# The Dynamic Consequences of Kinks in the Corporate Tax Schedule

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**Abstract**

How do firms respond to kinks in the tax schedule, and how do these responses affect production efficiency and misallocation in the economy? We focus on the kinked corporate income tax schedule in Taiwan and a major tax reform in 2010, combined with administrative employer-employee linked tax return data. We find that firms bunch below the corporate income tax threshold by misreporting family labor inputs and shrink the size of production. As firms approach the threshold, they lower revenue growth rate by 10%. Such strategically production slowdown lead to an unexpected 30% increase in the exit rate. We further develop a dynamic model where firms make the static bunching choice and dynamic growth and exit decisions under the kinked tax schedule.

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# 1 Introduction

In recent years, reducing the corporate tax burden—through decreasing marginal tax rates and restricting the tax base—has become a global trend as governments seek to stimulate firm production and overall economic growth. Advocates argue that a reduced corporate tax burden encourages investment and stimulate production growth, while critics contend that these benefits have limited impact on economic expansion and come with significant fiscal revenue losses. While a growing body of research has examined firms' responses to marginal tax rate reductions, much less is known about the impacts of tax kinks on firm dynamics and market efficiency.

Tax kinks, where marginal tax rates shift abruptly at specific taxable income thresholds, are a common feature in corporate income tax (CIT) systems worldwide. These thresholds often serve to foster the growth of small and medium-sized firms while ensuring larger firms contribute their fair share to tax revenue. Despite their prevalence, most research on tax kinks has focused on firms' immediate, static responses near these thresholds, leaving the impacts on dynamic firm behavior largely unexplored. Understanding firms' adjustments in response to tax kinks, both in terms of revenue growth (intensive margin) and enter/exit decision (extensive margin), could reveal how such policies shape broader market efficiency and composition. If firms respond to tax kinks by distorting their production growth to avoid crossing thresholds, these adjustments could ultimately affect firm exit rates, market turnover, and aggregate economic performance.

The objective of this paper is to examine two key questions. First, how do firms dynamically respond to the corporate income tax kink? Second, what are the aggregate policy implications of tax kinks on market turnover, efficiency, and the trade-off between production stimulation and fiscal revenue loss? We focus on a corporate income tax reform in Taiwan in 2010, which involved a substantial increase in the exemption threshold and a reduction in the marginal tax rates. Specifically, the reform raised the taxable income exemption threshold (henceforth, tax threshold) from 50K NTD (New Taiwan Dollars) to 120K NTD (approximately 17K USD to 40K USD), allowing more small firms to be exempt from corporate income tax. Additionally, it lowered marginal tax rates across all brackets. This reform aimed to reduce business costs, stimulate economic growth, and promote fair tax obligations.

We use a comprehensive set of administrative tax data spanning from 2004 to 2018. Leveraging both third-party-reported value-added transaction-level data and self-reported annual corporate income tax records, we distinguish firms' real responses from their reporting responses. Supplementary employee-employer data with kinship information further enables us to document clear misreporting channels within family networks. Lastly, the extended panel structure allows us to examine firms' dynamic responses over time.

We present a stylized theoretical model to illustrate the impacts of kinks in the corporate in-

come tax schedule on firms' production, bunching, growth, and exit decisions. Firms make static bunching choices and decide whether to adjust the size of production and misreport cost items. Moreover, firms make entry and exit decisions based on the expected sum of flow profits over the infinite horizon. The model yields two key insights. First, when a tax kink is introduced, it incentivizes firms to lower their taxable income to benefit from a reduced marginal tax rate. Second, this short-term optimization stalls firms' growth, eventually reduces firms' expected value, and unexpectedly increases their probability of exit.

We empirically investigate how tax kinks affect firms' static and dynamic behavior. Our empirical exercise proceeds in two steps. First, we document three stylized facts on how firms react to tax kinks. We find a significant bunching at the tax threshold, driven by a combination of shrinking size of production and shifting corporate profit to personal incomes, as they tend to inflate labor costs paid to employees who are family members of the owner. Moreover, we observe that firms' real responses are not one-time adjustments but rather dynamic revenue growth slowdowns. This trend is accompanied by a significantly higher share of exits (as a percentage of total incumbents) just below the threshold compared to firms above it. Finally, we illustrate the trade-offs created by raising the exemption threshold using the dynamic bunching technique (Garbinti et al., 2023; Marx, 2024). The increased tax threshold eases constraints for small firms previously below the threshold and tax kink, encouraging their production growth. However, the new threshold incentivizes a group of medium-sized firms, previously above but now near the new threshold, to suppress production growth in response to the change. As a result, the trade-off between increased production, lost tax revenue, and the overall social welfare effect remains ambiguous.

To estimate the effects of the CIT exemption threshold on firms' responses, one primary challenge is the endogeneity of firm size, as firms may strategically position themselves below or above the threshold based on productivity or other characteristics. Additionally, identifying clear control groups is challenging, as all corporations were subject to the same corporate income tax schedule change. To address these issues, we leverage the exogenous increase in the exemption threshold from 50k NTD to 120k NTD in 2010, as outlined in Liu et al. (2022), to separate the effects on firms' production responses to the threshold from those driven by variations in firm size. Our findings indicate that, on average, firms slow their revenue growth rate by 1.2 percentage points (p.p.), representing approximately a 10% reduction in revenue growth compared to the baseline mean of 10 p.p. This slowdown is accompanied by a significant 2 p.p. increase in the probability of exit, which amounts to a 30% rise relative to the baseline mean of around 7 p.p.

In the next steps, we aim to structurally estimate the model's key parameters to evaluate the policy's impact on aggregate market efficiency, turnover, and fiscal revenue. Additionally, we will assess how tax kinks contribute to production efficiency loss in the market and quantify the potential tax revenue gains and reductions in misallocation under alternative tax policy designs.

**Literature** Our paper contributes to the following two strands of literature. First, this paper contributes to a substantial body of work analyzing firms' behavioral responses to the corporate income tax kink schedule. The literature generally focuses on estimating the implied elasticity of corporate taxable income from static bunching patterns (Auerbach et al., 2007; Dwenger and Steiner, 2012; Bachas and Soto, 2021) or differentiating specific real and reporting responses in a static setting (Devereux et al., 2014; Coles et al., 2022; Lobel et al., 2024).[1] Our paper contributes to this literature by providing firm-level evidence on firms' dynamic growth, entry, exit, and productivity, in addition to their static responses, while distinguishing between real and reporting strategies. Additionally, there is a growing literature on firms' dynamic responses to size-based thresholds (Tam, 2023; Choudhary and Gupta, 2024; Garbinti et al., 2023; Muthitacharoen et al., 2021), which mainly focuses on value-added tax thresholds defined in terms of gross revenue. We extend this by documenting firms' dynamic responses to the corporate income tax kink schedule.

Second, our paper relates to the broader literature examining the effects of regulations and reforms on market efficiency and dynamics, including R&D incentives (Chen et al., 2021) and labor regulations (Braguinsky et al., 2011; Gourio and Roys, 2014; Garicano et al., 2016; Amirapu and Gechter, 2020). Our policy simulations contribute to this understanding by analyzing the aggregate equity and efficiency implications of corporate income tax kink schedules. Additionally, our study offers a new perspective on East Asian comparative development and the origins of small and medium-sized enterprises (SMEs) through the lens of tax policy. For example, Aw et al. (2003) empirically highlights that Taiwanese manufacturers experience a higher turnover rate compared to those in South Korea, underscoring unique dynamics in SME formation.

The remainder of this paper is structured as follows: Section 2 describes the Corporate Income Tax Reform in Taiwan and the data used for analysis. Section 3 we develop the model of firms with corporate income tax kink schedule. Section 4 presents descriptive evidence of firms' response to Taxable Notch, follow up by the regression analysis. Finally, Section 6 concludes the paper for now.

[1] Devereux et al. (2014) explore the option for owner-managers to over-report deductible expenses. Bachas and Soto (2021) decompose the elasticity of corporate taxable income into elasticity of revenue and deduction costs, using a unique corporate tax schedule based on gross revenue in Costa Rica.

# 2 Policy Background and Data

## 2.1 Corporate Income Tax Reform

Corporations in Taiwan are subject to an annual corporate income tax (CIT), which generated total revenue of 334 billion NTD (11 billion USD) in 2009, accounting for 21.8% of gross tax revenues.[2] This tax is levied on business profits, calculated as a firm's revenue minus production cost, including material input, labor salary, capital cost, and various other expenditures. The corporate income tax system is progressive, with a basic tax schedule that incorporates a threshold. Firms with annual corporate taxable income below this threshold face a zero statutory tax rate. However, once taxable income surpasses the threshold, a higher statutory tax rate is applied to the entire taxable income, creating a jump in the total tax payment.

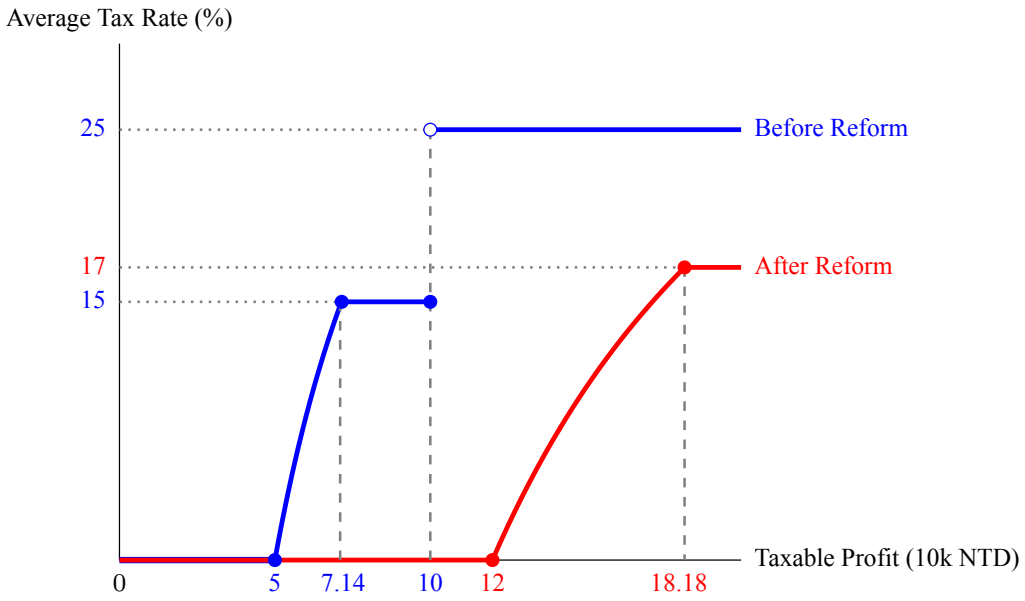
There was a major change in the corporate income tax schedule in 2010, replacing the previous schedule that had been in place since 1986. As illustrated in Figure 1, the older tax schedule was characterized by three tax brackets. The tax threshold was at 50K NTD (approximately 1,622 USD). Firms with annual corporate taxable income below this threshold were exempt from the corporate income tax. However, the statutory tax rate jumped to 15% if the annual taxable income exceeded 50K NTD, and further increased to 25% if the annual net income exceeds 100K NTD (approximately 40,000 USD). To smooth the tax rate change for small enterprises, the government set a buffer range immediately above the threshold, capping the corporate income tax below fifty percent of the amount that exceeded the threshold until the average tax rate reached 15%. Consequently, the tax schedule introduced two tax kinks and one tax notch. The exact tax amount $T^0$ can be summarized in the following formula, with $I$ denoting the taxable income.

$$T^0(I) = \begin{cases} 0, & \text{if } I < 50K \\ \min\{15\% \times I, 50\% \times (I - 50K)\}, & \text{if } 50K \leqslant I < 100K \\ 25\% \times I, & \text{if } I \geqslant 100K. \end{cases}$$

The Income Tax Act Amendment, proposed by the Ministry of Finance, was approved by the cabinet on March 5th, 2009. This Amendment was officially enacted in 2010. The amendment overall raised the tax threshold and lowered the tax rates in each tax bracket. According to the Ministry of Finance, this corporate income tax reform was implemented to achieve two policy goals. First, lowering the CIT rate could reduce the cost of doing business, attract more foreign investment, and boost economic growth. Second, the reform could alleviate the tax burden, especially for small

[2] Source: Chapter 1: A General Description of Taxation, Guide to ROC Taxes 2011 from ttc.gov.tw. and Public Finance and Tax Statistics.

