The Structure of Business Taxation in China*

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Abstract

This paper documents facts about the structure of business taxation in China using administrative tax data from 2007 to 2011 from the State Taxation Administration. We first document the importance of different business taxes across industries. While corporate income taxes play an important role for manufacturing firms, these firms also remit a large share of their tax payments through the value-added tax system, through the excise tax system and through payroll taxes. Gross receipts taxes play an important role for firms in other industries, leading to spillovers that may affect the overall economy. Second, we evaluate whether the structure of China's tax revenue matches its stage of development. A cross-country comparison of sources of government revenue shows that China collects a high share of tax revenue from taxes on goods and services and a high share of income tax on corporations. Finally, we study whether firm-level differences in effective tax rates can be an important source of allocative inefficiencies. Decomposing the variation in effective tax rates across firms, we find that government policies, including loss carry-forward provisions and preferential policies for regional, foreign, small, and high-tech firms, have significant explanatory power. Nonetheless, while effective tax rates vary along a number of dimensions, tax policy does not explain the large dispersion in the returns to factors of production across firms.

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1 Introduction

The structure of business taxation is at the heart of important economic and policy questions. Governments often use tax policy to provide short-run economic stimulus and to promote long-run growth. Understanding the structure of business taxation is critical for evaluating the pros and cons of these policy initiatives. The design and implementation of business taxation are also largely influenced by each country's stage of development. Policy goals and fiscal capacity could differ substantially between developed and developing economies. All of these factors impact the effectiveness of tax policies. Tax structures may also lead to differential returns to production factors if firms face different tax burdens. It is well documented that allocative efficiency is a major contributor to the large TFP differences across countries. However, it is still an open question whether and how much the business tax structure can explain the observed differences in measured factor returns at the micro level.

This paper documents important facts about the structure of business taxation in China. China is an ideal setting in which to investigate how the tax structure interacts with economic development. Over the last two decades, China's income per capita has rapidly approached the levels of middle income countries. Improving our understanding of business taxes can illuminate broader fiscal policy trends in China such as the evolution of the mix of private and state sectors as well as the government's growing focus on technology-intensive industries as a source of future economic growth. In addition, policy makers in China also provide fiscal incentives for a broad range of firm activities. Given that firm-level distortions in China are often used as a leading example for misallocation, understanding the role of business taxation in generating these distortions is important. Finally, because of China's growing dominance in manufacturing and its crucial role in the global value chain, tax policy in China affects production and consumption in the rest of the world.

To improve our understanding of business taxation in China, we take advantage of administrative tax survey data for the years 2007–2011. These data have a number of advantages. First, the fact that the data are used by Chinese tax authorities to audit companies helps forestall concerns over data quality. By merging administrative tax data with the Annual Survey of Manufactures, we provide a valuable cross-check for this well-studied database. Second, our data allow us to characterize business taxes beyond the manufacturing sector. We validate the representativeness of these data by showing that firm-level tax data result in aggregate decompositions similar to those published in China's statistical yearbook. Finally, with respect to the misallocation literature, which infers the influence of taxes through "wedges" in production choices, these data allow us to measure a variety of different taxes and how they interact with each other.

Our analysis starts by describing our data coverage and the different taxes paid by businesses in China. We next document the following facts.

First, we document the importance of multiple tax systems across Chinese industries. The value-added tax (VAT) is the major tax for firms in primary industries (e.g., mining, agriculture, and forestry) and the manufacturing industry. On the other hand, the business tax—a tax on gross receipts—affects many firms in construction and several service sectors (e.g., finance, insurance, transportation, and communications).[1] Surprisingly, an excise tax on specific commodities affects a large fraction of manufacturing firms. We also document the importance of payroll taxes for Chinese businesses. In spite of the fact that payments to the social security fund are not official taxes, we find that these contributions constitute a non-negligible fraction of payments to the Chinese government. The joint existence of VAT, gross-receipts taxes, and excise taxes runs counter to the prescriptions of simple theories of optimal taxation and may reflect practical aspects of tax administration in developing countries. Moreover, because these tax systems generate different effective tax rates and distortions, they can encourage some sectors while constraining growth in others.

Second, given the extraordinary growth experience of China in the past two decades, a potential hypothesis is that China's tax structure might not be well explained by its income level. To evaluate this hypothesis, we conduct a cross-country analysis of government revenue sources using public aggregate data from the IMF in 2011. A well-known fact is that the size of government revenue as a share of GDP is increasing in GDP per capita. Based on this metric, China's government revenue fits well with the level predicted by its income per capita and does not look like an outlier. However, over 60% of China's tax revenue relies on taxes on goods and services, which is very high compared to the proportions of other middle-income and high-income countries. Value-added tax represents around half of the total tax revenue from goods and services. While China's total income tax as a share of total tax revenue is in line with its level of development, relative to other countries, China relies disproportionately heavily on the corporate sector for its income taxes. More than 70% of income tax revenue comes from corporate income tax.

