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How Do Tax Incentives Affect Firm Value? Evidence from China

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Abstract: Using a unique Chinese quasi-experiment of corporate tax policy changes in 2014, we examine the effectiveness of introducing accelerated depreciation as a corporate tax incentive on improving firm value. The results show that, relative to control firms, treatment firms that received the accelerated depreciation tax treatment experience significant improvement in total factor productivity (TFP) both immediately and in the long term. We also find that the enhanced firm value is achieved through optimized capital structure and increased level of innovation. We further find that the beneficial effects are more pronounced in state-owned enterprises (SOE), firms with high labor intensity, financial constraints, high growth, and locations in high marketization provinces. Our research uniquely contributes by providing evidence of the microeconomic benefits of corporate tax policies in an emerging market.

Keywords: Accelerated Depreciation, Total Factor Productivity, Capital Efficiency, Emerging Markets.

1. Introduction

Optimizing the allocation of production factors played a critical role in the history of industrialization and the development of a market economy (Hopenhayn, 2011). Creating policies to encourage corporate productivity and enhance capital efficiency, therefore, has been a goal of policymakers in many countries. Improving firm productivity and efficiency may be particularly important in emerging markets, many of which face challenges such as population loss, decelerating economic growth, and industry structural transformation difficulties. All of these issues highlight the need for increased aggregate productivity (Hsieh and Klenow 2009; Everaert, Heylen and Schoonackers 2015).

Various governments have engaged corporate tax policies as an essential measure to stabilize economic growth, facilitate industrial transformation, and reduce the development gap among regions (Wu, 2005). In particular, introducing an accelerated depreciation policy in addition to the straight-line depreciation method could help achieve these goals in emerging markets for three reasons. First, accelerated depreciation records higher expenses in the early years of an asset's life, therefore lowering the company's taxable income and thus income taxes in those years. A reduction of tax expenses helps lighten a company's financing pressure and the risk of a cash shortage. Companies can also use the excess cash saved from taxes to capitalize on research and development (R&D) activities, further boosting the company's productivity and compatibility (Koowattanatianchai and Charles 2013). Second, by expediting the accrual process and expensing fixed assets sooner, accelerated depreciation promotes asset liquidity and encourages companies to invest in new machines and upgrade existing technologies. Third, many emerging countries often face a labor shortage problem (Wei, Xie, and Zhang, 2017). By reducing the overall after-tax expense of machine purchases, accelerated depreciation encourages companies to resolve labor-shortage issues by replacing human labor and leveraging business operations with fixed costs. As a result, companies can achieve an optimized capital-to-labor ratio and higher production efficiency.

We examine the effectiveness of introducing accelerated depreciation as a corporate tax incentive on improving firm productivity in emerging markets. Relative to other tax-reduction policies, the accelerated depreciation tax policy is unique in that, unlike other tax-reduction policies that directly lower the total amount of corporate tax expense, accelerated depreciation does not affect the total amount of corporate tax comparing to straight-line deprecation. The policy only affects the timing of the depreciation expense and thus alters the investment return on purchasing fixed assets through time value of money.

To address our research question of whether introducing accelerated depreciation as a corporate tax policy improves firm productivity, we use a unique Chinese quasi-experiment of corporate tax policy changes passed in 2014, which allowed selected firms to expense fixed assets using accelerated deprecation methods on their tax return in addition to the straight-line deprecation method accepted previously. China provides an ideal environment to study our research question for several reasons. First, existing research on the effect of accelerated deprecation mainly focuses on U.S. policies (House and Shapiro, 2008; Zwick and Mahon, 2017) where accelerated depreciation is allowed for all companies. However, isolating the effect of the accelerated depreciation from other contemporaneous factors is very difficult in the U.S. setting. For example, Zwick and Mahon (2017) show that the accelerated depreciation effect index changes from 0.874 to 0.946 from the 10^{th} percentile to the 90^{th} percentile, which creates a very narrow window of variability in this key variable for researchers to explore any potential benefits. On the other hand, China previously only allowed the straight-line method for most fixed assets for income tax purposes (State Taxation Administration, 2007). Only recently in 2014, China selected six industries to receive the accelerated depreciation tax treatment, and the remaining industries naturally became the control group. The introduction of this tax policy leads to an exogenous shock to firms' incentives to change their investing and operating behavior, which provides us with a research setting to avoid endogenous problems arising from omitted correlated variables or measurement errors that commonly exist in the tax research (Cummins, Hassett, Hubbard, Hall and Caballero 1994).

Second, unlike mature markets such as the U.S., China set up the accelerated depreciation in its recent corporate tax policy changes not merely to reduce companies' tax bill in the short term, but also to encourage production factor substitution for long-term purposes. A cheaper after-tax asset translates to a higher human labor cost, which motivates companies, especially those in labor-intensive industries, to replace human labor with machines. Therefore, accelerated depreciation serves as a macroeconomic tool for the Chinese government to help companies optimize the allocation of production factors and enhance capital efficiency.

Third, as the world's second-largest economy by gross domestic product (GDP), China experiences many challenges that also appear in other emerging markets but to a greater extent. For example, China' manufacturing activities sank to a three-year low in August 2015, causing growing nervousness among economists and investors around the globe (*New York Times*, 2015). China is also facing its most abrupt population decline in decades (*New York Times*, 2019), which for the world's largest manufacturing economy, means a labor shortage and a further economic slowdown. Therefore, research investigating the effect of tax policy changes in China provides valuable insights into other emerging markets.

Using ordinary least squares (OLS) regressions, we find that, relative to control firms, firms from the six industries that received the accelerated depreciation tax treatment experience significant improvement in total factor productivity (TFP), our proxy for firm value (Bertrand and Mullainathan 2003; Giannetti, Liao, and Yu 2015). In particular, we find that TFP significantly increases in the same year of the tax treatment, suggesting that the accelerated depreciation policy has an immediate effect on enhancing firm performance. We also find that, relative to control firms, treatment firms continue to observe increased TFP one and two years after the introduction of the accelerated depreciation methods, demonstrating the long-term benefits of such a policy. To mitigate concerns that selection bias might affect our findings, we perform a propensity-score matching (PSM) procedure and use the matched sample to run a difference-in-differences (DiD) analysis, and our results still hold. In further analyses, we show that the improved firm value is achieved through equipment purchases, enhanced capital-to-labor rate, and decreased employment of unskilled workers. These findings highlight the channels through which tax policies matter and can promote optimization of company structures and improve firm value.