**Figure 1:** Corporate Income Tax Rate




*Notes*: This figure shows the corporate income tax schedule in Taiwan. The blue curve denotes the tax schedule before 2010, and the red curve denotes the tax schedule in 2010 and after.

and medium enterprises, and thus achieve fair tax obligation.[3] After the reform, the corporate income tax rate in Taiwan was lower than that in mainland China (25%) and South Korea (22%), and equivalent to that in Singapore (17%) and Hong Kong (16.5%).[4] As shown in Figure 1, the three tax brackets in the previous tax schedule were combined into two, and the threshold was raised to 120K NTD (approximately 3,892 USD). The statutory tax rate was also lowered from 25% to 17% if the annual taxable income exceeded 120K NTD. Similar to the previous tax schedule, the government still set a buffer range immediately above the threshold, such that the corporate income tax was capped below fifty percent of the amount that exceeded the threshold until the average tax rate reached 17%. Accordingly, the new tax schedule introduced two tax kinks and no tax notch. The exact tax amount $T^1$ can be summarized in the following formula, with $I$ denoting the taxable income.

$$T^1(I) = \begin{cases} 0, & \text{if } I < 120K \\ \min\{17\% \times I, \quad 50\% \times (I - 120K)\}, & \text{if } I \geqslant 120K. \end{cases}$$

Another important source of tax revenues is the business tax, including the value-added tax (VAT). VAT is paid bi-monthly and relies on a third-party reporting system for monitoring both business-to-business transactions and the amount of material and capital inputs. The third-party

[3] Source: https://www.ey.gov.tw/Page/9277F759E41CCD91/cfe7d369-e943-4a2a-8db8-cedc19384885.
[4] Source: https://www.lawtw.com/archives/388050.

reporting system restrains firms from filing false tax information for VAT.

## 2.2 Data

Our empirical analysis is mainly based on an employee-employer-linked data set, combining administrative corporate tax income records, value-added tax records, personal income statements for employees, and household registration records. These data sets are maintained by the Ministry of Finance in Taiwan, and we constructed a comprehensive sample covering the years from 2004 to 2018.

The employer-side information contains detailed information on the corporate income tax and value-added tax at the annual level. The corporate income tax files provide comprehensive, balanced sheet information, including gross revenues, total costs, and total expenditures, as well as a complete list of the breakdown items. The value-added tax files provide information on business-to-business transactions, as well as the material and capital purchases. Moreover, the data set also covers the basic information of firms including firm ownership, industry, establishment date, and location.

The employee-side information is extracted from the W2 files contained in the individual personal income statements. We access the annual salary of employees and link it with the employer data. We also obtain the kinship relationship of employees with the firm owners from the household registration records, which enables us to identify whether an employee is a family member of the firm owner.

We perform additional steps to process the data and obtain the final sample. First, we focus on corporations that apply to the corporate income tax schedule and calculate taxable income according to the general corporate income tax guidelines described above.[5] Second, we discard around 3% of observations with any missing variables required to calculate corporate taxable income. A descriptive summary of the final sample used in the empirical analysis is provided in Table 1.

[5] Specifically, we exclude sole proprietorships and partnerships, as their profits are counted as personal income for the firm owners and are therefore subject to personal income tax. We also exclude corporations that file their taxes using a special simplified method, which may include additional criteria on gross revenues and constraints on taxable income calculation.

**Table 1:** Summary Statistics

| | Mean | SD | N |
|---|---|---|---|
| **Panel A: Pooled 2004-2009** | | | |
| Gross Revenue | 2,225.80 | 4137.81 | 245,460 |
| Material Inputs | 1448.77 | 3281.42 | 245,460 |
| Fixed Total Asset | 364.39 | 1460.11 | 245,460 |
| Labor Salaries | 250.87 | 399.32 | 245,460 |
| Labor Salaries from family-member | 45.73 | 48.93 | 245,460 |
| Labor Salaries from non-family-member | 205.14 | 385.06 | 245,460 |
| **Panel B: Pooled 2010-2017** | | | |
| Gross Revenue | 1783.22 | 3744.88 | 302,170 |
| Material Inputs | 1174.41 | 2973.11 | 302,170 |
| Fixed Capital Investment | 345.06 | 1731.85 | 302,170 |
| Labor Salaries | 193.13 | 340.10 | 302,170 |
| Labor Salaries from family-member | 38.50 | 46.87 | 302,170 |
| Labor Salaries from non-family-member | 154.62 | 325.22 | 302,170 |

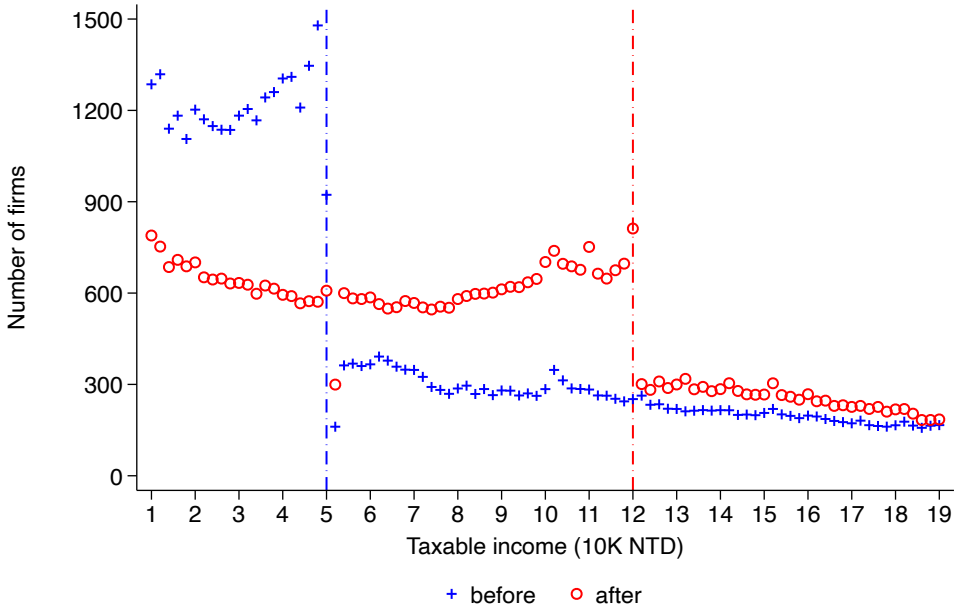
*Notes*: This table shows summary statistics before and after the 2010 corporate income tax reform (pre-reform pooled 2004-2009 in Panel A, and post-reform pooled 2010-2017 in Panel B). All the number unit is in thousand New Taiwan Dollar (NTD).

## 2.3 A First Glimpse of the Data

We take a first glimpse of the data and describe the distribution of corporate taxable incomes. As shown in Figure 2, we observe a sharp drop in the number of firms at the tax threshold of 50K NTD before the reform. The average number of firms was around 1,300 for each 2 thousand NTD taxable income bin below the threshold. However, this number decreased sharply to around 600 right above the threshold. As the tax schedule before the reform was in place for over twenty years, the discontinuity in the distribution of corporate taxable incomes indicates strong and persistent incentives for firms to manage their corporate taxable incomes below the threshold to avoid paying any corporate income tax. Moreover, we don't observe a sharp bunching right below the threshold of 50K NTD. Instead, the distribution of firms was evenly spread in the region below the threshold. According to Figure 1, there was a tax notch at 100K NTD and another tax kink at around 71.4K NTD. However, we don't observe any discontinuity at these two critical points.

After the 2010 corporate income tax reform, the threshold was raised to 120K NTD and the tax rate above 120K NTD was also significantly reduced. We observe a discontinuity in the taxable income distribution at this new threshold. The number of firms remained roughly unchanged for the taxable income bins above 120K NTD. However, a large number of firms with taxable incomes below 50K NTD were shifted to the taxable income bracket between 50K NTD and 120K NTD. Consistent with the observations before the reform, we find the distribution of firms was still evenly

**Figure 2:** Distribution of Corporate Taxable Incomes




*Notes*: This figure shows the average annual distribution of corporate taxable incomes before the reform (2004-2009, in blue plus) and after (2010-2017, in red circle). The vertical axis denotes the average number of firms yearly in each taxable income bin. The horizontal axis represents the taxable income bins. For example, the bin 1 represents firms that have taxable income between 10 thousand NTD (included) and 12 thousand NTD (not included).

spread in the region below the threshold and there was no discontinuity at the other tax kink of 181.8K NTD. The change in the distribution in response to the new tax schedule after the reform suggests that it is indeed motivated by the corporate income tax kink, and firms strategically lower their reported taxable income to bunch below the tax kink.

# 3 Theoretical Model

We present a stylized theoretical model to illustrate the impacts of kinks in the corporate income tax schedule on firms' production, bunching, growth, and exit decisions. There is a continuum of heterogeneous firms in a perfectly competitive market. Time is discrete and denoted as $t$. Each firm $i$ differ in their optimal production size $y_{it}$, which follows an Markov process $F(y_{it+1}|y_{it})$. Firm $i$ is also faced with the output price $p$, and the cost function for producing an output $y_{it}$ is represented by $c(y_{it})$, which is convex in $y_{it}$.

The corporate taxable income is calculated as $\pi(y_{it}) = py_{it} - c(y_{it})$. If the government introduces kinks in the corporate income tax schedule such that firms with profit $\pi_{it}$ below $\bar{\pi}$ would

enjoy a zero tax rate, while firms with profit above $\bar{\pi}$ are subject to a high tax rate $\tau$.

$$\tau_{it} = \begin{cases} 0, & \text{if } \pi_{it} \leqslant \bar{\pi} \\ \tau, & \text{if } \pi_{it} > \bar{\pi} \end{cases}$$

The kinks in the corporate income tax schedule induce the tax avoidance incentives. Firm $i$ faces the decision of whether to bunch their corporate incomes below $\bar{\pi}$, the reported profit would be $\pi^r(y_{it}) = py_{it} - \theta c(y_{it}), \theta > 1$. The profit actually obtained by the firm is $\pi^a(y_{it}) = py_{it} - \delta_i c(y_{it}), \delta_i > 1$, and $\delta_i$ represents the heterogeneous misreporting cost.

If firm $i$ decides to bunch at $\bar{\pi}$, the output will be shrunk to $\tilde{y}$ such that $\pi^r(\tilde{y}) = p\tilde{y} - \theta c(\tilde{y}) = \bar{\pi}$. The actually profit will therefore be $\pi_i^a(\tilde{y}) = p\tilde{y} - \delta_i c(\tilde{y})$. Firm $i$ decides whether to bunch or not, following the function below.

$$\max\{\pi_i^a(\tilde{y}), (1-\tau)\pi_{it}\mathbb{1}(\pi_{it} > \bar{\pi}) + \pi_{it}\mathbb{1}(\pi_{it} \leqslant \bar{\pi})\}$$

Only firms with misreporting cost lower than $\bar{\delta}$ will bunch and $\bar{\delta}$ satisfies $p\tilde{y} - \bar{\delta}c(\tilde{y}) = (1-\tau)\bar{\delta}$. For firms with misreporting cost $\delta_i < \bar{\delta}$, those whose $y_{it} \in (\underline{y}_i, \bar{y}_i)$ will bunch at $\bar{\pi}$. $\underline{y}_i$ and $\bar{y}_i$ satisfy the following two conditions.

$$\pi_i^a(\underline{y}_i) = \pi(\underline{y}_i), \qquad \pi_i^a(\bar{y}_i) = (1-\tau)\pi(\bar{y}_i).$$

Therefore, if the misreporting cost is not prohibitively high, or the optimal production size is not too low or too high, firm $i$ will choose to bunch at $\bar{\delta}$ to avoid paying high corporate income taxes. Moreover, the bunching region $(\underline{y}_i, \bar{y}_i)$ will be wider if the misreporting cost is lower.

The bunching incentives will also slow down the revenue growth of the firm. The natural growth rate of firm $i$ with optimal production size $y_{it}$ is defined as follows.

$$\%\Delta y_{it} = \frac{\int\limits_{y_{it+1}} y_{it+1} dF(y_{it+1}|y_{it})}{y_{it}} - 1.$$

However, for firms which bunches in year $t$, the growth rate is defined as follows.