Finally, we explore the potential for tax policy to be an important source of misallocation in China. To evaluate this possibility, we study drivers of differences in the effective corporate income tax (CIT) rates of firms. Loss carry-forwards and tax credits for high-tech enterprises, enterprises in transition, and small firms are the main drivers of the differences in effective CIT rates.[2] In addition, a small fraction of the variation in effective tax rates can be attributed to industry and ownership structure. These differences are consistent with well-documented

[1] Starting from 2012, pilot experiments for a tax reform aiming to replace the business tax with the VAT were launched in a few industries. The business tax was completely replaced by the VAT in May 2016.

[2] Enterprises in transition include foreign-invested enterprises subject to preferential rates and enterprises participating in the Western Development Program.

government tax policies. However, we find that they are responsible for a very small fraction of the observed dispersion in the returns to production factors.

This paper is related to several strands of research. The first is the literature on taxes in developing countries. Gordon and Li (2009) note that a lack of administrative capacity to enforce compliance leads developing countries to rely on tax systems that interact with the financial system, which generates a paper trail of economic activity. These kinds of frictions lead to departures from first-best policy recommendations (e.g., Diamond and Mirrlees, 1971), whereby governments may rely on gross-receipts taxes to limit compliance problems (e.g., Best, Brockmeyer, Kleven, Spinnewijn and Waseem, 2015). By studying the structure of business taxation in one of the largest emerging economies, we provide new facts that shed light on how countries balance tax revenue needs with economic distortions.

Second, this paper is related to recent work studying how Chinese firms respond to tax incentives (e.g., Cai and Harrison, 2018; Liu and Mao, 2018; Chen, He and Zhang, 2018; Chen, Liu, Suárez Serrato and Xu, 2019b; Chen, Jiang, Liu, Suárez Serrato and Xu, 2019a; Fan, Liu, Qian and Wen, 2018). These papers show that, as in other countries (e.g., Yagan, 2015; Maffini, Xing and Devereux, 2016; Rao, 2016; Zwick and Mahon, 2017; Ohrn, 2018a,b; Moon, 2019), in China firms are highly responsive to tax policy incentives. In addition, the government has relied on tax incentives as a way to implement national directives to focus on technology upgrade and to foster its innovation sector (e.g., Wei, Xie and Zhang, 2017).

Finally, this paper is related to the large literature that explains observed resource misallocation by pointing to dispersion in the marginal products of inputs across firms (e.g., Restuccia and Rogerson, 2008; Hsieh and Klenow, 2009a). These so-called wedges are often interpreted as distortions arising from fiscal policy. For the case of China, Brandt, Tombe and Zhu (2013) document rich variation in these wedges across different regions and time periods. However, few papers have quantified the costs of misallocation by measuring actual variation in tax policy (e.g., Fajgelbaum, Morales, Suárez Serrato and Zidar, 2018). Our unique data allow us to document new patterns of dispersion in actual taxes and subsidies. By comparing these observed wedges to those inferred from optimization, we can cross-check the extent to which fiscal policy is an important driver of misallocation.

The rest of the paper is structured as follows. Section 2 presents basic facts about business taxation in China and displays the structure of tax payment using the tax survey data. Section 3 compares the business tax structure of China with those of other countries. Section 4 describes patterns that drive differences between the statutory and effective corporate income tax tax rates. Section 5 concludes.

2 Business Taxes in China

2.1 Policy

Since the end of the 20th century, China has gone through a series of tax reforms. China's current tax system has the primary goals of collecting fiscal revenue, facilitating economic development policies, and improving the income distribution. By 2013, there were 18 taxes in China's tax system. Interestingly, 17 of those (except the personal income tax) can be classified as business taxes.[3] The 17 taxes affecting businesses are the value-added tax, corporate income tax, business tax, excise tax, city maintenance and construction tax, deed tax, tariffs, land appreciation tax, vehicle and vessel tax, urban land use tax, real estate tax, farmland occupation tax, stamp tax, resources tax, vehicle purchase tax, tonnage tax and tobacco tax.