We further probe our research question by performing several cross-sectional analyses. First, we separate our sample into state-owned enterprises (SOE) and non-SOE firms. Because SOEs carry heavy social responsibility to provide employment and cannot dismiss employees easily, we expect that SOE firms are less sensitive to the depreciation method changes in tax policies. Our result confirms this expectation, and we find that the effect of accelerated depreciation on improving TFP is concentrated in non-SOE firms. Second, we partition firms into capital-intensive and labor-intensive groups. We expect and find that our results are more pronounced in labor-intensive firms that can benefit from the tax incentive by switching human labor with machines. Third, we split our sample into groups with and without financial constraints. We argue that firms with financial constraints can benefit more from the early-year tax savings associated with the accelerated depreciation policy, therefore experiencing a higher increase in TFP. The results are consistent with this view. Fourth, when we divide our sample into high and low growth firms, we find that the effect of the tax policy change on TFP is more focused on high growth firms, presumably because these firms have more demand for equipment upgrades. Fifth, we partition our firms by location into low and high marketization areas. We argue that because human labor is relatively more expensive and labor shortage is more severe in high marketization regions, firms located in these areas should reap more benefits from the depreciation policy change. Our finding supports this argument.

Our results stand up to a battery of robustness checks. First, three provinces in Northeast China went through similar accelerated depreciation tax policy changes in 2004. We verify that removing firms incorporated in those three provinces does not affect our conclusions. Second, we restrict our observations to a balanced sample and demonstrate that our findings are not driven by survival bias. Third, in a falsification test, we show that treatment firms do not increase purchases in current assets not affected by the accelerated depreciation rules. Fourth, we conduct a placebo test with randomization of the treatment as a second falsification test (Chen, Li, and Lu 2018). We discover that the falsified regressor produces zero effect on TFP, providing further support for our conclusion. Overall, our results suggest that, compared to the straight-line depreciation method, adopting accelerated depreciation facilitates companies' efficiency in their capital and operating structures and therefore significantly improves firm value.

We contribute in the following ways. First, our paper is related to the literature exploring the effect of tax policy changes. Most of the studies in this area focus on the short-term benefits of the tax policy changes (House and Shapiro 2008; Wielhouwer and Wiersma 2014; Zwick and Mahon 2017). Our research uniquely contributes by demonstrating that the accelerated depreciation tax incentive produces significant long-term benefits by encouraging optimal capital-labor structure. Second, our work is also related to the literature on the microeconomic consequences of macroeconomic policies (Hsieh and Klenow 2009). Different from research that directly addresses the effects of macroeconomic policies on macroeconomic output (Mountford and Uhlig 2009; Castelnuovo and Lim 2019), we provide evidence on a firm angel about the effect of a national policy. Third, the findings in our study have noteworthy implications for other emerging economies. Many emerging markets are facing challenges such as industrial transformation and decreasing profits from cheap labor. We show that the depreciation policy changes can help solve these issues by promoting fixed asset investment, assisting cash-flow turnover, and encouraging research and innovation.

The rest of the paper is organized as follows. Section 2 discusses the institutional background of industrial transformation in China and reviews the 2014 Chinese depreciation tax policy changes in more detail. Section 3 describes sample selection, variable definitions, and descriptive statistics. Section 4 presents regression results. In

Section 5, we conduct several additional analyses and robustness checks. We conclude in Section 6.

2. Institutional Background

2.1. Industrial Transformations

The world's economy has experienced three industrial transformations. The first happened after World War II, when the U.S. transferred its labor-intensive industries to Japan and Germany. The second transformation happened in the 1960s, when Japan and Germany brought labor-intensive industries to Taiwan, Hong Kong, South Korea, and Singapore (also known as the "Four Asian Tigers"). The most recent industrial transformation occurred in the 1980s, when the Four Asian Tigers transferred labor-intensive industries to mainland China, contributing to the fastest-growing thirty years in China's economic history. With the advantage of cheap labor, China has developed into the world's second-largest economy.

However, as an emerging country, China still faces many challenges in the economic transformation process. Beginning in 2004, China's coastal areas started to experience labor shortages and difficulties in recruiting workers. Labor shortages caused labor costs to surge rapidly, and migrant workers' wages increased at an average rate of 10% annually (Cai, 2010; Cai and Du, 2011). As China's cheap labor advantage gradually disappears and the population rapidly ages, substituting labor with fixed assets becomes the only way forward for business development (Hicks 1962; Cai, Wang, and Qu 2009; Wei, Xie, and Zhang 2017).

Rising labor costs could result in three consequences. First, some companies may not have any growth opportunities and could not move production to areas with cheaper labor. If such companies cannot adjust to the increased costs, they will be forced out of the market very quickly (Cai, 2010; Nikkei Asian Review 2019). Second, some firms may relocate. Rising labor costs can significantly lower some companies' compatibility in local markets, forcing them to relocate to areas with cheaper workers, such as Southeast Asia. This move could stimulate a new round of industrial transformation (Cai, Wang, and Qu 2009). Third, some companies may ease the pressure from rising labor costs by adjusting the capital structure. With an optimized capital-to-labor ratio, these companies are more likely to innovate and upgrade to advanced technology and machines, therefore solving the problem of higher labor costs (Wei, Xie, and Zhang 2017).

The Chinese government introduced a series of measures to encourage companies to optimize capital structure, among which is the 2014 accelerated depreciation tax policy. This policy encourages companies to purchase capital assets by directly granting tax cuts when companies use advanced machinery and equipment to replace labor. This policy is different from the accelerated depreciation policy for fixed assets implemented in relatively mature markets such as the U.S. in that the U.S. policy does not involve factor substitution, nor does it encourage capitalization. The U.S. depreciation system is set up for corporate tax reduction, whereas the Chinese depreciation policy is created to assist in capital structural upgrades, therefore laying down the foundation for the next round of industrial transformation.

2.2. The 2014 Accelerated Depreciation Tax Policy

On September 24, 2014, the Chinese State Council executive meeting decided to allow enterprises in six pilot industries to use accelerated depreciation methods, including shortened-depreciable-life method (not less than 60% of the specified period), double-declining balance method, and the sum-of-years-digit method, to record depreciation of any assets purchased after January 1st, 2014 in addition to the straight-line depreciation method previously allowed. These six pilot industries include biopharmaceutical manufacturing; special equipment manufacturing; railway, shipbuilding, aerospace and other transportation equipment manufacturing; computer, communications and other electronic equipment manufacturing; instrumentation manufacturing; and information transmission, software and information technology services. This accelerated depreciation policy aims at increasing the deductible amount of a company's initial investment, reducing immediate tax burdens, and encouraging firms to speed up the process of upgrading and transformation. In 2015, this accelerated depreciation policy was extended to four more industries, including light industrial manufacturing, textiles, machinery, and automobiles (State Taxation Administration, 2014).