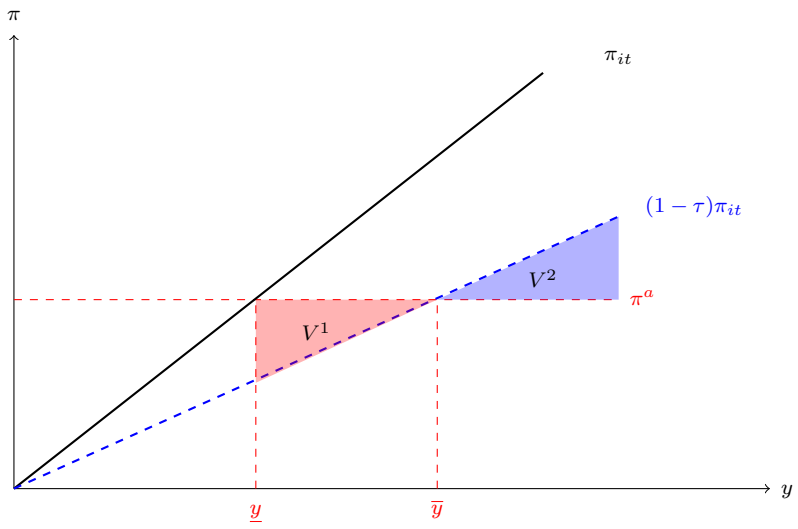
$$\frac{\int\limits_{y_{it+1}} y_{it+1} dF(y_{it+1}|\tilde{y}) - \int\limits_{y_{it+1} > \underline{y}_i}^{\bar{y}_i} (y_{it+1} - \tilde{y}) dF(y_{it+1}|\tilde{y})}{\tilde{y}} - 1 < \%\Delta y_{it}.$$

Moreover, the slowdown of revenue growth could also lead to the increase in the exit rate. Suppose the present value of the fixed cost is $c_f$ and firms exit the market if the discounted sum of

the flow profit falls short of the fixed cost. For firms that bunch their output such that the profit is $\pi_a$, given the discount factor $\beta$, the expected present value of future profit is $\frac{\beta\pi_a}{1-\beta}$ due to the stalled growth. Therefore, the exit rate is defined as $E_i^1 = Pr(\frac{\beta\pi_a}{1-\beta} < c_f)$.

However, for firms that don't bunch the reported profit, the expected present value of future profit is $\sum_{s=1}^{\infty} \beta^s(1-\tau)E[\pi(y_{it+s})|y_{it}]$. Therefore, the exit rate is defined as $E_i^2 = Pr(\sum_{s=1}^{\infty} \beta^s(1-\tau)E[\pi(y_{it+s})|y_{it}] < c_f)$. Heuristically, if the area $V_2$ is greater than $V_1$, $E_i^2$ could also be greater than $E_i^1$. Therefore, the tax kinks could potentially increases the exit rate for those firms which bunch at the threshold.

**Figure 3:** Model Illustration




*Notes*: This figure shows the corporate income tax schedule in Taiwan. The blue curve denotes the tax schedule before 2010, and the red curve denotes the tax schedule in 2010 and after.

# 4 How Firms Respond to Taxable Kinks

In this section, we explore firms' response to the tax kinks as well as the changes in the tax threshold. Motivated by the discontinuity in the corporate income distribution as well as the insights from the theoretical model, we first adopt a bunching estimator to quantify the bunching responses to the tax kinks. We then investigate the static input choices to answer the question of how firms achieve bunching within each period. Finally, we describe the growth rate as well as the exit rate to explore the dynamic consequences of tax kinks over time.

## 4.1 Bunching Responses

We adopt the bunching estimator following Saez (2010) and Kleven and Waseem (2013) to to quantify firms' bunching response to the tax kink. We first group the data into bins of the firms' corporate taxable income $I_j$, and estimate the counterfactual distribution using the following equation.

$$f_j = \sum_{i=0}^{q} \beta_i \cdot (I_j)^i + \sum_{k=I_{ub}}^{I_{lb}} \gamma_k \cdot \mathbf{1}(I_j = k) + \eta_j.$$

$f_j$ is the number of firms in taxable income bin $j$. We use $q$ to denote the order of the polynomial $(I_j)^q$. By assuming that only firms within the exclusion region $[I_{ub}, I_{lb}]$ would respond, we can use the distribution outside of the exclusion region to construct the counterfactual. $\gamma_k$ captures the intercept shift generated by firms' response to the policy of each bin within the exclusion region. The counterfactual distribution, in the absence of the policy, is predicted by the follows.

$$\hat{f}_j = \sum_{i=0}^{q} \widehat{\beta}_i \cdot (I_j)^i.$$

We denote the tax threshold as $\bar{I}$ and the bunching mass area ($B$) and the missing mass area ($H$) are given by the follows.

$$\hat{B} = \sum_{j=I_{lb}}^{\bar{I}} (f_j - \hat{f}_j) \geqslant 0, \quad \hat{H} = \sum_{j=\bar{I}}^{I_{ub}} (\hat{f}_j - f_j) \geqslant 0.$$

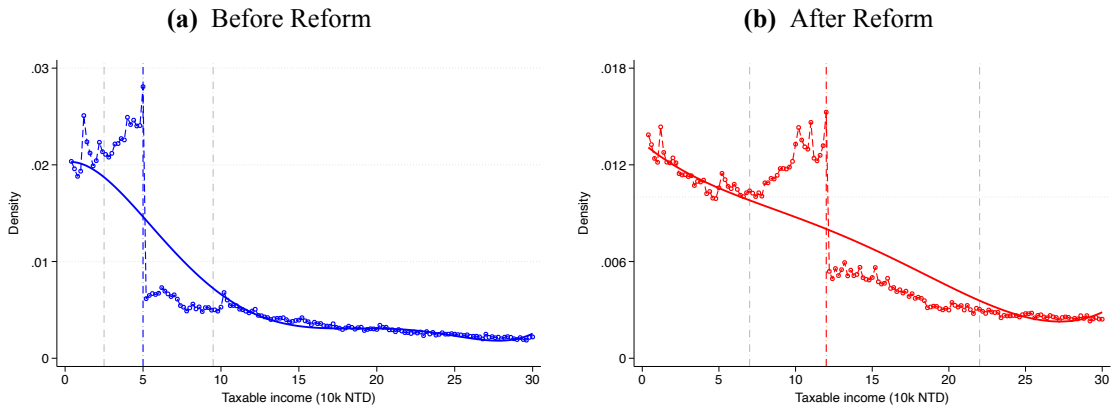
The estimates of the bunching response are shown in Figure 4. The solid line represents the estimated counterfactual distribution. The vertical gray line indicates the lower and upper bound of the exclusion region, generated by a data-driven procedure to ensure that the aggregated density of observed and counterfactual distribution is the same. Firms' bunching response $dI$ is defined as the percentage of the firms' density in the exclusive region, which measure the firms average taxable income response to the exemption threshold.[6]

$$dI = \frac{\hat{B}}{\frac{1}{2}(\hat{f}_{\bar{I}} + \hat{f}_{I_{ub}})}$$

[6]Following the bunching literature (Saez, 2010; Chetty et al., 2011; Kleven and Waseem, 2013; Almunia and Lopez-Rodriguez, 2018), the bunching estimator $b$ is interpreted as the average response of bunchers. Specifically, $B = \int_{\bar{I}}^{I_{ub}} \hat{f}(\bar{I})\, dI \approx \frac{1}{2}[\hat{f}(\bar{I}) + \hat{f}(I_{ub})]dI$, where $\hat{f}(I)$ represents the counterfactual density of firms' taxable income without the tax kink. Consequently, $dI \equiv \frac{B}{\frac{1}{2}[\hat{f}(\bar{I}) + \hat{f}(\bar{I} + dy^H)]} \approx dI$. Once we introduce heterogeneity in firms productivity that determine their taxable income, the bunching estimator $dI \approx E(dI)$ is interpreted as weight average of bunch's response and the lack of reaction of non-bunchers.

$\hat{f}_{\bar{I}}$ and $\hat{f}_{I_{ub}}$ are the number firm in each bin of the counterfactual distribution at the tax kink and at the upper bound of the bunching interval, respectively. On average, we find firms lowered their corporate taxable income by 13K NTD (approximately 26% of the corporate income tax threshold) to avoid exceeding the 50K NTD threshold. After the reform as shown in Panel (b), firms on average lower 27K (approximately 22% of the corporate income tax threshold) NTD to avoid exceeding the 120K NTD threshold. One thing worth noting is that the bunching estimation is constrained by the fraction of firms in the range $[I_{th}, I_{ub}]$ that do not respond to the threshold, as firms with corporate taxable income above the tax threshold and below the upper bound of the exclusive region do not respond to the threshold. The fraction of firms that do not respond to exempt threshold is between 59-69%.[7]

**Figure 4:** Estimated Counterfactual Density and the Average Bunching Response




*Notes*: This figure shows the density distribution of corporate taxable incomes before the reform (2004-2009) in Figure 3(a) and after (2010-2017) in Figure (b) with the bunching estimator reported at the right corner of each panel. The horizontal axis represents the taxable income bins. The vertical axis denotes the firms' density of corporate taxable income between 0 and 300,000 NTD. The vertical blue (in panel A) and red (in panel B) indicates the CIT exempt threshold before and after the reform. The vertical dashed line represents the lower bound and upper bound of the exclusive region.

We also explore the heterogeneity of the distribution across different industries and the dynamics of the distribution after the reform. As shown in Appendix Figure A.4, we observe almost the same distribution pattern in four major sectors in Taiwan: wholesales, retail, manufacturing, construction, as well as all the remaining industries, despite their different volumes of firms. Moreover, as presented in Appendix Figure A.5, the transition of the distribution before and after the reform was quick. The distribution became stationary since the year when the new tax schedule was enacted. Table A.1 presents the bunching estimator by year. The results are robust to a series

[7]Following the literature, the fraction of firms that do not respond is defined as $a \equiv \frac{\int_{\bar{I}}^{I_{ub}} f_0(I)dI}{\int_{\bar{I}}^{I_{ub}} f(I)dI}$.

of alternative specifications. We show that the results are robust to a wide range of polynomial orders and the exclusive region in the Appendix.

