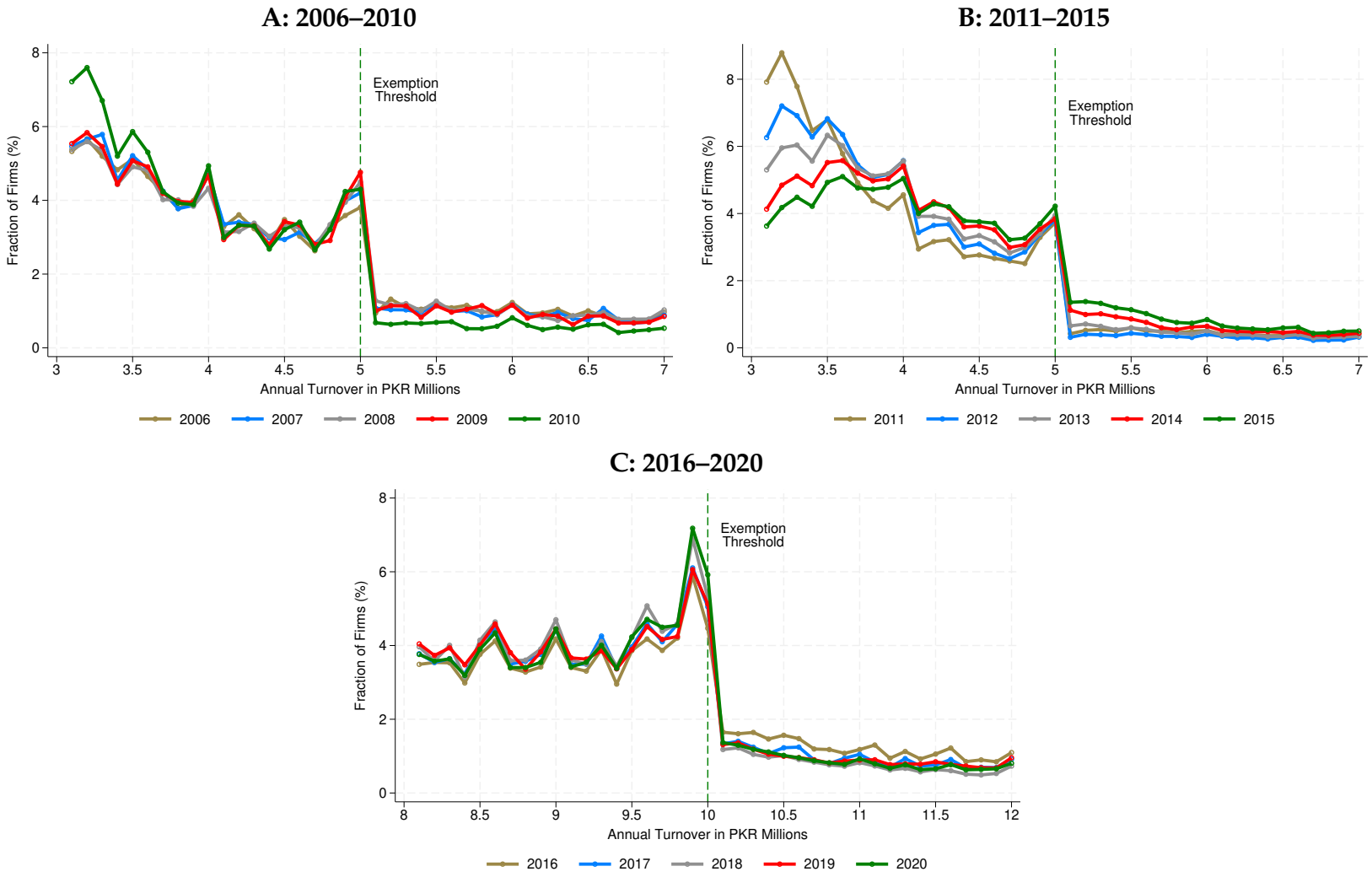
$$\tilde{g}_{i,t}(Z) = \frac{Y_{i,t+1} - Y_{i,t}}{Y_{i,t}} - \frac{Z_i - Y_{i,t}}{Y_{i,t}} = \frac{Y_{i,t+1} - Z_i}{Y_{i,t}}$$

Note that

- if $\tilde{g}_{i,t}(Z) = 0$ then firm i in period t is exactly at the threshold Z,
- if $\tilde{g}_{i,t}(Z) < 0$ then firm i in period t is below the threshold Z,
- if $\tilde{g}_{i,t}(Z) > 0$ then firm i in period t is above the threshold Z.