3. Sample Descriptions, Variable Definitions, and Descriptive Statistics

3.1. Sample descriptions

To explore the effect of accelerated depreciation on firm value, we begin by constructing a sample with all observations between 2010 and 2017 in the Chinese Stock Market and Accounting Research (CSMAR) database. We apply several restrictions to construct our sample, following Brandt et al. (2012). We first exclude observations with missing data on total assets, number of employees, wages payable, sales, and net operating cash flow. We further require our observations to have total assets greater than current assets, total assets higher than the net value of fixed assets, and accumulated depreciation greater than current depreciation. We then exclude loss firms as well as firms in the financial industry (Fang, Lerner, and Wu, 2017). Finally, we truncate extreme variables at 1% on each tail. Our final sample consists of 14,133 firm-year observations. We summarize our sample selection process in Table 1.

Table 1. Sample Selection Procedure

Total firm-year (2010 – 2016)	16,698
Less: firm-years without data on total assets, number of employees, wages payable, sales, and net operating cash flow	-1,835
Less: firm-years with total assets less than current assets, total assets less than the net value of fixed assets, or accumulated depreciation less than current depreciation	-463
Less: loss firms and financial firms	-267
Firm-years with available data	14,133

3.2. Variable definitions

Accelerated depreciation is allowed for fixed assets purchased beginning in 2014 by the 6 pilot industries and in 2015 by the 4 additional pilot industries. To identify the effect of accelerated depreciation tax policy changes on firm value, we first create an indicator variable to denote firms in the pilot industries as the treatment group. Specifically, *PostTreat* equals one for firms in the initial 6 pilot industries for the fiscal year 2014 and after, as well as firms in the 4 additional pilot industries for the fiscal year 2015 and after, and zero otherwise. The 6 initial pilot industries include biopharmaceutical manufacturing; special equipment manufacturing; railway, shipbuilding, aerospace and other transportation equipment manufacturing; computer, communications and other electronic equipment manufacturing; instrumentation manufacturing; and information transmission, software and information technology services. The 4 additional pilot industries include light industrial manufacturing, textiles, machinery, and automobiles.

We use TFP as our dependent variable to capture firm value. Following Giannetti et al. (2015) and Krishnan et al. (2015), we compute TFP as the residual of the regression in Eq (1):

$$Ln(Y_{i,j,t}) = \alpha_{j,t} + \beta_{j,t}Ln(L_{i,j,t}) + \gamma_{j,t}Ln(K_{i,j,t}) + \delta_{j,t}Ln(M_{i,j,t}) + \varepsilon_{i,j,t}, \quad (1)$$

where $Y_{i,j,t}$ represents total sales (in thousands of RMB) of firm *i* belonging to industry *j* during year *t*. *L* is the number of workers (in thousands of people), *K* equals total assets (in thousands of RMB), and *M* represents expenses for the cost of materials and other inputs measured using the "Cash paid for the purchase of goods and services (in thousands of RMB)" variable. We estimate Eq. (1) by industry and year.

We include a series of time-variant factors in our OLS regressions as control variables. Following prior literature, we include research and development (*R&D*), firm size (*Size*), return-on-assets (*ROA*), Tobin's q (*Tobin-q*), leverage (*Leverage*), firm age (*Age*), institutional ownership (*InsHold*), and Herfindahl Index (*HHI*) (Aboody and Lev, 2000; Godfrey and Hamilton, 2005; Gao, Zhang and Zhang, 2018; Matsumoto, 2002; Yu, 2008). We detail the definitions of each variable in Appendix A.

Appendix A: Variable Definitions

Variables	Definitions
TFP	Total factor productivity calculated using Eq. (1).
PostTreat	Equals one for firms in the initial 6 pilot industries for the fiscal year 2014 and after, as well as firms in the 4 additional pilot industries for the fiscal year 2015 and after, and zero otherwise.
R&D	R&D expenditure divided by total assets
Size	The natural log of total assets
ROA	Net income scaled by lagged total assets
Tobin-q	Market value equity scaled by lagged total assets
InsHold	Percentage of shares held by institutional owners
Leverage	Total liabilities over total assets
Age	The number of years elapsed since a firm is established
HHI	The Herfindahl index calculated based on the three-digit SIC code

3.3. Descriptive Statistics

Table 2 provides summary statistics. The mean value of TFP is -0.0046 with a standard deviation of 0.3056, which is comparable to the mean of -0.008 and the standard deviation of 0.265 in Giannetti et al. (2015). The mean value *PostTreat* is 0.203, suggesting that the number of treatment firm-year observations represents approximately 20.3% of the whole sample. The average firm in our sample has a total asset of 3,400 million RMB, an R&D of 1.55%, a ROA about 3.73%, a market value of about 2.4 times its book value, and institutional ownership about 22%. The mean leverage in our sample is 0.4389, and the average firm age is 16.

Table 2. Summary Statistics

Variables	Mean	Std. Dev	P25	Medium	P75
TFP	-0.0046	0.3056	-0.1629	0.0368	0.1813
PostTreat	0.2030	0.4022	0	0	0
R&D	0.0155	0.0186	0.0003	0.0113	0.0231
Size	21.950	1.2291	21.0813	21.811	22.658
ROA	0.0373	0.0569	0.0131	0.0350	0.0641
Tobin-q	2.3965	2.1860	0.9735	1.7485	3.0392
InsHold	0.2202	0.2125	0.0506	0.1469	0.3354
Leverage	0.4389	0.2238	0.2601	0.4298	0.6076
Age	2.7723	0.3464	2.5649	2.8332	2.9957
HHI	2.2477	0.7891	1.7039	1.8073	2.9047

4. Empirical Results

4.1. Baseline Difference-in-differences Results

Since the accelerated depreciation tax policy was introduced at different times to various industries, our treatment firms change over time, which creates both time-series and cross-sectional variation in firm incentives to increase firm value. We follow Bertrand and Mullainatha (2003) and adopt a difference-in-differences (DiD) approach:

$$TFP_{i,t} = \beta_1 PostTreat_{i,t-1} + \sum\beta_k Controls_{i,t} + \varepsilon_{i,t}, \quad (2)$$

The dependent variable *TFP* and the main independent variable *PostTreat* are both defined above. We measure TFP in year *t* and *PostTreat* in year *t-1* to infer causality. *Controls* refer to the array of control variables also discussed previously, measured contemporaneously at the end of each year. We also include firm fixed effects, year fixed effects, industry-year fixed effects, and province-year fixed effects. We cluster standard errors by firm. Because *PostTreat* measures the difference in *TFP* between treatment firms and control firms before and after the tax policy change, the coefficient on *PostTreat* would capture this difference-in-differences. A positive β_1 would support our prediction that adopting the accelerated depreciation tax policy enhances firm value.