## 4.2 How do firms bunch?

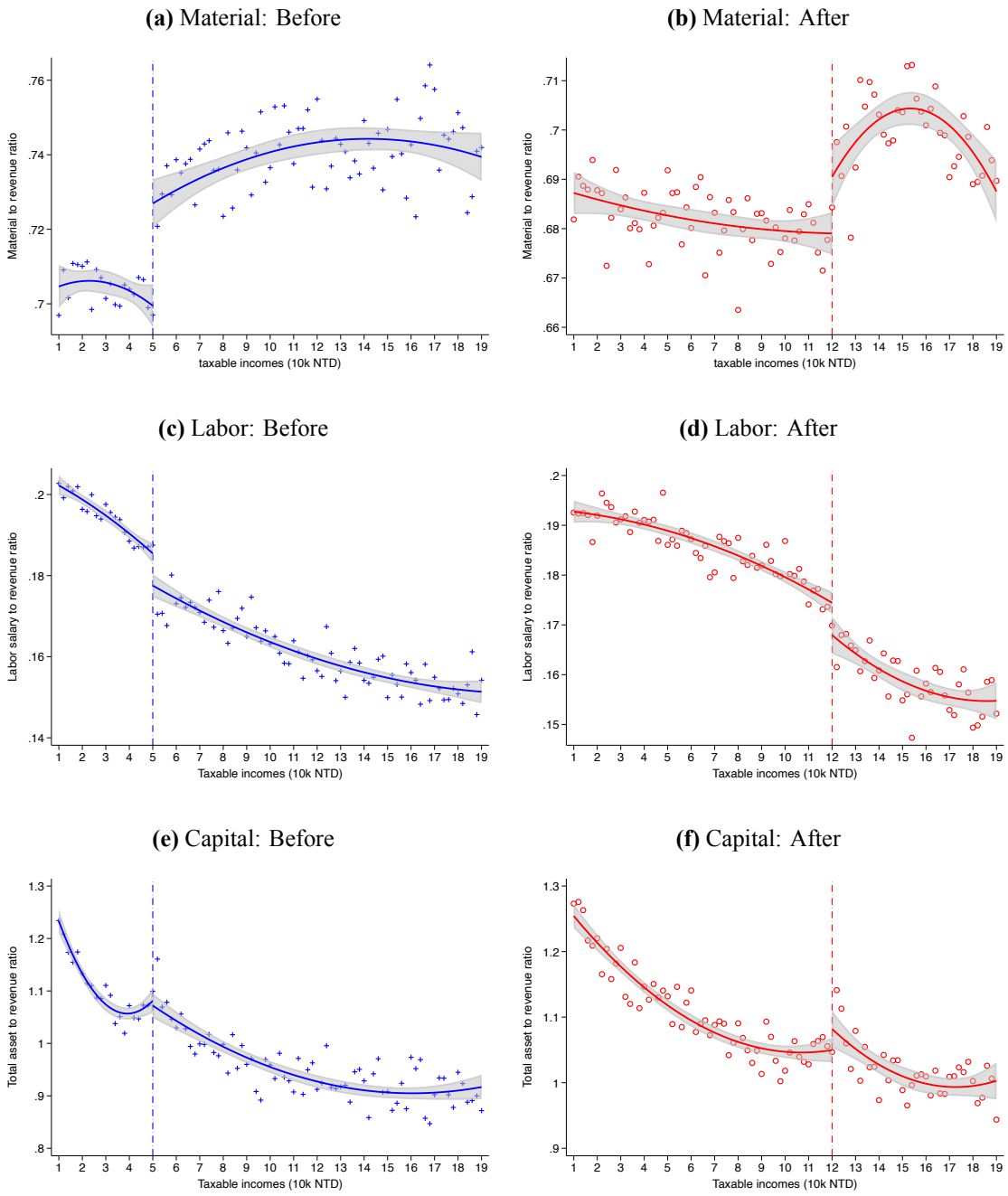
We next investigate the channels for firms to manage their taxable income below the threshold and respond quickly to the change of the threshold. According to the accounting rule of calculating the taxable income, it could be roughly defined as firm revenues minus material inputs, capital costs, and labor salaries. Therefore, we explore the following three channels: under-reporting revenues, shrinking firm size, and over-reporting costs. We find that firms respond to the tax threshold with a combination of real and reporting adjustments.

**A Lack of Revenue Misreporting** We explore the average firm revenues across taxable income bins as shown in Appendix Figure A.1, and find no evidence that firms strategically lower their reported revenue by manipulating the reported gross revenue. The average firm revenues by taxable bin are increasing with respect to taxable incomes, and the relationship is smooth around the thresholds and displays no discontinuity. If firms manage their taxable incomes mainly by strategically controlling their revenues, we expect to observe a sharp drop in total revenues left to the threshold, which is inconsistent with the data pattern we observe.

To ease the concerns of revenue misreporting, we measure the revenues from business-to-business transactions in the VAT records and constructed the ratio of the business-to-business revenues to firms' total revenues.[8] Following Kleven et al. (2011) and Carrillo et al. (2017), if firms tend to under-report revenue, they will tend to hide the business-to-consumer transaction but leave the business-to-business transactions unchanged. As shown in Appendix Figure A.2, the ratio of the business-to-business revenues is around 70% across different taxable income bins and both before and after the reform. Since the VAT relies on a third-party reporting system for monitoring business-to-business transactions, the revenues are less likely to be misreported, and this piece of evidence serves as additional support that distorting total revenues might not be an important force to manage taxable incomes. It might be relatively more costly for firms to under-report their revenues than to take other strategies.

[8] A value-added tax (VAT) system serves as a third-party reporting system. It makes the revenue from selling intermediate goods to other firms (business-to-business transaction, B2B), easy to track. Since such transaction records are the deduction term of the buyer firms, buyer firms would always have an incentive to report such transactions to the tax authority. Assuming no collusion exists between supplier and buyer firms, it is easy to cross-check the discrepancy in B2B sales. Therefore, B2B transactions are subject to higher transaction traceability. In contrast, revenue from selling goods to the final consumer (business-to-consumer transaction, B2C) is subject to lower transaction traceability. Since the final consumer would not be incentivized to keep the receipts and report to the IRS, B2C is subject to lower transaction traceability.

**Figure 5:** Input Revenue Ratios and Taxable Income




*Notes*: This figure shows the average input revenue ratios with respect to corporate taxable income bins before the reform (2004-2009) and after (2010-2017). Panel (a) and (b) plot the ratios of material and gross revenue; Panel (c) and (d) plot the ratios of labor salary and gross revenue; Panel (e) and (f) plot the ratios of capital and gross revenue. The horizontal axis represents the taxable income bins. The vertical axis denotes the firms' average gross revenue growth rate. The vertical dashed line indicates the corporate income tax exemption threshold. The quadratic fitted lines with 95% confidence intervals are added for taxable income bins below and above the threshold respectively.

**Shrinking Firm Size** Next, we explore if firms lower their taxable income by shrinking firm size. We examine this channel by focusing on the share of intermediate input with respect to the total revenue. If firms shrink their size in response to the tax kinks, we expect to observe a lower intermediate input share, since the intermediate input share is increasing with the total output if the production function is decreasing returns to scale. We plot the binned intermediate input share in Panel (a) and (b) of Figure 5. Before the reform, we observe a clear and statistically significant drop just below the 50K NTD taxable income threshold. This discontinuity is still present in the data after the reform, but is shifted to the new threshold at 120K NTD. Collectively, these results suggest that firms situated just below the tax threshold generally employ a lower ratio of intermediate inputs to generate production compared to their counterparts positioned just above the threshold, which indicates that these firms strategically shrink size of production to avoid high tax rate.

Importantly, this pattern is unlikely to be driven by the reporting behavior, as the intermediate inputs are important deduction items in the value-added tax which is strictly monitored. Moreover, the intermediate inputs are required to be reported bi-monthly in the Taiwanese VAT system, which increases the misreporting cost compared to other items that are reported only annually, such as labor expenditures.

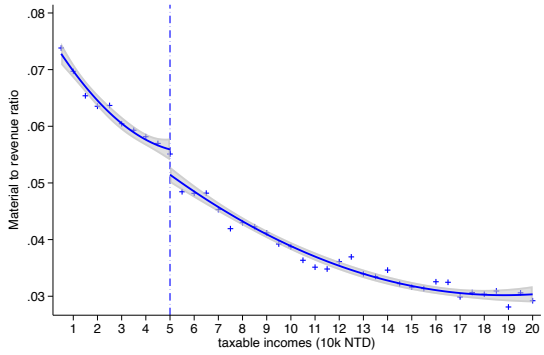
**Shifting Labor Costs** We explore the labor reporting behavior in Panels (c) and (d) in Figure 5, and find the average ratio of labor costs to total revenues is relatively stable left to the taxable income threshold at 50K NTD before the reform, following a significant drop immediately right to the threshold. Such pattern shifts correspondingly to the increased tax threshold at 120K NTD after the reform. The average ratio of labor costs to total revenues is relatively stable left to the taxable income threshold, while there is a significant drop immediately right to the threshold. The significant shift in labor cost share between 50k and 120k taxable income further indicates that firms strategically lower their taxable income by inflating labor cost as a deduction term.

We investigate whom exactly firms increase their revenue on the record by linking the firm-level data to employee information to explore the heterogeneity within the firm. If the increased salary is a *reporting strategy* to lower the taxable income, the most straightforward way is to increase the salary of those who own the firms or the manager of the firm who can make the decision. We divide all employees into two groups: those related to the shareholder of the firms (relatives), and those not related to the shareholder of the firms (non-relatives). The results shown in Figure 6 demonstrate that misreporting is mainly driven by the salary paid to employees who are related to the shareholder of the firms, while we observe null effects on the salary paid to other employees. As a result, we interpret the higher labor cost share as a *reporting strategy*, which serves as a way to manage their taxable incomes right below the threshold.

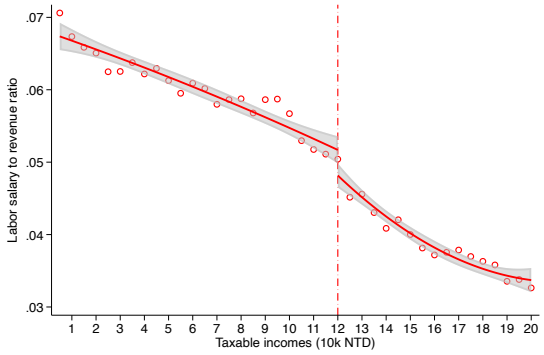
**Other Mechanisms** We explore the capital revenue shares in the Panels (e) and (f) in Figure 5 but we don't observe a salient pattern on the cpacity shares. Moreover, we rule out the possibility that firms adjust their taxable incomes by splitting into multiple smaller firms. As we could access firms' shareholder information, we define splitting firms as those which have a common shareholder with any other firms and calculate the ratio of splitting firms to the total number in each tax bin. The result is shown in Appendix Figure A.3 and we observe no shape discontinuity in the ratio of firm splitting either with respect to the taxable income threshold or before/after the reform. The ratio remained roughly 10-15% across all taxable income bins over time. Consequently, the changing ownership is unlikely to be the main driving force in the empirical facts we find.

**Figure 6:** Labor Salary Ratio and Taxable Income: Family and Non-family Member

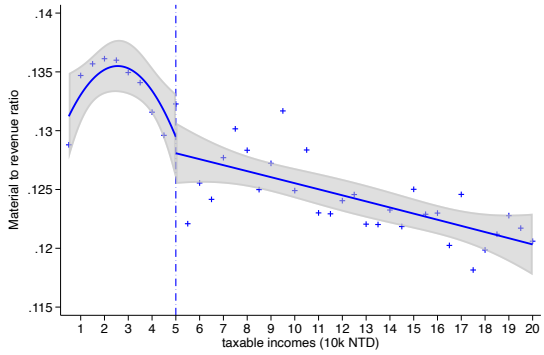
**(a)** Salary to Family Member Employee: Before



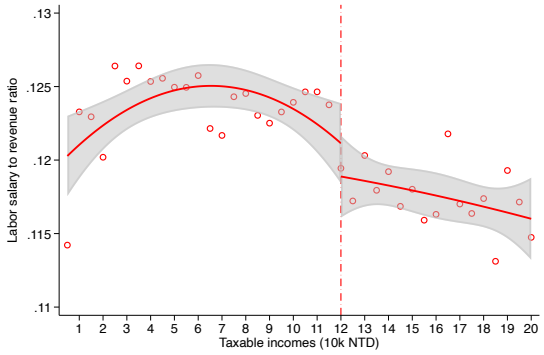

**(b)** Salary to Family Member Employee: After




**(c)** Salary to Non-Family Member Employee: Before




**(d)** alary to Non-Family Member Employee: After

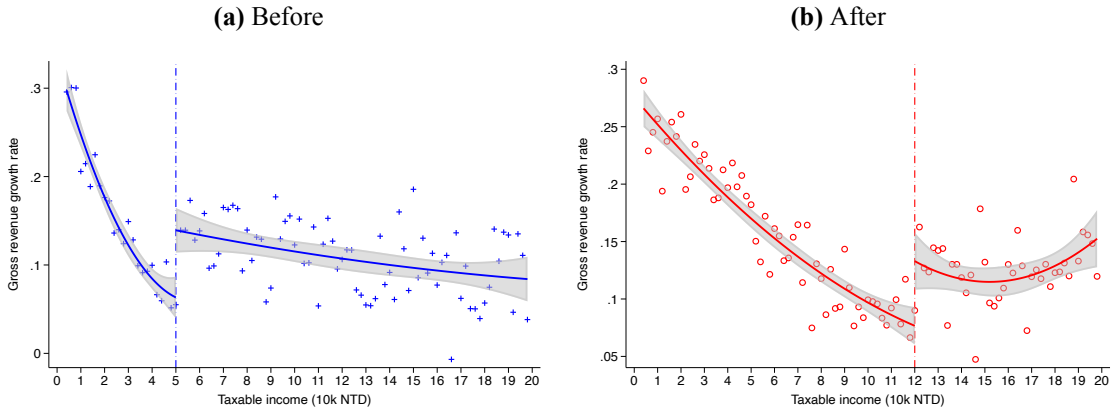



*Notes*: This figure shows the average input revenue ratios with respect to corporate taxable income bins before the reform (2004-2009) and after (2010-2017). Panel (a) and (b) plot the ratios of salary paid to the family members of firm owners; Panel (c) and (d) plot the ratios of salary paid to the non-family member Employee; The horizontal axis represents the taxable income bins. The vertical axis denotes the firms' average gross revenue growth rate. The vertical dashed line indicates the corporate income tax exemption threshold. The quadratic fitted lines with 95% confidence intervals are added for taxable income bins below and above the threshold respectively.