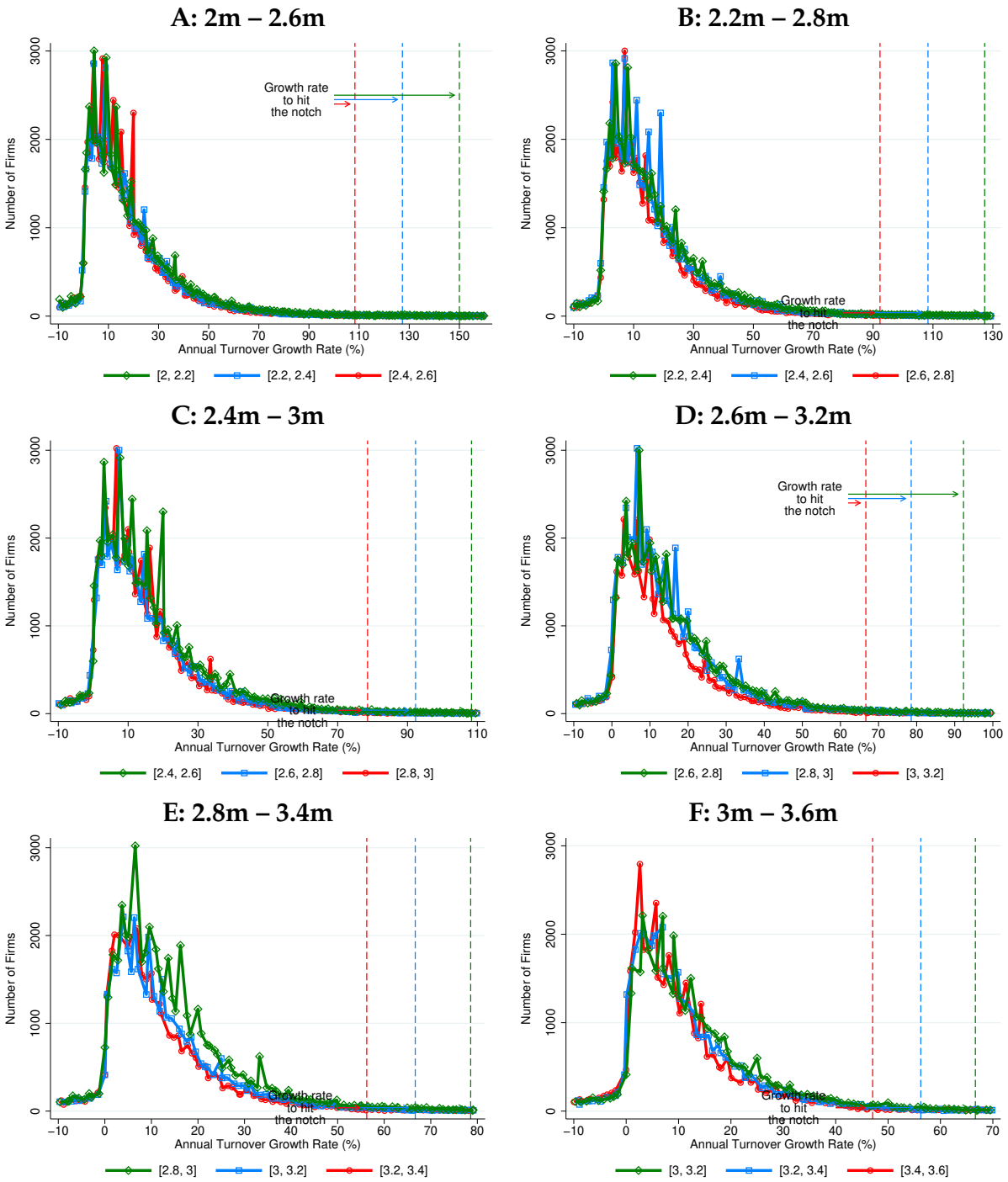
In this setting, while the group-specific distributions may have different means and shapes, the normalized distributions are comparable across groups. The results of this analysis, presented in Figure VI, show excess mass just below the normalized threshold, reduced mass just above it, and minimal distortions far from it. This graph provides non-parametric evidence of dynamic bunching patterns, demonstrating that static bunching frameworks underestimate the true distortions induced by size-based thresholds.