We present the regression results for model (2) in Table 3. In Column (1), we show the simple regression results without control variables. The coefficient on *PostTreat* in this simple regression is positive (0.043) and significant at the 1% level. In Column (2), when we include the control variables, we find that β_1 (0.046) remains significantly positive at the 1% level. In terms of economic significance, the coefficient β_1 in Column (2) implies that treatment firms experience a 10% (0.046/|-0.0046|) boost in TFP. Overall, our baseline DiD model suggests that accelerated depreciation significantly improves companies' TFP, which is consistent with our expectation.

Table 3. Baseline Difference-in-Differences Regression

	DV= *TFP*		
	(1)	(2)	(3)
PostTreat	0.043***	0.046***	
	(3.964)	(4.295)	
Treat$_{-2}$			0.007
			(0.428)
Treat$_{-1}$			0.019
			(1.166)
Treat			0.044***
			(3.349)
Treat$_{+1}$			0.059***
			(3.959)
Treat$_{+2}$			0.055***
			(2.817)
R&D		-0.183	-0.212
		(-0.625)	(-0.730)
Size		-0.090***	-0.090***
		(-9.887)	(-9.929)
ROA		-0.002	0.001
		(-0.027)	(0.014)
Tobin-q		-0.000	-0.001
		(-0.179)	(-0.274)
InsHold		-0.012	-0.012
		(-0.548)	(-0.543)
Leverage		0.040	0.040
		(1.267)	(1.281)
Age		0.119*	0.116*
		(1.811)	(1.764)
HHI		-0.096*	-0.097*
		(-1.750)	(-1.761)
Province×Year FE	YES	YES	YES
Industry×Year FE	YES	YES	YES
Firm FE	YES	YES	YES
Year FE	YES	YES	YES
N	14,133	14,133	14,133
Adjusted R^2	0.037	0.050	0.051

To further explore any potential long-term benefits of the tax policy change, we extend our time horizon to allow us to investigate the effects of multiple years in the regression. Specifically, we set indicator variables $Treat_{i,t-2}$, $Treat_{i,t-1}$, $Treat_{i,t}$, $Treat_{i,t+1}$, and $Treat_{i,t+2}$ equal one for treatment firms in years *t-2*, *t-1*, *t*, *t+1*, and *t+2*, respectively, where year *t* is the first year of the depreciation changes. $Treat_{i,t}$, $Treat_{i,t+1}$, and $Treat_{i,t+2}$ would help us isolate any immediate benefits from the long-term effects by year, and $Treat_{i,t-2}$ and $Treat_{i,t-1}$ would verify the parallel trend assumption in our DiD model. Our extended baseline DiD model is as follows:

$$TFP_{i,t} = \beta_1 Treat_{i,t-2} + \beta_2 Treat_{i.t-1} + \beta_3 Treat_{i,t} + \beta_4 Treat_{i,t+1} + \beta_5 Treat_{i,t+2} + \sum \beta_k Controls_{i,t} + \varepsilon_{i,t} \quad (3)$$

If the accelerated depreciation tax policy change has any long-term effect on enhancing firm value, we would expect to find a positive β_4 and β_5. To fulfill the parallel trend assumption where in the absence of treatment, the difference in TFP between our treatment and control groups would be constant, we expect to see β_1 and β_2 being insignificantly different from zero.

We present the results for our expanded baseline DiD model estimated using Eq. (3) in Column (3) of Table 3. We find that both β_1 and β_2 are not significantly different from zero, suggesting that prior to the tax policy change, firms in our treatment and control groups did not exhibit different levels of TFP. Consistent with our previous findings from model (2), results show a significant and positive coefficient (β_3) on $Treat_{i,t}$ (0.044), representing the immediate benefits accelerated depreciation brings to adopting firms in the same year of the policy adoption. We also discover that both β_4 (0.059) and β_5 (0.055) are significantly positive, indicating that the adoption of accelerated depreciation has a trailing effect on enhancing firm value that lasts even two years post-adoption.

4.2. PSM-DiD Results

To further mitigate concerns related to selection bias which might affect the results in our baseline models, we perform a PSM to match our treatment firms in the pilot industries to their counterparts not in the pilot industries. Specifically, we calculate a propensity score using a logit regression base on *Size*, *ROA*, *Tobin-q*, *InsHold*, *Leverage*, *Age*, and *HHI* for every firm in our sample. For each treatment firm, we perform a one-to-one match with replacement to find the best quality control based on the propensity score we calculated. This process generates 1,456 pairs of matched-firm pairs. We then re-estimate our baseline DiD model in Eq. (2) using our matched sample.

We report our PSM-DiD results in Table 4. In Panel A, we present a comparison of the 1,456 pairs of firms allowed and not allowed to use the accelerated depreciation tax preferential policy. The t-statistics show that there are no significant differences between the treatment firms and their matched counterparts in all the variables used in the regression. We report the regression results when we re-run Eq. (2) using our matched sample in Panel B. The coefficient on *PostTreat* (0.044) is significantly positive at the 1% level, providing evidence that our main findings – implementing the accelerated depreciation tax policy significantly enhances firm value – are not affected by potential selection bias.