## 4.3 The Dynamic Consequences of Tax Kinks

**Slow-down of Production Growth** We explore the impacts of tax kinks on firm growth. Figure 7 plots the annual revenue growth rate, defined as the percentage change in revenues from year $t-1$ to year $t$, with respect to the corporate taxable income bins. We first observe a growth slowdown as firms approach the tax threshold at 50K NTD before the reform, followed by a sharp, discontinuous jump once firms surpass the threshold. After the reform, this pattern shifts to the new tax threshold of 120K NTD. This pattern suggests that firms may strategically suppress their growth to avoid crossing the tax threshold and paying high tax rates.

**Figure 7:** Revenue Growth Rate and Taxable Income



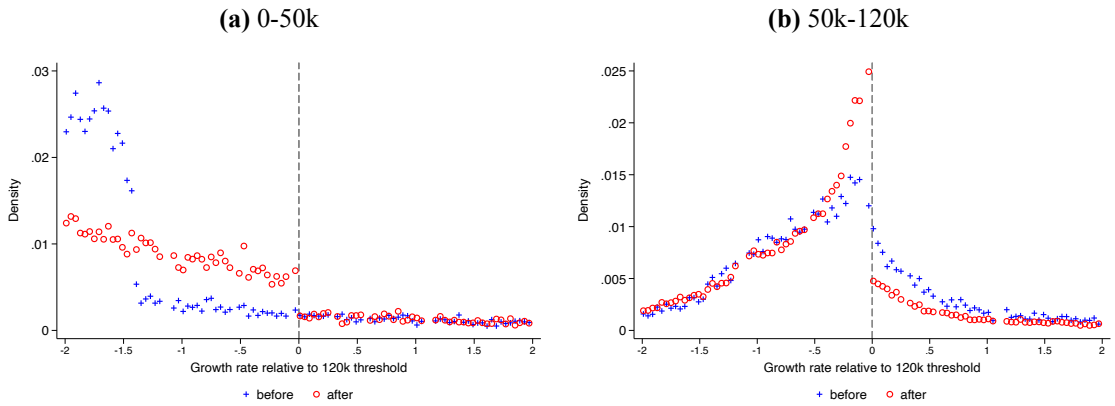

*Notes*: This figure shows the average gross revenue growth rate with respect to corporate taxable income bins before the reform (2004-2009, Panel (a)) and after (2010-2017, Panel (b)). The horizontal axis represents the taxable income bins. The vertical axis denotes the firms' average gross revenue growth rate. The vertical dashed line indicates the corporate income tax exemption threshold. The quadratic fitted lines with 95% confidence intervals are added for taxable income bins below and above the threshold respectively.

The shift in the revenue growth rate pattern following the tax threshold change highlights a trade-off from increasing tax threshold. On one hand, the increased threshold eases constraints for small firms previously below the tax threshold, encouraging their production growth. On the other hand, the new threshold incentivizes a group of medium-sized firms, previously above but now near the new threshold, to suppress production growth in response to the change. We compute the normalized average growth rate following Marx (2024) and Garbinti et al. (2023), which is defined as the growth rate in excess of the growth rate required for firms to cross the new introduced tax threshold at 120K NTD.

$$\tilde{g}_{i,t,120k} = \underbrace{\frac{R_{i,t+1} - R_{i,t}}{R_{i,t}}}_{\text{actual growth rate}} - \underbrace{\frac{120K - R_{i,t}}{R_{i,t}}}_{\text{growth rate needed to be at 120k threshold}} = \frac{R_{i,t+1} - 120K}{R_{i,t}}$$

Figure 8 describes the distribution normalized average growth distribution before and after the reform for firms in different taxable income bins. As the tax threshold was raised to 120k NTD, it is evident that the revenue growth rates for firms in the bins below 50k USD increase and the entire distribution shifts to the right, yet still get stalled at the new tax threshold. Meanwhile, the new tax threshold incentivizes firms with taxable incomes between 50k NTD and 120k NTD to withhold growth and remain below the tax threshold. This introduces a potential trade-off in production from raising the tax threshold: while encouraging growth for smaller firms, it introduces new production distortions for medium-sized firms.

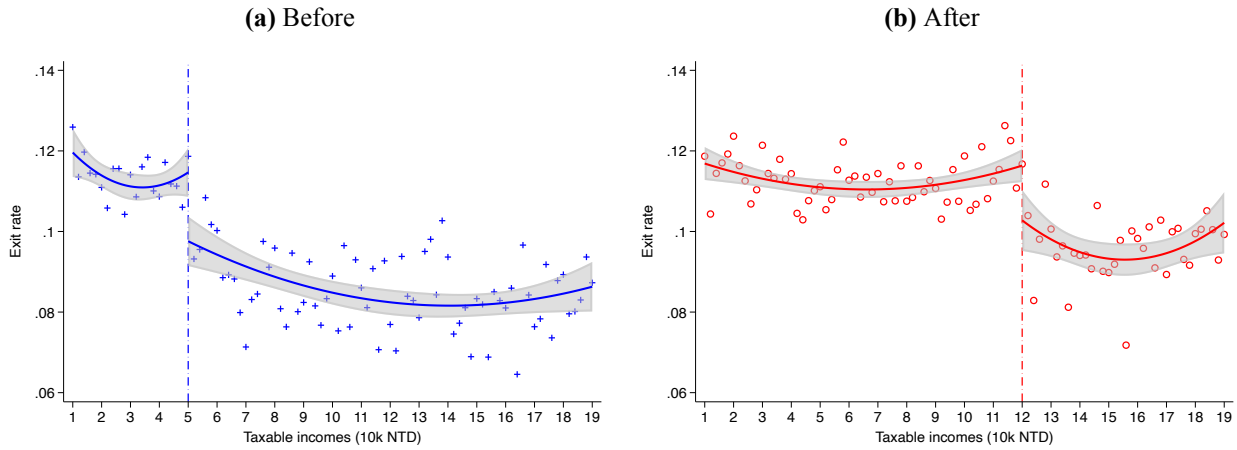
**Figure 8:** Dynamic Bunching: Distribution of Normalized Growth Rate




*Notes*: The figure applies the strategy developed by Garbinti et al. (2023) to illustrate the distribution of firms' normalized revenue growth rates. The normalized revenue growth rate (relative to the NTD 120k threshold) is defined as the growth rate each firm in a group would need to exceed the CIT exemption threshold of 120,000 NTD calculated as: $\tilde{g}_{i,t,120k} = \frac{R_{i,t+1}-R_{i,t}}{R_{i,t}} - \frac{120K-R_{i,t}}{R_{i,t}} = \frac{R_{i,t+1}-120K}{R_{i,t}}$. We plot the distribution of the normalized growth rate before and after the corporate income tax reform for firms with taxable income ranges of 0-50,000 NTD (Panel (a)) and 50,000-120.,000) NTD (Panel (b)), respectively.

**Unintended Increase of Exit Probability** As tax kinks induces slowdown in firm growth, we explore whether this strategic growth deceleration leads to higher exit rates. Figure 9 describes the probability of exit across firms' taxable income bins. Firm $i$ is defined as exit if it exists in the dataset in year $t$ but disappear in year $t+1$. We observe a clear negative relationship: firms with higher taxable income (or profit) are less likely to exit. Moreover, we observe a significant, discontinuous drop in the exit rate just below the tax threshold, both at 50K NTD before the reform and at 120K NTD after the reform. This suggests an unintended consequence of firms' strategic slowdown in response to the threshold, as they may stall growth to reduce their likelihood of crossing the threshold, which in turn increases their exit rate. We demonstrate that the exit rate pattern is robust under alternative definitions of exit in Figure A.6, for example, if firm exit is defined as the last appearance in the tax return data, or disappearing from the data for three consecutive years.

**Figure 9:** Exit Rate and Taxable Income




*Notes*: This figure shows the average exit rate with respect to corporate taxable income bins before the reform (2004-2009, Panel (a)) and after (2010-2017, Panel (b)). The horizontal axis represents the taxable income bins. The vertical axis denotes the firms' average exit rate. The vertical dashed line indicates the corporate income tax exemption threshold. The quadratic fitted lines with 95% confidence intervals are added for taxable income bins below and above the threshold respectively.

## 4.4 Exploiting Changes in Distance to Threshold

We exploit the 2010 tax reform which introduced an exogenous change in the tax threshold and thus the distance of firms' taxable incomes to the tax threshold. Our empirical model is as below.

$$y_{ijt} = \sum_{k=-5,k\neq 1}^{5} \alpha_k \mathbb{1}(Rbin_{it} = k) + \sum_{k=1}^{20} \beta_k bin_{it}^k + \lambda_{jt} + X_{it} + \epsilon_{ijt} \tag{1}$$

$y_{ijt}$ represents the outcome variable, which includes revenue growth, exit probability, and the corresponding production factor input ratio of firm $i$ in industry $j$ and year $t$. The variable $Rbin_{it}$ measures how close firm $i$ is to the tax threshold in year $t$, and is calculated as the distance between a firm's taxable income and the exemption threshold in year $t$, binned at 10K NTD. For example, if firm $i$ had a taxable income between 10K NTD and 11K NTD before the 2010 tax reform, the relative binned distance is $Rbin^5it = 1$ since the tax threshold is 50K NTD. We control for the dummies of the taxable income bins $bin_{it}^k$.

Moreover, we control for industry-by-year fixed effects, $\lambda_{jt}$, to account for common macroeconomic factors over time and across industries, such as economic growth rates, inflation, and overall labor market conditions that could affect compensation for all firms. These fixed effects control for the impact of the 2008 global financial crisis and the subsequent economic recovery as well. The vector $X_{it}$ includes firm-level covariates, such as a firm's location, company type, age, and lagged

assets. These covariates help capture potential differences in outcomes driven by factors unrelated to the relative distance between a firm's taxable income and the tax threshold. The coefficients of interest, $\alpha_k$, identifies the treatment effect of approaching the corporate income tax threshold at distance $k$. The key identification assumption is that conditional on the firms' taxable incomes, the variation in the relative distance to the tax threshold comes from the exogenous shift in the tax threshold from 50K NTD to 120K NTD . Firms prior to the policy change could anticipate neither whether the threshold would increase or decrease, nor the exact amount of change.

Figure 10 plots the $\alpha_k$ coefficients for each outcome variable. Our results confirms the qualitative findings from the raw data pattern. Compared to firms immediately above the tax threshold, those firms below the threshold tend to have a significantly lower intermediate input share but a higher labor cost share. There is a slowdown in revenue growth as a firm approaches the tax threshold from below, accompanied by a significantly higher probability of firm exit.

Quantitatively, this slowdown reaches up to 1.2 percentage points (p.p.), representing approximately a 10% reduction in revenue growth compared to the baseline mean of about 10 p.p.[9] Correspondingly, the probability of exit increases significantly by 2 p.p., or a 30% rise, relative to the baseline mean of around 7 p.p. Regarding misreporting, firms on average inflate salaries to family-member employees by 1.2 p.p., representing approximately a 6% reduction in revenue growth compared to the baseline mean of about 18 p.p.

# 5 Structural Model and Estimation

In this section, we build and estimate a structural model which consists of both a static part and a dynamic part. In the static part, firms choose whether to avoid paying high tax rate by shrinking firm sizes and shifting firm profit as personal income. In the dynamic part, firms decide the optimal investment and whether to exit the market.

## 5.1 Static Part

Each firm $i$ has a realized productivity $z_{it}$ at the beginning of the year $t$. They make the optimal input choices in face with competitive input prices, and decide how much output to produce on the competitive output market. The kinks in the corporate income tax schedule introduce non-linear incentives for them to bunch below the tax threshold, steer their reporting behavior, and distort their production choices.