FIGURE A.I: **BUNCHING AT VAT EXEMPTION THRESHOLDS**



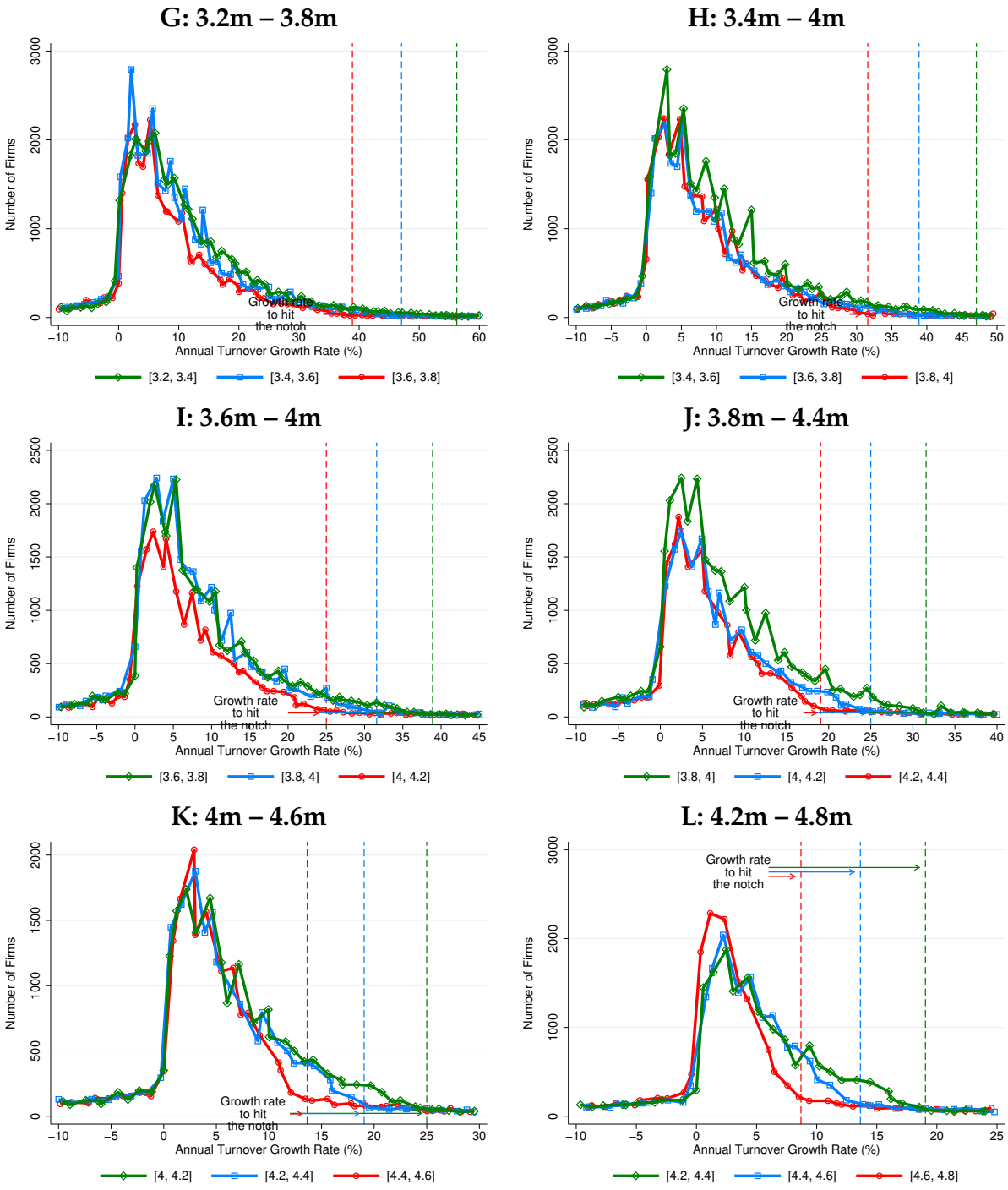
Notes: The figure shows the empirical distribution of turnover for firms around the VAT threshold separately for each year in our sample. We divide our sample into three parts: Panel A and B show results for the period 2006–2010 and 2011–2015 respectively. The VAT threshold during all these years stayed at PKR 5 million. Panel C shows results for the period 2016–2020, when the VAT threshold was PKR 10 million. The bin size is PKR 100,000 for all plots.