These 17 business taxes can be classified into three main categories: taxes on goods and services, corporate income tax, and taxes on international trade. Taxes on goods and services include the domestic VAT, business tax, domestic excise tax, city maintenance and construction tax, deed tax, land appreciation tax, vehicle and vessel tax, urban land use tax, real estate tax, farmland occupation tax, stamp tax and resources tax. The VAT is levied on the production and sale of goods, while the business tax is levied on the provision of services. Taxes on international trade include the VAT and excise taxes on imports and tariffs.

China has implemented a number of reforms to taxes on goods and service since 2008. Consider first the VAT, which is one of the consumption taxes and is levied on the value-added part at each production and distribution stage for goods. The baseline VAT rate is 17 %, but a 13 % VAT is applied to the mining and utilities industries, and self-produced agricultural output is exempt from the VAT. One of the major VAT reforms in China took place during our sample period of 2007–2011. The VAT reform of 2009 changed China's production-based VAT to a consumption-based VAT. Before 2009, the input VAT of fixed investment was not allowed to be deducted from the output VAT. Since 2009, the VAT on investment in fixed assets can be deducted from the output VAT base.

Consider now the excise tax, which is also one of the consumption taxes but is levied on a small group of intermediate and consumption goods, such as oil and gasoline, automobiles, tobacco, alcohol, and a few other "luxury" goods to adjust consumer behaviors. The VAT and excise tax are not mutually exclusive. That is, producers need to pay both the VAT and excise tax if the goods are taxable under each. The excise tax can be calculated based on price, quantity, or both, depending on the category of the goods. Excise tax rates have varied considerably over time.

[3]Individuals also pay some of these 17 taxes. For example, individual taxpayers need to pay the real estate tax, vehicle and vessel tax, vehicle purchase tax, stamp tax and deed tax if they engage in taxable activities.

For instance, in 2008, China raised the per-unit excise tax on refined oil and large displacement vehicles and lowered the excise tax on small displacement vehicles. In 2009, China added a 5% excise tax at the wholesale stage of tobacco. In addition, the input excise tax from purchases cannot be deducted from excise tax liabilities, which is another feature that makes it different from the VAT.

Table 1: **Breakdown of Business Taxes Revenue, 2011**

Type of Tax	Tax Revenue[a]	Tax Survey[b]
Total Tax Revenue	100 %	100 %
Domestic Value Added Tax (VAT)	27.0%	29.5%
Corporate Income Tax	18.7%	19.1%
Business Tax	15.2%	14.2%
VAT and Excise Tax on Import	15.1%	15.4%
Domestic Excise Tax	7.7%	10.9%
Personal Income Tax[c]	6.7%	5.2%
City Maintenance and Construction Tax	3.1%	3.4%
Deed Tax	3.1%	0.4%
Tariff	2.9%	2.8%
Land Appreciation Tax	2.3%	0.6%
Vehicle and Vessel Tax	0.3%	0.3%
Urban Land Use Tax	1.4%	1.0%
Real Estate Tax	1.2%	1.4%
Farmland Occupation Tax	1.2%	0.1%
Stamp Tax	1.2%	1.0%
Resources Tax	0.7%	0.8%
Other taxes[d]	2.4%	0.2%
VAT and Excise Tax Refunded on Exports	-10.3%	-6.2%

Notes: [a] Calculations are based on 2011 fiscal revenue report from Gov.cn (2012). [b] All taxes are amounts paid, except for that of CIT, where the prepaid CIT amount is used due to data availability. [c] In tax survey data, personal income tax only includes reported withholding personal income tax by enterprises and paid personal income tax from sole proprietorship, private proprietorship, and private partnership enterprises.
[d] In tax survey data, this category includes the tobacco tax and vehicle purchase tax. On top of these two taxes, government fiscal revenue also includes revenues from the tonnage tax and other miscellaneous taxes.

The third largest consumption tax in China is the business tax, which is the counterpart of the VAT on services and is levied on gross business receipts with no deductions of input tax credits. Specifically, enterprises pay business tax on the gross business revenue from the provision of services, the transfer of intangible assets, and the sale or leasing of real estate. The business tax rate is 3% or 5% depending on the industries of service provision. The 3% business tax is levied on business revenue in the construction, transportation, postal, telecommunication, and culture and sports industries. The 5% business tax is applied to business revenue from most other services industries.[4] Due to limited enforcement and asymmetric information, the business tax was a more reliable tax instrument than the VAT on services, as it was harder to evaluate inputs in service industries and the business tax was levied on a broader tax base. As technology progresses, the tax authority has been able to collect more firm information, which was a foundation of the reform that replaced the business tax with the VAT starting in 2012.