[9] The baseline mean is calculated from firms with taxable income ranging from 0 to 50,000 NTD after the reform.

### 5.1.1 Firm Cost and Profit

Firm $i$ produces outputs with the capital $k_{it}$, labor $l_{it}$, and intermediate input $m_{it}$ according to the following production function.

$$y_{it} = z_{it}(k_{it}^{\alpha_k} l_{it}^{\alpha_l} m_{it}^{1-\alpha_k-\alpha_l})^{\lambda}.$$

We denote Hicks-neutral firm productivity as $z_{it}$, which follows a log-normal distribution with mean and standard deviation as $\mu_z$ and $\sigma_z$, respectively. We use $\alpha_k$ and $\alpha_l$ as input intensity parameters for capital and labor, respectively. $\lambda < 1$ such that the production function has decreasing returns to scale. The input factor market is competitive. The capital, labor, and the intermediate input prices are given by $r_t$, $w_t$, and $p_t$, respectively.

The input cost function is the follows.

$$\begin{aligned} c_{it}(y_{it}) = c(y_{it}, z_{it}, r_t, w_t, p_t) &= \frac{r_t^{\alpha_k} w_t^{\alpha_l} p_t^{1-\alpha_k-\alpha_l}}{{\alpha_k}^{\alpha_k}{\alpha_l}^{\alpha_l}(1-\alpha_k-\alpha_l)^{(1-\alpha_k-\alpha_l)}} (\frac{y_{it}}{z_{it}})^{\frac{1}{\lambda}} \\ &= A_t \times (\frac{y_{it}}{z_{it}})^{\frac{1}{\lambda}}, \quad A_t = \frac{r_t^{\alpha_k} w_t^{\alpha_l} p_t^{1-\alpha_k-\alpha_l}}{{\alpha_k}^{\alpha_k}{\alpha_l}^{\alpha_l}(1-\alpha_k-\alpha_l)^{(1-\alpha_k-\alpha_l)}} \end{aligned}$$

Specifically, the labor expenditure function is as follows.

$$e_{it}(y_{it}) = \alpha_l \times c_{it}(y_{it}) = \alpha_l \times A_t \times (\frac{y_{it}}{z_{it}})^{\frac{1}{\lambda}}$$

We denote the output price as $P_t$, and firm profit function is defined as the follows.

$$\pi_{it}(y_{it}) = P_t y_{it} - c_{it}(y_{it}) = P_t y_{it} - A_t(\frac{y_{it}}{z_{it}})^{\frac{1}{\lambda}}$$

If the government imposes a flat tax rate $\tau$ on the profit, firm's profit maximization problem would not be affected.

$$\max_{y_{it}} (1-\tau)\pi_{it}(y_{it}) \Leftrightarrow \max_{y_{it}} \pi_{it}(y_{it}).$$

I denote the optimized output as $y_{it}^*$ such that

$$y_{it}^* = (\frac{\lambda P_t}{A_t})^{\frac{\lambda}{1-\lambda}} z_{it}^{\frac{1}{1-\lambda}}, \quad \pi_{it}^* = (1-\lambda) P_t y_{it}^*.$$

### 5.1.2 Tax Kinks, Profit Shifting, and Production

Suppose the government introduces notches to the tax schedule such that firms with profit $\pi_{it}$ below $\bar{\pi}$ would enjoy a low tax rate $\tau_L$, while firms with profit $\pi_{it}$ above $\bar{\pi}$ are subject to a high tax rate

$\tau_H$, and $\tau_L < \tau_H$.

$$\tau_{it} = \begin{cases} \tau_L, & \text{if } \pi_{it} \leqslant \bar{\pi} \\ \tau_H, & \text{if } \pi_{it} > \bar{\pi} \end{cases}$$

Therefore, we wrote $\tau_{it}(y_{it}) = \tau_L \times \mathbb{1}(\pi_{it}(y_{it}) \leqslant \bar{\pi}) + \tau_H \times \mathbb{1}(\pi_{it}(y_{it}) > \bar{\pi})$. At the beginning of the period, firms decide whether to bunch below $\bar{\pi}$ and enjoy the low tax rate $\tau_L$. Firms have two strategies to achieve bunching. First, firms could shrink their production size by choosing $y_{it}$ lower than $y^*_{it}$. Second, firms could shift their profit to personal income and choose a *reported* labor expenditure $e^r_{it}$ higher than $e_{it}(y_{it})$. Suppose that the final reported labor expenditure is $e^r_{it}$, while the *true* labor expenditure function is $e_{it}(y_{it})$. Following the literature, firms pay the profit shifting cost as below.

$$g(e^r_{it}, e_{it}(y_{it}), \epsilon_{it}) = e_{it}(y_{it}) h[\frac{e^r_{it} - e_{it}(y_{it})}{e_{it}(y_{it})}] + \theta\epsilon_{it}.$$

We parameterize $h(x) = \frac{exp(vx)-1}{v}$, where $v$ captures the average misreporting cost. $\epsilon_{it}$ is an i.i.d. component of the fixed profit shifting cost, which follows an exponential distribution with mean $\theta$.

Those firms trade off the potential savings on the tax payment against the profit-shifting cost and the distortion on production. We denote the tax rate choice as $D_{it}$ which equals one if the firm chooses to bunch the profit below $\bar{\pi}$. Firm's profit maximization problem subject to the tax notch can be formulated as below.

$$\begin{aligned} \Pi_{it} = \max_{y_{it}, e^r_{it}, D_{it} \in \{0,1\}} & (1 - D_{it}) \times [1 - \tau_{it}(y^*_{it})] \times \pi^*_{it} + \\ & D_{it} \times \{E_\omega\{(1 - \tau_L) \times \{\pi_{it}(y_{it}) - e_{it}(y_{it}) h[\frac{e^r_{it} - e_{it}(y_{it})}{e_{it}(y_{it})}]\}\} + \theta\epsilon_{it}\} \\ \text{s.t.} \quad & \pi_{it}(y_{it}) + e_{it}(y_{it}) - e^r_{it} = \bar{\pi} - \omega_{it} \end{aligned}$$

Notice that firms don't bunch exactly at $\bar{\pi}$ as the exact bunching suggests the tax avoidance behavior and would involve scrutiny. We assume that the firms bunch below $\bar{\pi}$ at a distance of $\omega_{it}$, which follows an i.i.d. exponential distribution with mean $\mu_\omega$.

Firms' problem can be solved in two steps. First, if firm $i$ decides to bunch the reported profit below tax threshold, it decides how much to misreport $e^r_{it}$, and furthermore, how much production to shrink $y_{it}$. The problem is as follows.

$$\begin{aligned} \max_{y_{it}, e^r_{it}} \quad & \pi_{it}(y_{it}) - e_{it}(y_{it}) h[\frac{e^r_{it} - e_{it}(y_{it})}{e_{it}(y_{it})}] \\ \text{s.t.} \quad & \pi_{it}(y_{it}) + e_{it}(y_{it}) - e^r_{it} = \bar{\pi} - \omega_{it} \end{aligned}$$

The optimal misreported labor salary $\tilde{e}^r_{it}$ and output $\tilde{y}_{it}$ would satisfy the following two condi-

tions.

$$\frac{\partial \pi_{it}(\tilde{y}_{it})}{\partial y_{it}} - \frac{\partial e_{it}(\tilde{y}_{it})}{\partial y_{it}} \times \frac{exp(\frac{v(\pi_{it}(\tilde{y})-\bar{\pi}+\omega_{it})}{e_{it}(\tilde{y}_{it})}) - 1}{v} - \frac{exp(\frac{v(\pi_{it}(\tilde{y}_{it})-\bar{\pi}+\omega_{it})}{e_{it}(\tilde{y}_{it})})}{e_{it}(\tilde{y}_{it})}(\frac{\partial \pi_{it}(\tilde{y}_{it})}{\partial y_{it}} e_{it}(\tilde{y}_{it}) - (\pi_{it}(\tilde{y}_{it}) - \bar{\pi} + \omega_{it})\frac{\partial e_{it}(\tilde{y}_{it})}{\partial y_{it}}) = 0 \tag{2}$$

$$\pi_{it}(\tilde{y}_{it}) + e_{it}(\tilde{y}_{it}) - \tilde{e}^r_{it} = \bar{\pi} - \omega_{it} \tag{3}$$

Therefore, the optimized expected profit if a firm bunches is given by the following.

$$\tilde{\pi}_{it} = E_\omega\{\pi_{it}(\tilde{y}_{it}) - e_{it}(\tilde{y}_{it})h[\frac{\tilde{e}^r_{it} - e_{it}(\tilde{y}_{it})}{e_{it}(\tilde{y}_{it})}]\}$$

The ratio of firms that decide to bunch at $\bar{\pi}$ is given by the follows.

$$P(D_{it} = 1) = 1 - exp\{-\frac{\tilde{\pi}_{it} - \frac{[1-\tau_{it}(y^*_{it})]\pi^*_{it}}{1-\tau_L}}{\theta}\} \tag{4}$$

## 5.2 Dynamic Part

At the beginning of each year $t$, state variables are realized for firm $i$, including the aggregate state variables such as input prices $w_t, \lambda_t, r_t$, aggregate demand $P_t$, as well as individual state variables such as productivity $z_{it}$. Firm productivity $z_{it}$ follows a Markov Process $G(z'|z)$. We define $\boldsymbol{s_{it}}$ as a collection of both aggregate and individual state variables. Firm $i$ also has a random draw of the fixed cost $\phi_{it}$ each period. The fixed cost follows an exponential distribution such that $\phi_{it} \sim F(\phi_{it}) = 1 - exp(-\frac{\phi_{it}}{\sigma^x})$. We denote the firm value as $V(\boldsymbol{s}, \phi)$.

The dynamic optimization problem can be written down as follows.

$$V(\boldsymbol{s_{it}}, \phi_{it}) = \Pi_{it} + \max\{\phi_{it}, \beta\mathbb{E}[V(\boldsymbol{s_{it+1}})|\boldsymbol{s_{it}}]\}$$

We use $p^x(\cdot)$ to denote the exit probability defined as follows.

$$p^x(\boldsymbol{s_{it}}, \phi_{it}) = exp(-\frac{\beta\mathbb{E}[V(\boldsymbol{s_{it+1}})|\boldsymbol{s_{it}}]\}}{\sigma^x})$$

There is a continuum of potential entrants who observe the payoff relevant state variables and their private i.i.d. entry cost $\kappa_{it}$ before making a one-time entry decision. The entry cost is drawn from a common distribution $R(\kappa_{it})$. If potential entrant j decides not to enter, it vanishes with a payoff of zero. Otherwise, it pays the entry cost and continues as an incumbent in the next period. The entrant is assumed to be endowed with a random initial capital stock that is realized

the following period once the firm becomes an incumbent and begins operation.

Potential entrant $i$ solves the following problem.