FIGURE A.II: **PDF OF TURNOVER GROWTH AROUND THE VAT THRESHOLDS**



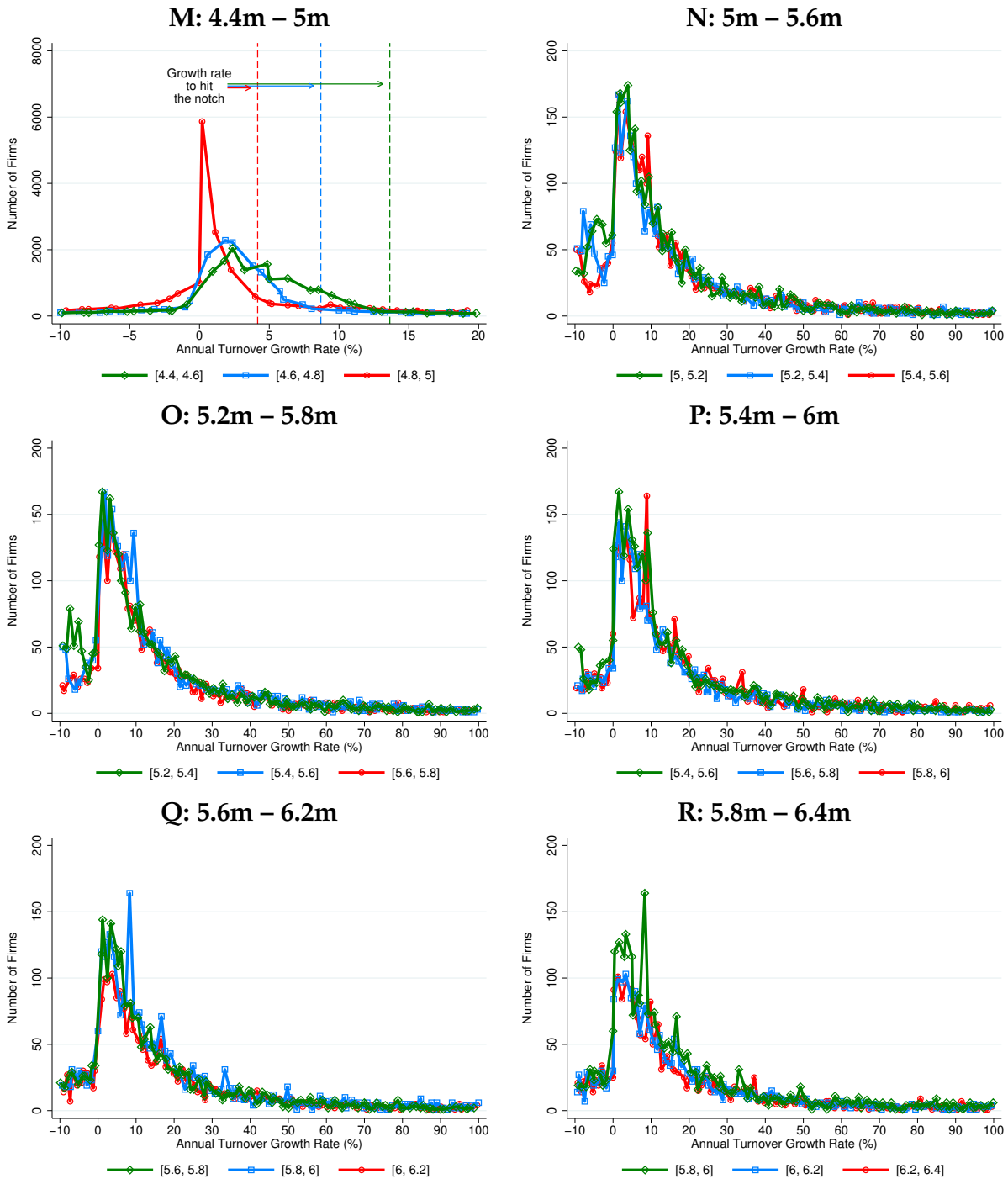
Notes: The figure uses the strategy developed by Marx (2024) to illustrate that the VAT threshold begins to distort firm growth from PKR 3 million onwards. The sample here consists of years 2006–2014, when the VAT threshold remained fixed at PKR 5 million. Each plot restricts the sample to firms with turnover in year t in the range indicated in the title of the plot. We then show the probability density function of the turnover growth of these firms. The turnover growth is defined as the percent increase in turnover from year t to $t+1$. We divide firms in each plot into three equal-sized intervals in terms of baseline turnover. The three vertical lines show the growth rate needed by the typical firm in each of these three groups to hit the VAT threshold in the next year i.e. in $t+1$.