The CIT has also seen a number of reforms in recent years. Before 2008, the CIT followed a dual-track system whereby domestic enterprises paid a 33% CIT rate and foreign-invested enterprises (FIEs) paid a preferential CIT rate of either 15% or 24% (The National People's Congress, 1991). FIEs also enjoyed various preferential tax credits.[5] In 2008, the CIT rate was consolidated to a common rate of 25% for both domestic enterprises and FIEs. FIEs that paid 15% before 2008 were allowed to pay 18%, 20%, 22% and 24% transition rates in the following four years thereafter and were then subject to the common 25% CIT rate from 2012.[6]

Table 1 shows the breakdown of China's tax revenue in 2011.[7] The total tax revenue from business taxes accounts for over 93% of tax revenue in 2011. The value-added tax, corporate income tax, business tax and excise tax together contributed more than 80% of the total tax revenue of China in 2011, as shown in the first column of Table 1.

In addition to the 17 business taxes above, enterprises established in China also have to make contributions to social security funds, similar to the payroll tax system in the United States.[8]

[4]The entertainment industry is subject to different business tax rates varying from 5% to 20%.

[5]For example, the "2-year free and 3-year half" policy waives CIT liability for the first two years and cuts CIT liability in half for the next three years for foreign-invested production enterprises from the first year of making a positive accounting profit.

[6]In addition, since 2006, China has unified several other taxes for domestic and foreign-invested enterprises. These taxes include the vehicle and vessel tax, urban land use tax, farmland occupation tax, real estate tax, resources tax, and city maintenance and construction tax.

[7]Contributions to social security from employers and employees are not a formal tax in China and are therefore excluded from the tax revenue amounts.

[8]Specifically, the contribution of enterprise for social security, health care, unemployment, casualty and maternity insurance varies from 0.6% to 20% of the total wage bill.

2.2 Administrative Tax Data

Our main data come from an administrative tax survey collected by the State Taxation Administration (STA) of China from 2007-2011. The STA is the Chinese counterpart of the IRS and is responsible for tax collection and tax auditing. In this data, we have access to firm-level records of detailed tax payment breakdowns for the above 17 business taxes, with details on the specific annual tax bases, tax payable, tax deductions and exemptions, tax credits and actual tax payment information for the VAT, CIT, business tax, and excise tax. In addition to tax payments, the data also include payment information on contributions to social security funds as well as charges and fees and financial statement information used in tax-related calculations.

In the data cleaning procedure, we leave out observations that pertain to either tax authority institutions or officials and observations classified under the public administration and social organization or international organization categories. We end up with an enterprise-only sample that accounts for over 99.6% of the raw data and has 3,564,691 observations in total. Our data sample size expanded from 632,998 firms per year in 2007 to more than 740,000 firms per year from 2008 to 2010, while there is a 7% drop (representing about 55,000 firms) in the total number of observations in 2011 due to sample shrinkage in 4 provinces (Beijing, Hebei Province, Henan Province and Hunan Province).[9] The shrinkage in the number of observations for 2011 mainly applies to small firms with asset values of less than 20 million RMB.

In Column (2) of Table 1, we break down the total tax payment in 2011 by adding up actual tax payments by enterprises in the tax survey data. The sum of total tax payments in 2011 from the tax survey data is 6.7 trillion RMB, which is around 75% of the total tax revenue reported by the government.[10] As can be seen from the comparison with aggregate tax revenue data, our data match the aggregate tax revenue breakdown quite well. This result suggests that our data are a representative sample with which to study business taxation in China.

As shown in Table 2, we reclassify the 18 industry groups into 10 groups according to the meaningful differences in how they are treated by the tax code. Table 3 and Table 4 report summary statistics for firms in each industry and each ownership structure, respectively. Enterprises in the first 5 groups are mainly subject to the VAT, which is levied on the value added during production. Specifically, in Group 1, self-produced agricultural products are exempt from VAT, and crops and agriculture machines are subject to a 13% statutory VAT rate. In Group 2, the mining, quarrying and oil and gas extraction industry is subject to a 13% statutory VAT rate

[9]The tax survey sample is not random. There is a core group and a sampling group within the survey. Firms in the core group are main tax revenue payers in terms of VAT or business tax and are more likely to be repeatedly surveyed, while firms in the sampling group are picked by the local tax authority each year(Ministry of Finance and State Taxation Administration, 2008).