Table 4. PSM-DiD

Panel A: Comparison of treatment groups and control group after matching

	Treatment	Control	Diff	t-statistic
	Treat =1	*Treat* =0		
R&D	0.023	0.022	0.001	1.31
Size	21.964	21.981	-0.017	-0.47
ROA	0.041	0.042	-0.001	-0.34
Tobin-q	3.267	3.215	0.052	0.72
InsHold	0.273	0.270	0.003	0.44
Leverage	0.382	0.377	0.005	0.93
Age	2.816	2.823	-0.007	-0.73
HHI	2.603	2.602	0.001	0.05

Panel B: Multivariate results using PSM sample

	DV=*TFP*
PostTreat	0.044***
	(3.802)
R&D	-0.072
	(-0.245)
Size	-0.088***
	(-8.774)
ROA	-0.045
	(-0.614)
Tobin-q	0.000
	(0.097)
InsHold	-0.030
	(-1.257)
Leverage	0.026
	(0.767)
Age	0.092
	(1.263)
HHI	-0.118**
	(-1.973)
Province×Year FE	YES
Industry×Year FE	YES
Firm FE	YES
Year FE	YES
N	10,661
Adjusted R^2	0.058

5. Additional Tests

5.1. Mechanisms

To further probe our research question, we investigate several mechanisms through which implementing the accelerated depreciation tax policy can increase firm value. In particular, we study the effects of accelerated depreciation adoption on capital structure and innovation. The accelerated depreciation policy lowers the price of capital assets, causing labor to become a relatively more expensive production factor. Companies therefore have strong incentives for production factor substitution, resulting in increased demand for machinery and equipment in the market (Hicks 1932; Elvin, 1972; Allen, 2009; Bena and Simintsz, 2016; Irmen, 2017). We capture changes in a firm's capital structure using three measurements, including changes in the amount of company equipment (*Equipment*), the capital-to-labor rate (*Capital-Labor rate*), and the number of unskilled employees (*Employment*) . We replace the dependent variable in Eq. (2) with our three measurements of capital structure and rerun our baseline regressions. We show the results in Table 5, Panel A. Our analyses reveal that, relative to control firms, treatment firms experience a significant increase in both net equipment value (0.080) and capital-to-labor rate (0.019), as well as a dramatically decreased number of unskilled laborers (-0.321). These results are consistent with our argument --- because assets become cheaper under the accelerated depreciation tax policy, pilot companies have more incentives to purchase new machines and equipment and replace lower-level employees, leading to more streamlined production processes and greater operating efficiency.

To measure different aspects of a firm's engagement in innovation, we use three proxies. Following Hall, Jaffe and Trajtenberg (2001) and Hall et al. (2005), we calculate Invent as the number of invention patents granted, Utility as the number of utility model patents authorized, and Design as the number of approved patented design applications. Similar to the tests above, we re-run our baseline model in Eq. (2) with these three innovation variables as the new dependent variables and display the regression results in Table 5, Panel B. We find a significantly positive coefficient on PostTreat in all three specifications, which provide evidence that adoption of the accelerated deprecation tax policy encourages a firm to engage in more research and innovation, leading to more invention patents, utility model patents, and patented design applications.

Table 5. Mechanisms

Panel A: Accelerated depreciation and capital structure

	(1)	(2)	(3)
DV=	*Ln(Equipment)*	*Ln(Employment)*	*Capital-Labor rate*
PostTreat	0.080^{**}	-0.321^{***}	0.019^{**}
	(2.015)	(-2.826)	(2.127)
R&D	8.404^{***}	-0.494	-1.501^{***}
	(3.239)	(-0.117)	(-6.194)
Size	0.741^{***}	1.378^{***}	-0.135^{***}
	(10.984)	(11.847)	(-8.898)
ROA	-1.666^{***}	-1.963^{***}	-0.017
	(-3.975)	(-2.642)	(-0.236)
Tobin-q	-0.059^{***}	0.238^{***}	-0.002
	(-3.823)	(7.824)	(-0.443)
InsHold	-0.006	-0.598^{**}	-0.017
	(-0.088)	(-2.508)	(-1.000)
Leverage	0.269	-0.040	-0.061
	(1.165)	(-0.102)	(-1.302)
Age	1.006^{***}	-2.228^{***}	0.097^{*}
	(4.440)	(-2.960)	(1.820)
HHI	0.148^{*}	1.034^{*}	-0.041
	(1.732)	(1.706)	(-0.478)
Province×Year FE	YES	YES	YES
Industry×Year FE	YES	YES	YES
Firm FE	YES	YES	YES
Year FE	YES	YES	YES
N	14,133	14,133	14,133
Adjusted R^2	0.194	0.828	0.081

Panel B: Accelerated depreciation and corporate innovation

	(1)	(2)	(3)
DV=	*Ln(1+Invent)*	*Ln(1+Utility)*	*Ln(1+Design)*
PostTreat	0.240^{***}	0.274^{***}	0.116^{***}
	(8.641)	(6.519)	(7.076)
R&D	1.951^{**}	1.388	0.627
	(2.412)	(1.211)	(1.363)
Size	-0.081^{***}	-0.115^{***}	-0.049^{***}
	(-4.368)	(-3.985)	(-4.400)
ROA	-0.067	-0.402^{**}	-0.150^{**}
	(-0.529)	(-2.099)	(-2.109)
Tobin-q	-0.023^{***}	-0.021^{**}	-0.011^{***}
	(-4.146)	(-2.483)	(-3.586)
InsHold	-0.115^{**}	-0.197^{**}	-0.043
	(-2.153)	(-2.487)	(-1.407)
Leverage	0.221^{***}	0.390^{***}	0.104^{***}
	(3.835)	(4.017)	(3.086)
Age	1.164^{***}	2.457^{***}	0.678^{***}
	(6.749)	(8.444)	(5.616)
HHI	0.081	0.174	0.062^{**}
	(1.104)	(1.317)	(2.235)
Province×Year FE	YES	YES	YES
Industry×Year FE	YES	YES	YES
Firm FE	YES	YES	YES
Year FE	YES	YES	YES
N	14,133	14,133	14,133
Adjusted R^2	0.141	0.154	0.126

5.2. Cross-sectional analyses

To further understand the effect of accelerated depreciation on firm value, we perform several cross-sectional analyses.

5.2.1. SEO vs. Non-SEO

In addition to economic functions, SEOs also carry heavy social responsibilities, including protecting the environment, providing employment, and maintaining social stability. Therefore, compared with non-SEOs, SEOs have more difficulty dismissing workers and achieving structural upgrades (Gu, Tang, and Wu 2019), resulting in managers' reluctance to substitute machinery for laborers. We therefore expect the impact of accelerated asset depreciation policies on non-SEOs to be more evident. We split our sample into SEOs and non-SEOs based on listed company's "direct controlling shareholder nature" and "actual controller nature," and then we re-run Eq. (2) using each subsample. We provide the findings in Table 6, Panel A. We find that the coefficient of *PostTreat* in column (2) for non-SEOs is significantly positive at the 1% level, while the coefficient of *PostTreat* in column (1) for SEOs is positive but insignificant, consistent with our expectations.