FIGURE A.III: **PDF OF TURNOVER GROWTH AROUND THE VAT THRESHOLDS**



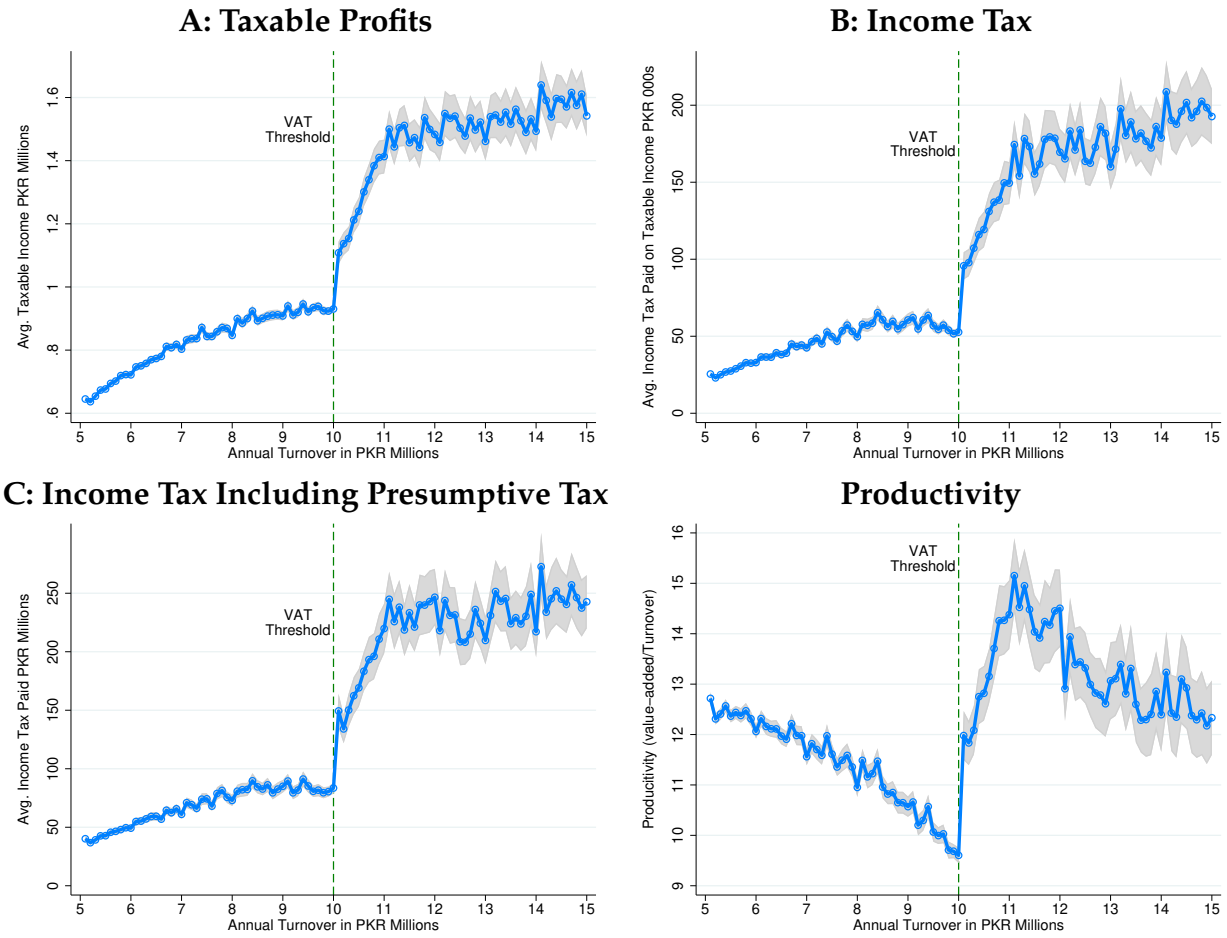
Notes: The figure uses the strategy developed by Marx (2024) to illustrate that the VAT threshold begins to distort firm growth from PKR 3 million onwards. The sample here consists of years 2006–2014, when the VAT threshold remained fixed at PKR 5 million. Each plot restricts the sample to firms with turnover in year t in the range indicated in the title of the plot. We then show the probability density function of the turnover growth of these firms. The turnover growth is defined as the percent increase in turnover from year t to $t+1$. We divide firms in each plot into three equal-sized intervals in terms of baseline turnover. The three vertical lines show the growth rate needed by the typical firm in each of these three groups to hit the VAT threshold in the next year i.e. in $t+1$.