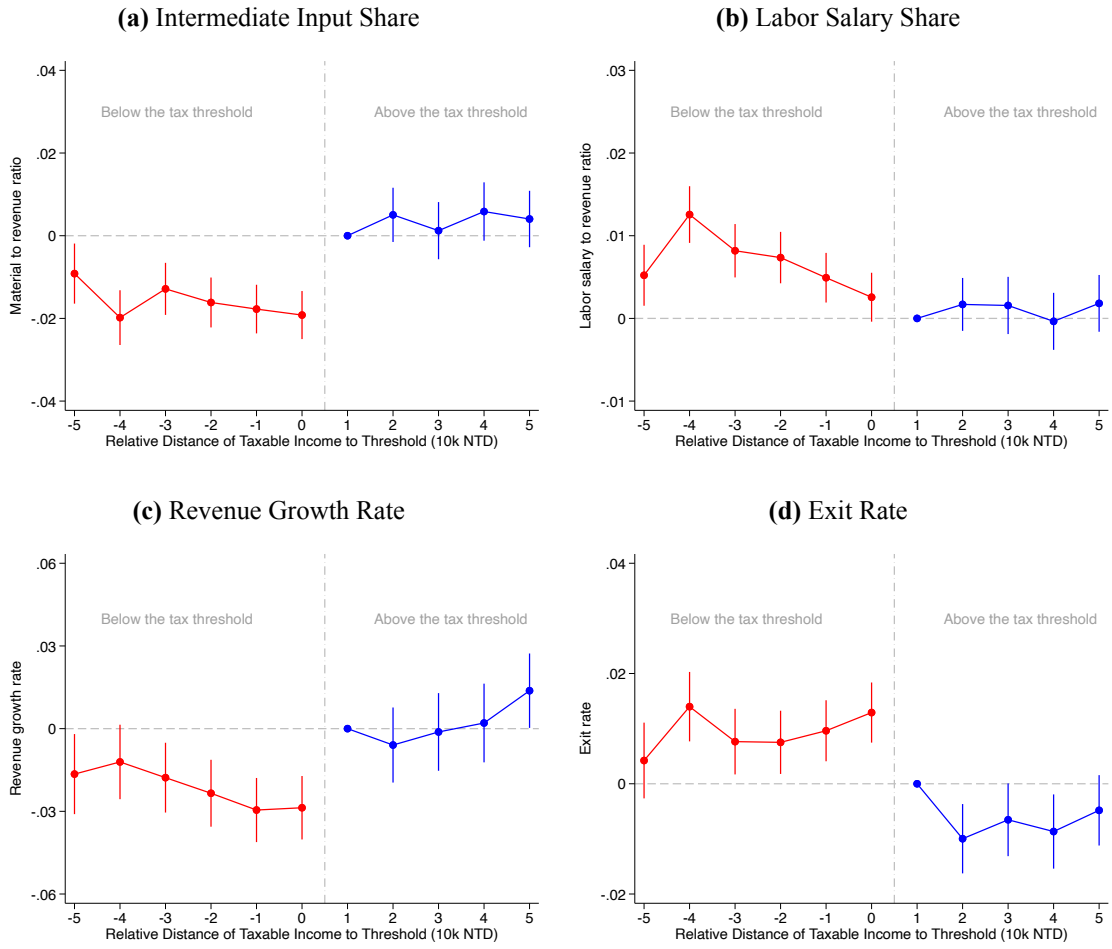
$$\max\{0, -\kappa_{it} + \beta\mathbb{E}[V(\boldsymbol{s_{it+1}})|\boldsymbol{s_{it}}]\}$$

# 6 Conclusion

In this paper, we examine firms' responses and the aggregate policy implications of raising the corporate income tax kink, using evidence from a corporate income tax reform in Taiwan. Empirically, we find that firms respond strongly to changes in the exemption threshold on the corporate income tax schedule, employing a mix of real and reporting strategies. On one hand, firms overreport salaries for employees who are family members of the firm owner, inflating deductions to lower taxable income. On the other hand, firms reduce production by strategically slowing their revenue growth rate. This intentional growth slowdown further leads to an unexpected increase in exit probability.

In the next step, we aim to structurally estimate the model using the simulated method of moments, mapping data-driven moments of firms' behavioral responses to changes in the exemption threshold onto theoretical moments. This approach will allow us to quantify the aggregate policy implications and simulate counterfactuals to inform improved corporate income tax schedule design.

**Figure 10:** Empirical Evidence Exploiting Changes in Distance to Threshold




*Notes*: The figure displays the coefficients, $\alpha_k$, from equation 1 with 95% confidence intervals, capturing the treatment effect of approaching the corporate income tax threshold at distance $k$. The equation controls for firm size (in terms of taxable income), industry-year fixed effects, and firm-level covariates, including location, company type, age, and lagged assets. The horizontal axis represents the relative distance of firms' taxable income from the exemption threshold. For example, the value -1 corresponds to firms with taxable income in the range of 40,000–50,000 NTD prior to the reform (when the exemption threshold was 50,000 NTD) and firms with taxable income in the range of 110,000–120,000 NTD after the reform (when the exemption threshold was raised to 120,000 NTD).

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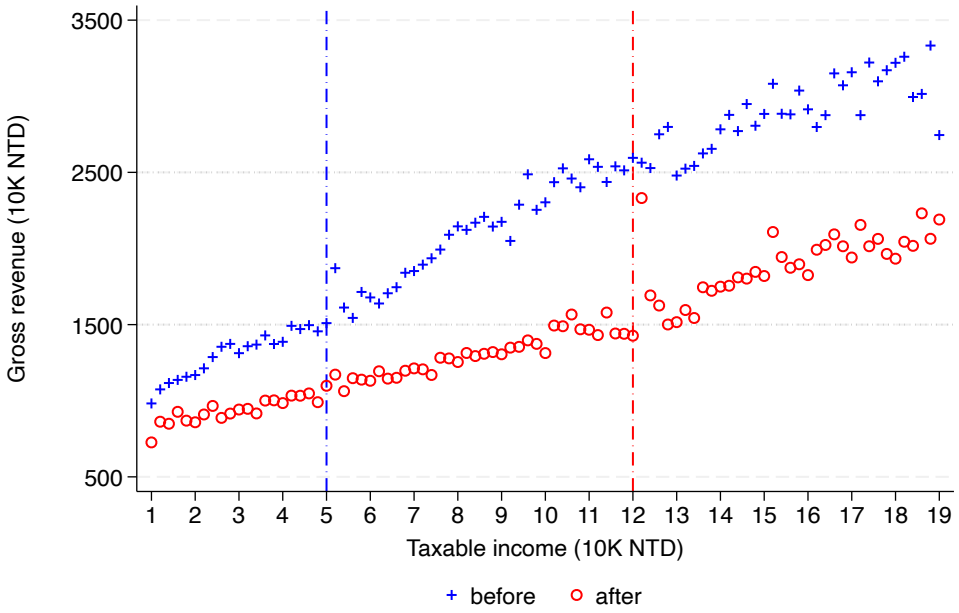
# Online Appendix (Not for Publication)

# A Additional Figures and Tables

**Figure A.1:** Average Firm Revenues across Taxable Income Bins



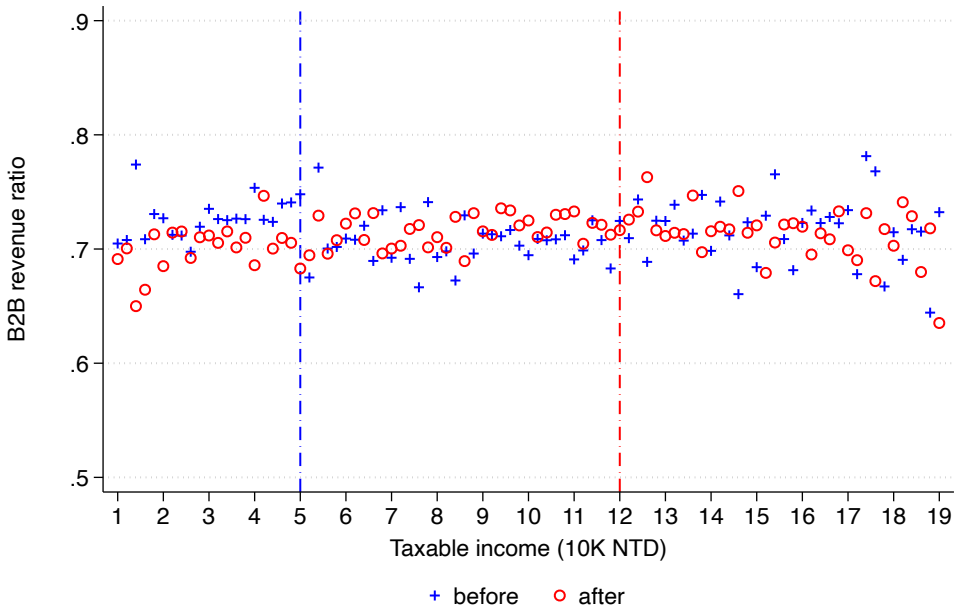

*Notes*: This figure shows the average firm revenues across corporate taxable income bins before the reform (2004-2009, in blue circle) and after (2010-2017, in red plus). The vertical axis denotes the average firm revenues in each taxable income bin. The horizontal axis represents the taxable income bins. For example, the $5^{th}$ bin represents firms that have taxable income between 50 thousand NTD (included) and 60 thousand NTD (not included).

**Table A.1:** Bunching Estimator by Year

| | $dI$ | $I_{lb}$ | $I_{ub}$ | $a$ | $B$ | $H$ | N |
|---|---|---|---|---|---|---|---|
| 2004 | 1.070*** | 2.5 | 9 | .589 | 2312.117 | -3103.095 | 43247 |
| | (.3039) | | | | | | |
| 2005 | 1.297*** | 2.5 | 9.5 | .591 | 2699.09 | -3408.256 | 43609 |
| | (.2489) | | | | | | |
| 2007 | 1.393*** | 2.5 | 9.5 | .606 | 2719.248 | -3080.689 | 41045 |
| | (.2680) | | | | | | |
| 2008 | 1.613*** | 2.5 | 10 | .607 | 2957.643 | -3242.673 | 39851 |
| | (.2189) | | | | | | |
| 2009 | 1.360*** | 2.5 | 9.5 | .601 | 2554.283 | -2994.385 | 39849 |
| | (.3240) | | | | | | |
| Pooled 2004-2009 | 1.317*** | 2.5 | 9.5 | .595 | 15774.81 | -19393.95 | 249780 |
| | (.2739) | | | | | | |
| 2010 | 2.183 | 7 | 23.5 | .722 | 2342.162 | -3282.35 | 40448 |
| | (2.334) | | | | | | |
| 2011 | 2.5** | 7 | 22.5 | .718 | 2749.105 | -3096.576 | 40534 |
| | (1.218) | | | | | | |
| 2012 | 2.796** | 7 | 22 | .69 | 3154.449 | -3321.768 | 39521 |
| | (1.358) | | | | | | |
| 2013 | 2.377 | 7 | 22 | .627 | 2924.273 | -4355.693 | 38847 |
| | (1.458) | | | | | | |
| 2014 | 2.915* | 7 | 22 | .669 | 3362.092 | -3623.487 | 38505 |
| | (1.741) | | | | | | |
| 2015 | 2.632* | 7 | 22 | .687 | 2939.06 | -3317.346 | 37276 |
| | (1.481) | | | | | | |
| 2016 | 2.414* | 7 | 22 | .686 | 2712.224 | -3356.316 | 36600 |
| | (1.404) | | | | | | |
| 2017 | 2.303 | 7 | 22 | .665 | 2663.587 | -3674.338 | 36199 |
| | (1.463) | | | | | | |
| Pooled 2010-2017 | 2.625** | 7 | 22 | .695 | 23572.76 | -26002.84 | 307930 |
| | (1.256) | | | | | | |

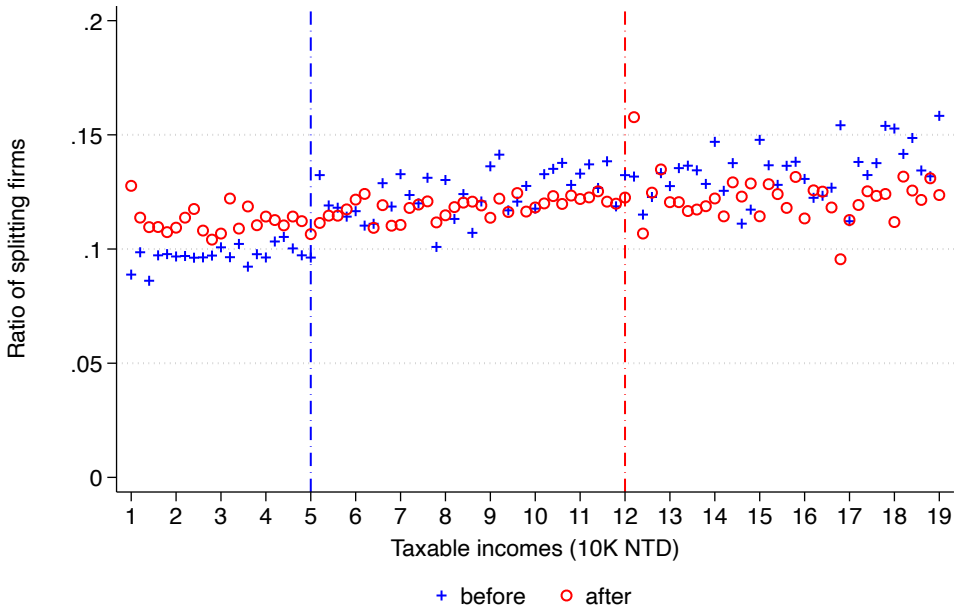
*Notes*: Th bootstrapped standard errors are shown below each bunching estimator. B is the number of firms difference between observed distribution and estimated distribution in the bunching region [$I_{lb}$, $\bar{I}$], and H is the number of firms difference between observed distribution and estimated distribution in the range [$\bar{I}$,$I_{ub}$]. $I_{ub}$ and $I_{lb}$ is the upper bound and lower bound of the exclusive region. $a$ is the fraction of firms that do not respond to the exempt threshold in the range [$\bar{I}$,$I_{ub}$]. Finally, N is the number of observations included in the estimation, i.e., the number of firms with corporate taxable income in between 0 and 300,000 NTD.