5.2.2. Capital-intensive Firms vs. Labor-intensive Firms

Labor-intensive companies employ a large number of workers and bear a high labor cost. Therefore, when facing the labor shortage problem in China, labor-intensive companies are more willing to substitute labor with cheaper production factors than capital-intensive firms (Wei, Xie, and Zhang 2017). Consequently, we believe that the impact of the accelerated depreciation policies is more concentrated in labor-intensive enterprises. We use the average salary of rank-and-file employees, scaled by the company's total sales, to measure labor intensity. Firms with labor intensity greater than our sample median are classified as labor-intensity firms; otherwise, we classify them as capital-intensive firms. We perform cross-sectional analyses using these two groups and present our regression results in Table 6, Panel B. We find that the coefficient of *PostTreat* in column (2) for labor-intensive companies is significantly positive at the 1% level, whereas the coefficient of *PostTreat* in column (1) for capital intensity firms is not significantly different from zero. These results provide evidence to support our argument that labor-intensive firms have more incentive to substitute production factors under the accelerated depreciation tax policy.

5.2.3. Firms with and without Financial Constraints

Since firms can save more tax payments using accelerated depreciation rather than straight-line depreciation, we expect firms with financial constraints to be more motivated to take advantage of this tax policy change than firms without financial constraints. We follow Whited and Wu (2006) and calculate the WW index as our measure of financing constraint:

$$WW = -0.091 * CF/Asset - 0.062 * Div + 0.021 * LLia/Asset - 0.044 * Ln(Asset) + 0.102 * Growth\_ind - 0.035 * Growth\_firm \quad (4)$$

In this equation, *CF* is the operating cash flow, *Asset* is total assets, *Div* is a dichotomous variable for cash dividends, *LLia* is long-term liabilities, *Growth_ind* is the industry sales growth and *Growth_firm* is the firm's sales growth. We categorize a firm as having financial constraints if its WW index falls into the top 50% in our sample. We present our cross-sectional regression results by financial constraints in Table 6, Panel C. As expected, we find that the effect of adopting an accelerated depreciation on a firm's TFP is focused on firms with financial constraints. Specifically, the coefficient on *PostTreat* in column (1) for financially restrained firms is significant and positive at 1%, but the effect goes away in column (2) for non-financially strained firms.

5.2.4. High vs. Low Growth Firms

Considering that we find the effect of accelerated depreciation on TFP is carried out through increasing equipment purchases in our previous test, we expect that high growth firms with more potential for equipment upgrade to be more motivated to take advantage of the accelerated depreciation than low growth firms. We split our sample into high and low growth firms based on percentage of sales growth, and we present our subsample analysis in Table 6, Panel D. We find that the coefficient of *PostTreat* in column (1) for high growth firms is significantly positive at the level of 1%. While the coefficient of *PostTreat* in column (2) for low growth firms is positive, it is not statistically significant. Overall, we find evidence that the effect of accelerated depreciation on TFP is more pronounced in high growth firms.

5.2.5. Firms in high vs. low marketization provinces

From the perspective of China's economic development, issues such as labor shortage and rising labor costs first appeared in developed areas. As a result, we believe that the accelerated depreciation policy should have more significant impact on firms in highly-developed provinces. We use the marketization index following Fan, Wang and Ma (2011) to measure a province's economic development. If a firm is located in a province with a marketization index above the median in our sample, then we define the firm as high marketization firm, and vice versa. The cross-sectional regression results are shown in Table 6, Panel E. The results show that the coefficient on *PostTreat* in column (1) for high marketization firms is significantly positive at the 1% level, while the coefficient on *PostTreat* in column (2) for low marketization firms is not different from zero. This evidence suggests that the TFP increase from selection accelerated depreciation tax policy is highly concentrated in regions with a high degree of marketization.

5.3. Robustness Checks

We carry out a battery of robustness checks. First, we exclude 736 firm-year observations from the three Northeastern provinces (i.e., Heilongjiang Province, Liaoning Province, and Jilin Provinces) from our sample. These three provinces have been allowed to use accelerated depreciation since the Corporate Income Tax and VAT Reform in 2004. We report this robustness analysis in Table 7, Column (1). Our conclusions are not affected by this exclusion. Second, we re-run our primary analysis using a balanced sample to rule out the possibility that new firms coming into our sample tinted the results. The findings are displayed in Column (2) and are consistent with our main results. Third, since current assets do not involve depreciation and should not be affected by the change in depreciation method, we re-run our model (2) using net current assets as the dependent variable as a falsification test. We report our findings in Column (3). We do not find changes in treatment firms' current assets, which provides falsification comfort for our main results. Fourth, we conduct a placebo test with randomization of the treatment as a second falsification test (Chen, Li, and Lu 2018). We randomly select

3,048 observations from our entire sample and categorize them as our false treatment firms (i.e., *TreatFalse*=1). We code the rest of the observations as false control firms (i.e., *TreatFalse* = 0) and re-run our model (2) with the falsified sample. We repeat this process 1,000 times and report the average regression coefficients in Column (4). We notice that the falsified regressor produces zero effect on TFP, providing further support for our conclusion. Following Cai et al. (2016), we plot the coefficients of *TreatFalse* obtained in the 1,000 randomized samples in a scatter plot against its p-value in Figure 2. We observe that the mean of *TreatFalse* is concentrated around 0, and most of the p-values are greater than 0.1. This observation indicates that there are unlikely to be any missing unobservable variables, and our regression results are less likely to be caused by selection errors due to missing unobservable variables.

Table 6. Cross-Sectional Analyses

Panel A: SOEs vs. Non-SOEs

	DV= *TFP*	
	(1) SOEs	(2) Non-SOEs
PostTreat	0.031	0.047***
	(1.593)	(3.660)
Controls	YES	YES
Province×Year FE	YES	YES
Industry×Year FE	YES	YES
Firm FE	YES	YES
Year FE	YES	YES
N	4,273	9,860
Adjusted R^2	0.048	0.054

Panel B: Capital-intensive firms vs. labor-intensive firms

	DV= *TFP*	
	(1) capital-intensive firms	(2) labor-intensive firms
PostTreat	0.024	0.074***
	(1.428)	(5.000)
Controls	YES	YES
Province×Year FE	YES	YES
Industry×Year FE	YES	YES
Firm FE	YES	YES
Year FE	YES	YES
N	6,799	7,334
Adjusted R^2	0.036	0.073

Panel C：Firms with and without financial constraints

	DV= *TFP*	
	(1) firms with financial constraints	(2) firms without financial constraints
PostTreat	0.068***	0.024
	(4.246)	(1.603)
Controls	YES	YES
Province×Year FE	YES	YES
Industry×Year FE	YES	YES
Firm FE	YES	YES
Year FE	YES	YES
N	7,550	6,583
Adjusted R^2	0.024	0.113