FIGURE A.IV: **PDF OF TURNOVER GROWTH AROUND THE VAT THRESHOLDS**



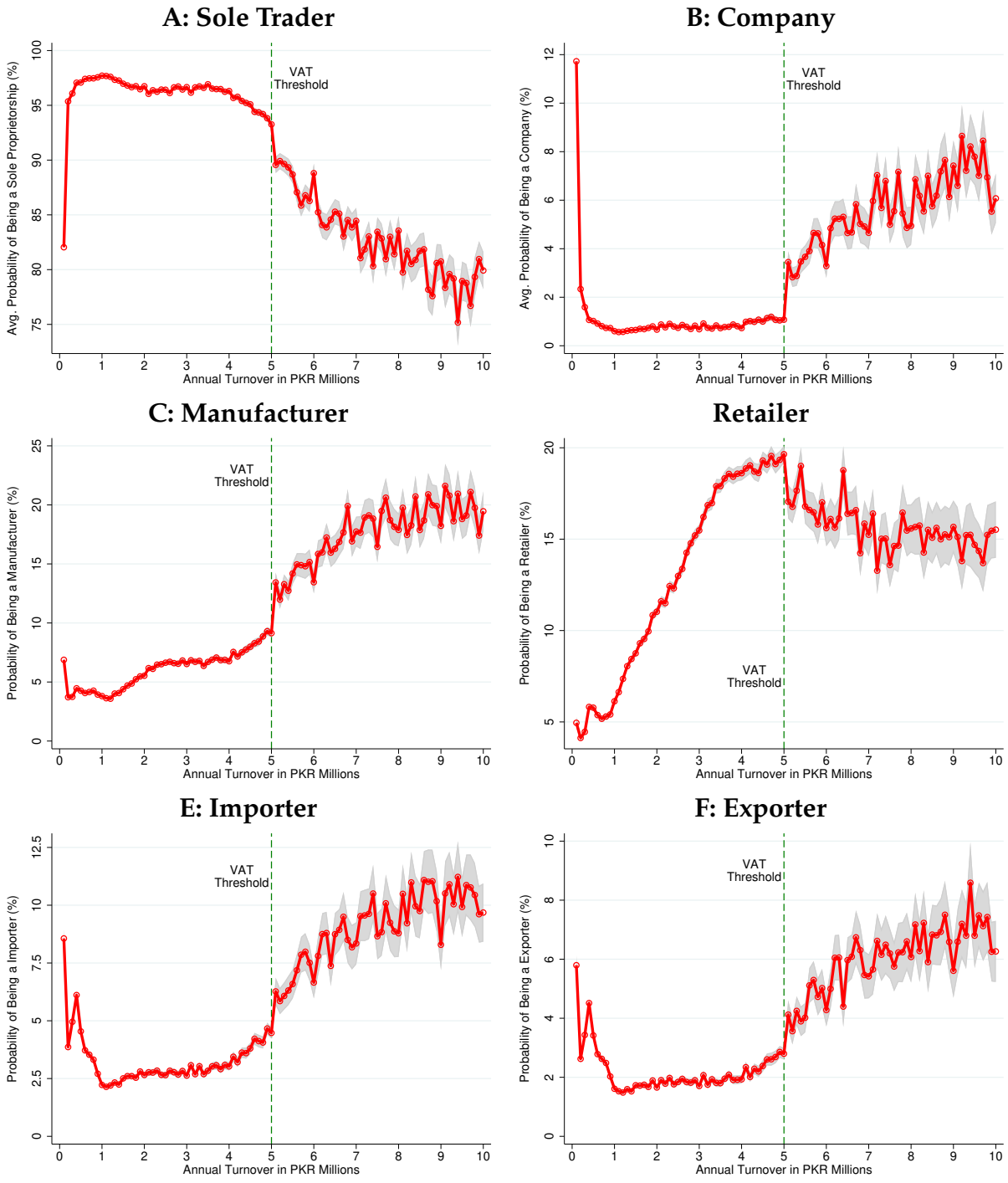
Notes: The figure uses the strategy developed by Marx (2024) to illustrate that the VAT threshold begins to distort firm growth from PKR 3 million onwards. The sample here consists of years 2006–2014, when the VAT threshold remained fixed at PKR 5 million. Each plot restricts the sample to firms with turnover in year t in the range indicated in the title of the plot. We then show the probability density function of the turnover growth of these firms. The turnover growth is defined as the percent increase in turnover from year t to $t+1$. We divide firms in each plot into three equal-sized intervals in terms of baseline turnover. The three vertical lines show the growth rate needed by the typical firm in each of these three groups to hit the VAT threshold in the next year i.e. in $t+1$.