**Figure A.2:** Ratio of B2B Revenues by Taxable Incomes



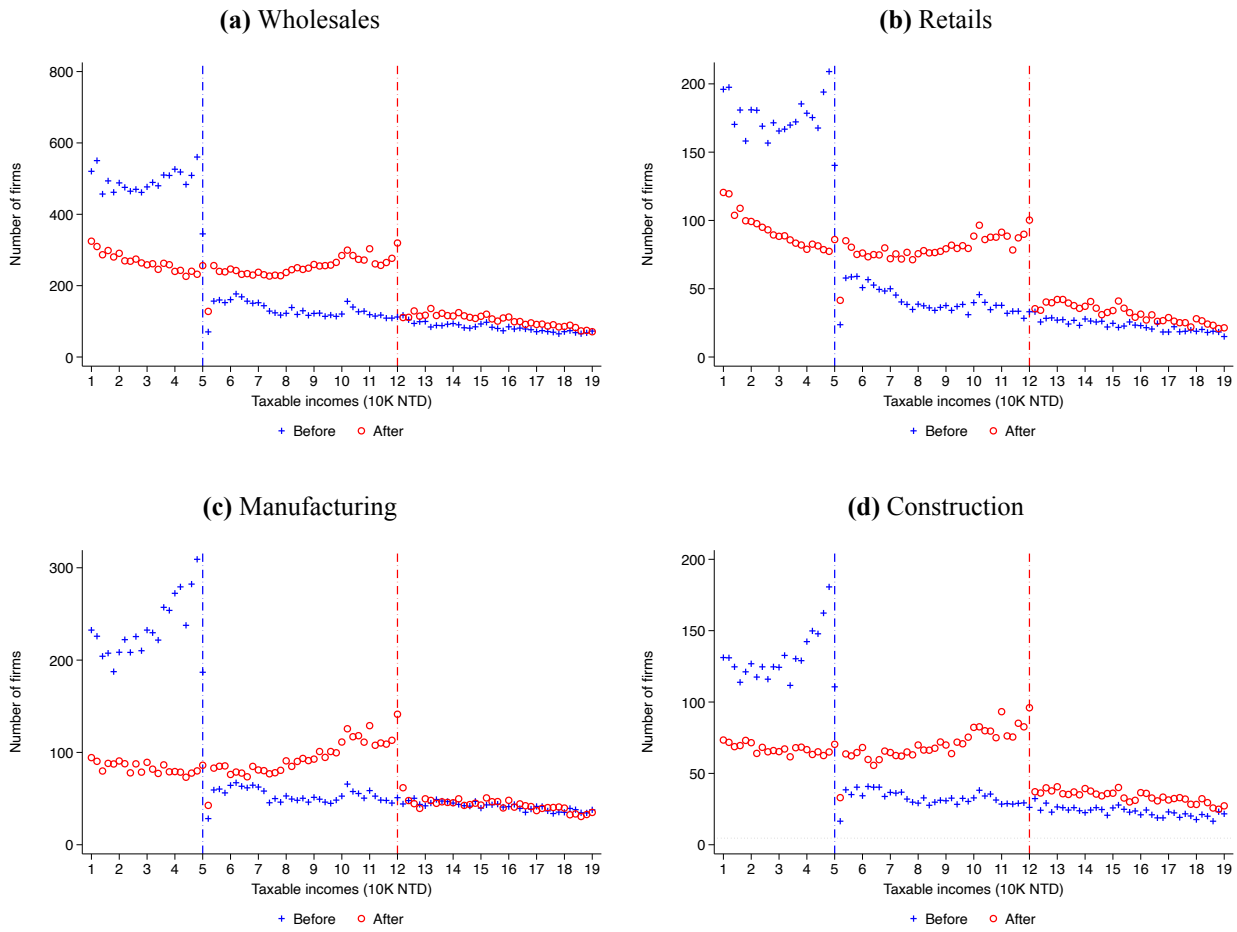

*Notes*: This figure shows the ratio of firms' B2B revenues in each taxable income bin before the reform (2004-2009, in blue circle) and after (2010-2017, in red plus). The vertical axis denotes the ratio of business-to-business revenues to the total revenues of firms in each taxable income bin. Business-to-business revenues are constructed from firms' VAT records. The horizontal axis represents the taxable income bins. For example, the $5^{th}$ bin represents firms that have taxable income between 50 thousand NTD (included) and 60 thousand NTD (not included).

**Figure A.3:** Ratio of Firm Splitting by Taxable Incomes



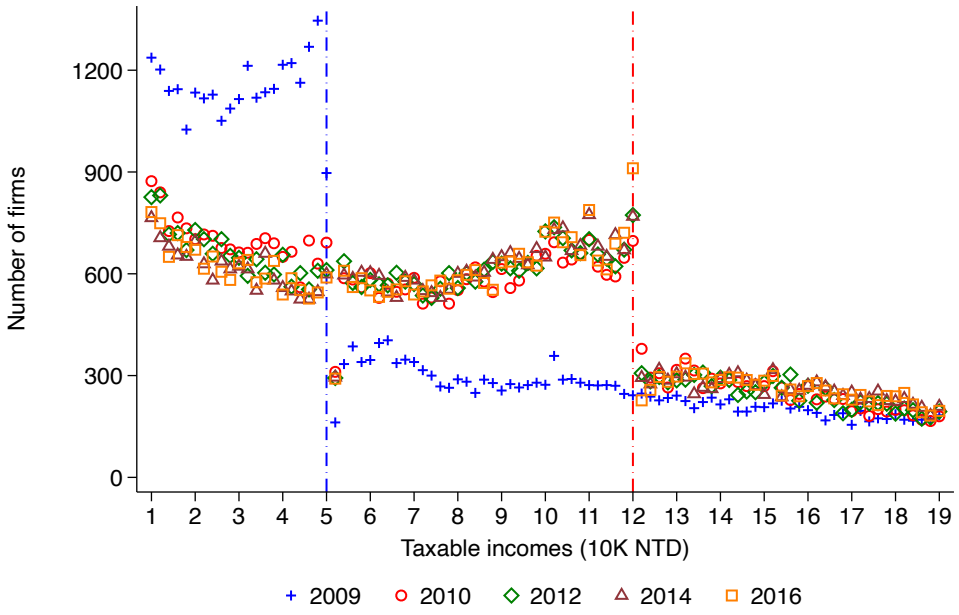

*Notes*: This figure shows the ratio of splitting firms in each taxable income bin before the reform (2004-2009, in blue circle) and after (2010-2017, in red plus). The vertical axis denotes the ratio of splitting firms to the total number of firms in each taxable income bin. Splitting firms are defined as those which have a common shareholder with any other firms. The horizontal axis represents the taxable income bins. For example, the $5^{th}$ bin represents firms that have taxable income between 50 thousand NTD (included) and 60 thousand NTD (not included).

**Figure A.4:** Distribution of Corporate Taxable Incomes by Sector



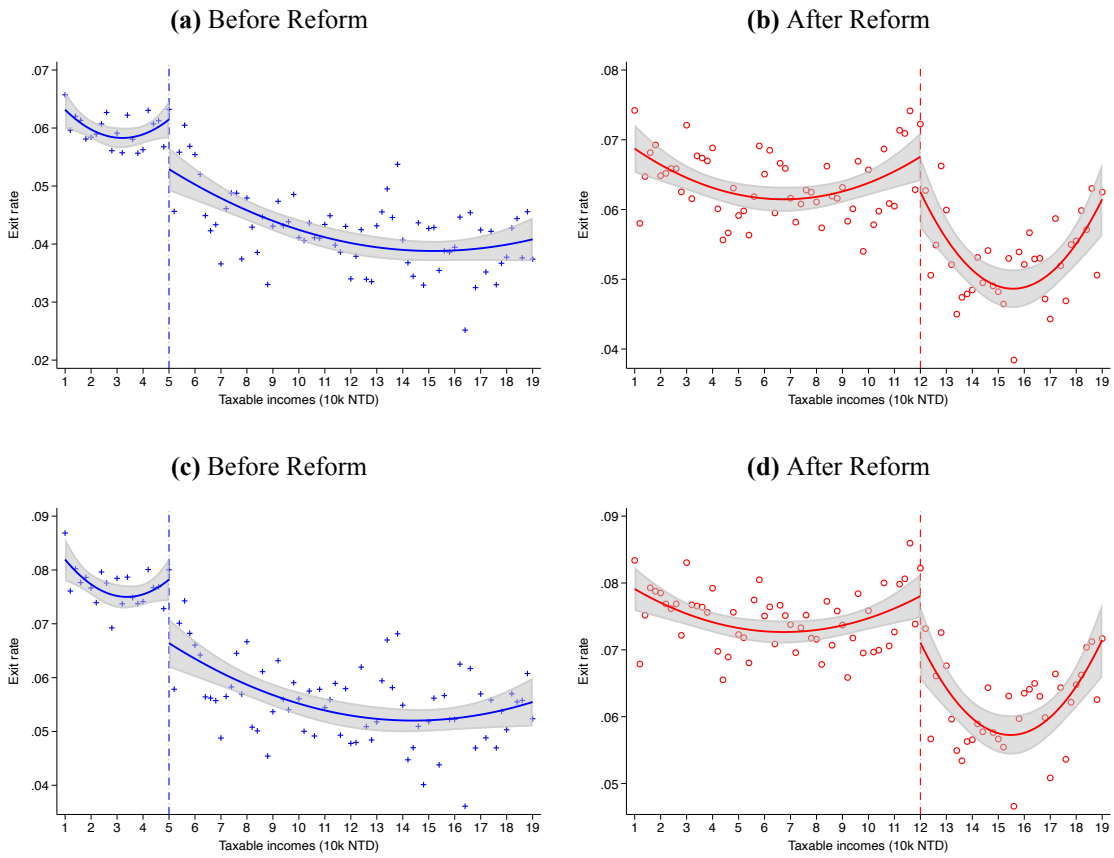

*Notes*: This figure shows the average annual distribution of corporate taxable incomes before the reform (2004-2009, in blue circle) and after (2010-2017, in red plus) by five different sectors: wholesales, retails, manufacturing, construction, and other sectors. The vertical axis denotes the average number of firms yearly in each taxable income bin. The horizontal axis represents the taxable income bins. For example, the $5^{th}$ bin represents firms that have taxable income between 50 thousand NTD (included) and 60 thousand NTD (not included).

**Figure A.5:** Distribution of Corporate Taxable Incomes by Years




*Notes*: This figure shows the annual distribution of corporate taxable incomes in five different years: 2009 (in blue circle), 2010 (in red plus), 2012 (in green diamond), 2014 (in maroon triangle), and 2016 (in orange square). The vertical axis denotes the number of firms yearly in each taxable income bin. The horizontal axis represents the taxable income bins. For example, the $5^{th}$ bin represents firms that have taxable income between 50 thousand NTD (included) and 60 thousand NTD (not included).

**Figure A.6:** Exit Rate and Taxable Income: Alternative Definitions




*Notes*: This figure shows the average exit rate with respect to corporate taxable income. The definition of exit in Panel (a) and (b) the last appearance in the tax return data. The definition exit in Panel (c) and (d) is to disappear from the data for three consecutive years. The horizontal axis represents the taxable income bins. The vertical axis denotes the firms' average exit rate. The vertical dashed line indicates the corporate income tax exemption threshold. The quadratic fitted lines with 95% confidence intervals are added for taxable income bins below and above the threshold respectively.