Panel D：High vs. low growth firms

	DV= *TFP*	
	(1) high growth firms	(2) low growth firms
PostTreat	0.063***	0.021
	(4.006)	(1.434)
Controls	YES	YES
Province×Year FE	YES	YES
Industry×Year FE	YES	YES
Firm FE	YES	YES
Year FE	YES	YES
N	6,502	7,631
Adjusted R^2	0.049	0.138

Panel E：High vs. low marketization firms

	DV= *TFP*	
	(1) high marketization firms	(2) low marketization firms
PostTreat	0.061***	-0.005
	(4.648)	(-0.278)
Controls	YES	YES
Province×Year FE	YES	YES
Industry×Year FE	YES	YES
Firm FE	YES	YES
Year FE	YES	YES
N	9,997	4,136
Adjusted R^2	0.048	0.065

Table 7. Robustness Checks

	(1) Exclude three Northeastern provinces	(2) Balanced sample	(3) Current assets	(4) Randomization of treatment
	DV= *TFP*	DV=*TFP*	DV=Net Current Assets	DV=*TFP*
PostTreat	0.052***	0.046***	0.208	
	(4.749)	(4.297)	(1.374)	
TreatFalse				0.001
				(0.356)
Controls	YES	YES	YES	YES
Province×Year FE	YES	YES	YES	YES
Industry×Year FE	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
N	13,397	13,122	14,133	14,133
Adjusted R^2	0.053	0.050	0.004	0.051

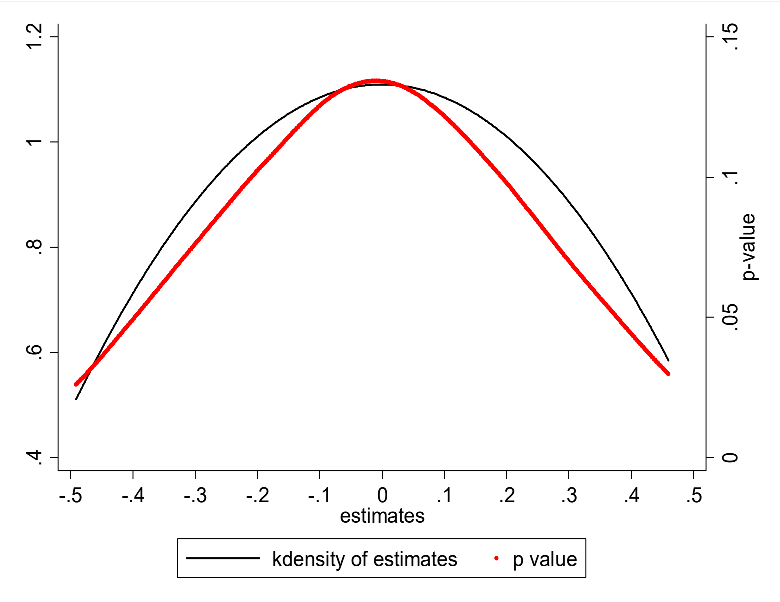

Figure 2. Placebo Test with Randomization of the Treatment

6. Conclusion

Resource allocation efficiency is a crucial factor affecting economic development (Hopenhayn, 2011). As the largest developing country, China's capital and labor allocation have been highly distorted during the past decades (Hsieh and Klenow, 2009). The tax incentive has an essential role in affecting resource allocation within the firm.

In this paper, we examine the impact of a tax reduction policy, presented by an accelerated depreciation policy launched by China in 2014, on the efficiency of enterprise resource allocation and enhancement in firms' value. We discover that, relative to control firms, treatment firms that received the accelerated depreciation tax treatment experience significantly improved in TFP both immediately and in the long term. Further analyses reveal that the higher firm value is achieved through enhanced capital structure and more productive innovation activities. We further find that the beneficial effect is more pronounced in state-owned enterprises (SOE) and in firms with higher labor intensity, more financial constraints, higher growth, and high marketization area locations.

Our paper uniquely contributes to the literature in many ways. We provide empirical evidence for the relationship between tax incentives and enterprise resource allocation and firm value. Our study also shows that accelerated depreciation policy can promote technological upgrades by reducing the cost of investment in fixed assets and mobilizing the willingness and enthusiasm of investment in fixed assets. Additionally, our study clarifies the economic impact of tax incentive policies in China, especially for developing countries that may seek to use tax incentives to promote fixed investment and technological upgrades.

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References

[1] Aboody, D., Lev, B. (2000). Information asymmetry, R&D, and insider gains. *Journal of Finance*, 55(6), 2747–2766.

[2] Adkins, R., & Paxson, D. (2013). The effect of tax depreciation on the stochastic replacement policy. *European Journal of Operational Research*, 229(1), 155-164.

[3] Allen, R. C. (2009). *The British industrial revolution in global perspective*. Cambridge University Press.

[4] Bena, J., & Simintzi, E. (2017). *Globalization of work and innovation: Evidence from doing business in china*. Discussion paper.

[5] Bernini C., Cerqua A., & Pellegrini G. (2017). Public subsidies, TFP and efficiency: A tale of complex relationships, *Research Policy*, 46(4): 751−767.

[6] Bertrand, M., & Mullainathan, S. (2003). Enjoying the quiet life? Corporate governance and managerial preferences. *Journal of political Economy*, 111(5), 1043-1075.

[7] Brandt, L., Van Biesebroeck, J., & Zhang, Y. (2012). Creative accounting or creative destruction? Firm-level productivity growth in Chinese manufacturing. *Journal of development economics*, *97*(2), 339-351.

[8] Cai, F. (2010). Demographic transition, demographic dividend, and Lewis turning point in China. *China Economic Journal*, *3*(2), 107-119.

[9] Cai, F., & Du, Y. (2011). Wage increases, wage convergence, and the Lewis turning point in China. *China Economic Review*, 22(4), 601-610.

[10] Cai, F., Wang, D., & Qu, Y. (2009). Flying Geese within Borders: How China Sustains Its Labor-intensive Industries? *Economic Research Journal*, *9*, 4-14.

[11] Cai, X., Lu, Y., Wu, M., & Yu, L. (2016). Does environmental regulation drive away inbound foreign direct investment? Evidence from a quasi-natural experiment in China, *Journal of Development Economics*, 123, 73-85.

[12] Castelnuovo, E., & Lim, G. (2019). What Do We Know About the Macroeconomic Effects of Fiscal Policy? A Brief Survey of the Literature on Fiscal Multipliers. *Australian Economic Review*, 52(1), 78–93.