FIGURE A.V: **PRODUCTIVITY JUMPS AT THE VAT THRESHOLD**



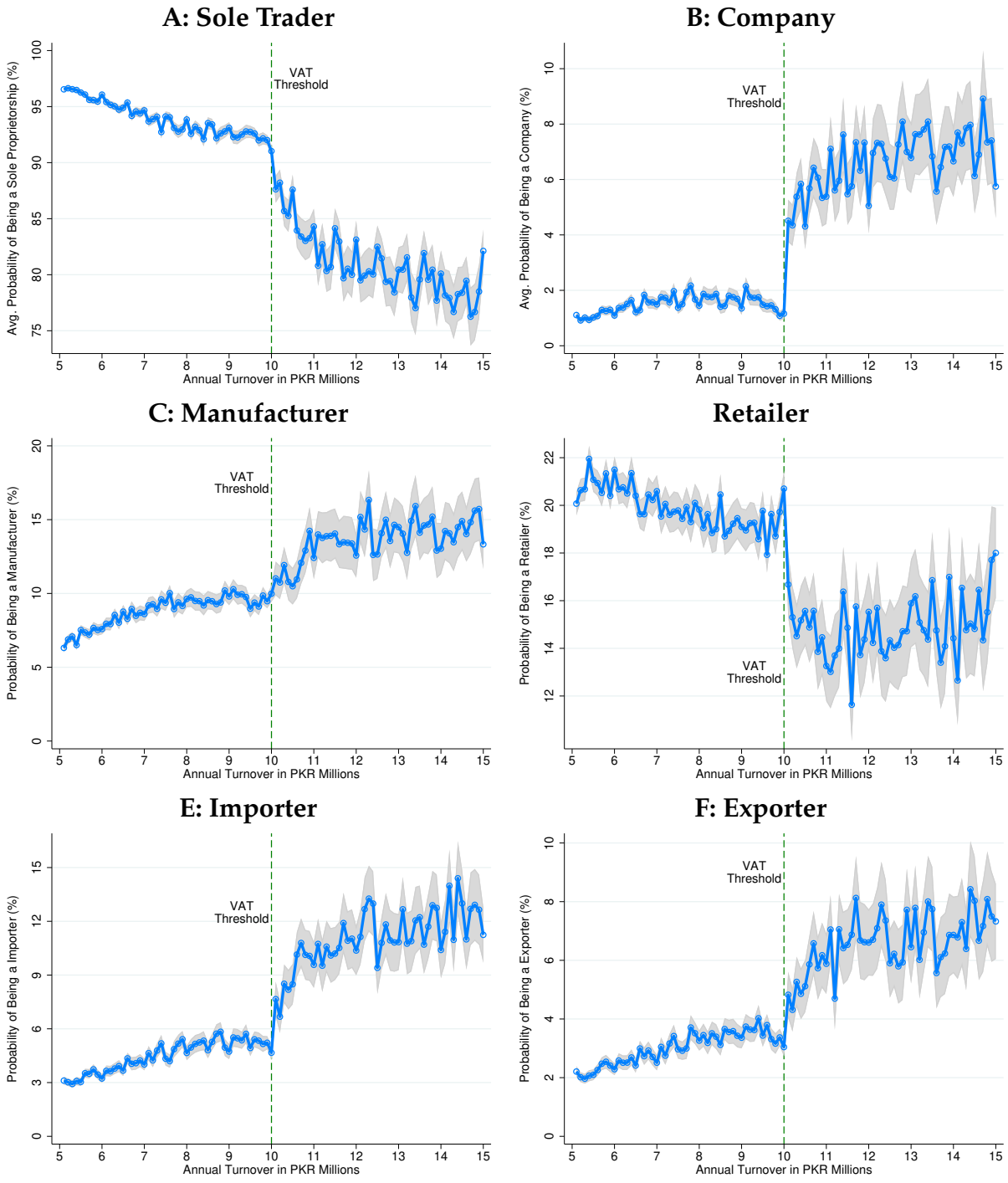
Notes: The figure plots the evolution of productivity around the VAT threshold. We examine four different measures of firm productivity. The sample consists of post-reform years (2016–2020) only. Each marker in Panel A indicates the average taxable income reported by firms in each bin of size PKR 100,000. The gray surface plot around the curve shows the 95% confidence interval around the average. The green dashed line indicates the VAT threshold for the sample. Panel B replicates the analysis showing the average income tax paid by firms in each bin. Panel C also includes income tax paid under any presumptive tax scheme by the firm. The final panel uses the value-added of the firm normalized by its turnover as the measure of the productivity of the firm.

FIGURE A.VI: **PRODUCTIVITY JUMPS AT THE VAT THRESHOLD**



Notes: The figure plots the evolution of firm characteristics around the VAT threshold. We examine six characteristics, signalling the productivity of firms. The sample consists of pre-reform years (2006–2015) only. Each marker in the plots indicates the share of firms in each bin of size PKR 100,000 having the characteristic indicated in the heading of the panel. The gray surface plot around the curve shows the 95% confidence interval around the average. The green dashed line indicates the VAT threshold for the sample. For complete definitions of the variables used here, please refer to section A.1.

FIGURE A.VII: **PRODUCTIVITY JUMPS AT THE VAT THRESHOLD**



Notes: The figure plots the evolution of firm characteristics around the VAT threshold. We examine six characteristics, signalling the productivity of firms. The sample consists of post-reform years (2016–2020) only. Each marker in the plots indicates the share of firms in each bin of size PKR 100,000 having the characteristic indicated in the heading of the panel. The gray surface plot around the curve shows the 95% confidence interval around the average. The green dashed line indicates the VAT threshold for the sample. For complete definitions of the variables used here, please refer to section A.1.