[13] Chen, Y. J., Li, P., & Lu, Y. (2018). Career concerns and multitasking local bureaucrats: Evidence of a target-based performance evaluation system in China. *Journal of Development Economics*, 133, 84-101.

[14] Cummins J. G., Hassett K. A., Hubbard R. G., Hall R. E. & Caballero R. J. (1994). A Reconsideration of Investment Behavior Using Tax Reforms as Natural Experiments，*Brookings Papers on Economic Activity*, 2: 1-74.

[15] Elvin, M. (1972). The High-level Equilibrium Trap: The Cause of the Decline of Invention in the Traditional Chinese Textile Industries. Stanford Univ. Press.

[16] Everaert G., Heylen F., & Schoonackers R. (2015). Fiscal policy and TFP in the OECD: Measuring direct and indirect effects, *Empirical Economics*, 49(2): 605−640.

[17] Fan, G., Wang X., & Ma G. (2011). Contribution of Marketization to China's Economic Growt. *Economic Research Journal*, 9(002).

[18] Fang, L. H., Lerner J., & Wu, C. (2017). Intellectual property rights protection, ownership, and innovation: Evidence from China. *The Review of Financial Studies*, 30(7), 2446-2477.

[19] Gao, H., Zhang, H., & Zhang, J. (2018). Employee turnover likelihood and earnings management: evidence from the inevitable disclosure doctrine. *Review of Accounting Studies*, 23(4): 1424-1470.

[20] Giannetti, M., Liao, G., & Yu, X. (2015). The Brain Gain of Corporate Boards: Evidence from China, *Journal of Finance*, 70(4), 1629-1682.

[21] Godfrey, J. M., & Hamilton, J. (2005). The impact of R&D intensity on demand for specialist auditor services. *Contemporary Accounting Research*, 22(1), 55–93.

[22] Gu, Z., Tang S., & Wu, D. (2019). The Political Economy of Labor-Employment Decisions: Evidence from China, *Management Science*, forthcoming.

[23] Hall, B. H., Jaffe, A., & Trajtenberg, M. (2005). Market value and patent citations. *RAND Journal of economics*, 16-38.

[24] Hall, B. H., Jaffe, A. B., & Trajtenberg, M. (2001). *The NBER patent citation data file: Lessons, insights and methodological tools* (No. w8498). National Bureau of Economic Research.

[25] Hicks, J. (1963). *The theory of wages*. Springer.

[26] Hopenhayn, H. A. (2011). Firm microstructure and aggregate productivity. *Journal of Money, Credit and Banking*, 43, 111-145.

[27] House C., & Shapiro M. D. (2008) Temporary investment tax incentives: Theory with evidence from bonus depreciation, *American Economic Review*, 98(3): 737−768.

[28] Hussain, S. M. (2015). The contractionary effects of tax shocks on productivity: An empirical and theoretical analysis. *Journal of Macroeconomics*, 43, 93-107.

[29] Hsieh, C.-T., & Klenow, P.J. (2009). Misallocation and manufacturing TFP in China and India, *Quarterly Journal of Economics*, 124(4), 1403-1448.

[30] Irmen, A. (2017). Capital- and Labor-Saving Technical Change in An Aging Economy. *International Economic Review*, 58(1), 261-285.

[31] Koowattanatianchai, N., & Charles, M. B. (2015). A mixed methods approach to studying asset replacement decisions. *International Journal of Business Innovation and Research*, 9(5), 544-567.

[32] Krishnan, K., D. K. Nandy, & M. Puri. (2015). Does Financing Spur Small Business Productivity? Evidence from a Natural Experiment. *Review of Financial Studies*, 28(6): 1768-1809.

[33] Matsumoto, D. A. (2002). Management's incentives to avoid negative earnings surprises. *The Accounting Review*, 77(3), 483–514.

[34] Mountford, A., & Uhlig, H. (2009).What are the Effects of Fiscal Policy Shocks? *Journal of Applied Econometrics*, 24(6):960-992.

[35] Nikkei Asian Review. (2019, January 6). Labor shortage drives more bankruptcies in Japan. Retrieved on September 14, 2019, from https://asia.nikkei.com/Business/Business-trends/Labor-shortage-drives-more-bankruptcies-in-Japan.

[36] Opp, M. M., Parlour, C. A., & Walden, J. (2014). Markup Cycles, Dynamic Misallocation, and Amplification, Journal of Economic Theory, 154: 126-161.

[37] State Taxation Administration. (2007, December 6). Implementation Regulation of the Enterprise Income Tax Law of the People's Republic. Retrieved on September 9, 2019, from http://www.chinatax.gov.cn/n810341/n810765/n812176/n812748/c1193046/content.html (in Chinese).

[38] State Taxation Administration. (2014, October 20). Notice on Improving the Enterprise Income Tax Policy for Accelerated Depreciation of Fixed Assets. Retrieved on September 9, 2019, from http://www.chinatax.gov.cn/n810341/n810755/c1260992/content.html (in Chinese).

[39] The New York Times. (2015, September 1). Stocks Dive As Worries About Asia Reverberate. Retrieved on July 25, 2019, from https://www.nytimes.com/2015/09/02/business/dealbook/daily-stock-market-activity.html.

[40] The New York Times. (2019, January 21). China's Looming Crisis: A Shrinking Population. Retrieved on July 24, 2019, from https://www.nytimes.com/interactive/2019/01/17/world/asia/china-population-crisis.html?_ga=2.248934087.1968373327.1564016735-1353886149.1564016735.

[41] Wielhouwer J. L., & Wiersma E. (2014). Investment decisions and depreciation choices under a discretionary tax depreciation rule, *European Accounting Review*, 26(3): 1−25.

[42] Wei, S. J., Xie, Z., & Zhang, X. (2017). From" Made in China" to" Innovated in China": Necessity, prospect, and challenges. *Journal of Economic Perspectives*, 31(1), 49-70.

[43] Whited, T. M., & Wu, G. (2006). Financial constraints risk. *The Review of Financial Studies*, *19*(2), 531-559.

[44] Wu, Y. (2005). The effects of state R&D tax credits in stimulating private R&D expenditure: A cross-state empirical analysis. *Journal of Policy Analysis and Management*, 24(4), 785-802.

[45] Yu, F. (2008). Analyst coverage and earnings management. *Journal of Financial Economics*, 88(2), 245–271.

[46] Zwick, E., & Mahon, J. (2017). Tax policy and heterogeneous investment behavior. *American Economic Review*, *107*(1), 217-48.