[10]The total tax payment adds up to 7.6 trillion RMB, which is more than 85% of the total tax revenue in 2011, if the paid VAT, CIT, business tax and excise tax amounts are replaced with amounts payable.

and the resources tax. In Group 3, the statutory VAT rate for production, assembly and processing activities is 17%. In addition, production of specific products such as fireworks, alcohol, makeup, tobacco, automobiles, and petroleum gasoline are subject to excise tax. In Group 4, the statutory VAT rate in the utilities and energy industry is 13%. The wholesale and retail industry pays a 17% statutory VAT rate in Group 5, and certain products (such as tobacco and gold and silver jewelry) are subject to excise tax. Starting from Group 6, activities in these industries are mainly subject to the business tax, which is levied on gross business receipts. The statutory rate of the business tax in the construction industry is 3% in Group 6, while the finance and insurance industry is subject to a 5% statutory business tax in Group 7. The real estate industry in Group 8 is subject to a 5% statutory business tax and various taxes such as the land appreciation tax, urban land use tax, real estate tax, farmland occupation tax, stamp tax and deed tax. In Group 9, the transportation, postal and telecommunication industries are subject to a 5% statutory business tax rate. Finally, in the last group, all other service industries are in general subject to either a 3% or 5% statutory business tax rate.

Summary statistics by industry and ownership structure are displayed in Table 3 and Table 4, respectively.

Table 2: **Industry Classification**

Group	Industry	China Industry Classification
1	Agriculture, Fishing and Forestry	Agriculture, Fishing and Forestry
2	Mining, Quarrying, and Oil and Gas Extraction	Mining, Quarrying, and Oil and Gas Extraction
3	Manufacturing	Manufacturing
4	Utilities	Utilities and Energy
5	Wholesale and Retail	Wholesale and Retail Trade
6	Construction	Construction
7	Finance and Insurance	Finance and Insurance
8	Real Estate	Real Estate
9	Transportation, Postal and Telecommunication	Transportation, Warehousing and Postal Industry - Transportation, Postal Industry Information - Telecommunications Transportation, Warehousing and Postal Industry - Warehousing Information - Information Service, Software
10	Other	Accommodation and Food Services Leasing and Business Services Professional, Scientific, and Technical Services Water, Environment and Public Facilities Management Resident Services and Other Services Educational Services Health Care and Social Assistance Arts, Entertainment, and Recreation

Notes: Eighteen China Industry Classification codes from China's Bureau of Statistics are reclassified based on the tax code treatment of each industry. Industries that share a similar statutory tax rate for a certain tax and similar structure of applicable taxes are classified into one group.

2.2.1 Industry

Table 3: **Summary Statistics by Industry**

Industry	2007	2008	2009	2010	2011
(A) Number of Firms					
Agriculture	4,287	7,206	8,100	6,867	6,206
Mining	16,894	18,130	17,224	18,132	18,192
Manufacturing	273,455	313,797	308,789	315,358	283,051
Utilities	11,417	12,737	13,764	13,874	13,463
Wholesale/Retail	192,020	242,376	239,721	220,184	191,289
Construction	23,597	26,149	27,404	30,226	30,537
Finance/Insurance	16,862	18,765	19,886	20,853	22,443
Real Estate	21,375	25,554	30,467	36,186	37,367
Transport/Postal/Telecom	16,699	18,941	19,796	21,850	24,229
Other	56,292	66,009	58,738	63,152	64,803
Total	632,898	749,664	743,889	746,682	691,580
(B) Business Revenue					
Agriculture	20,910	20,536	28,046	39,662	60,713
	[3,416]	[2,266]	[2,512]	[4,799]	[9,012]
Mining	60,477	81,946	75,780	100,353	122,805
	[11,428]	[14,116]	[11,368]	[16,904]	[21,452]
Manufacturing	56,261	57,756	61,584	77,256	98,303
	[6,617]	[6,643]	[8,137]	[11,492]	[18,153]
Utilities	156,867	164,069	167,096	193,297	192,898
	[18,304]	[18,842]	[17,338]	[21,170]	[20,900]
Wholesale/Retail	49,247	50,540	59,566	87,956	116,424
	[4,447]	[4,873]	[5,503]	[9,141]	[12,484]
Construction	74,858	89,146	109,913	129,855	148,271
	[13,381]	[17,190]	[25,666]	[33,322]	[37,270]
Finance/Insurance	141,684	172,574	175,035	201,662	206,384
	[38,286]	[44,278]	[50,000]	[55,291]	[38,036]
Real Estate	75,065	71,543	94,731	106,496	105,186
	[18,471]	[15,754]	[23,000]	[27,961]	[24,090]
Transport/Postal/Telecom	83,089	93,257	96,807	108,486	101,762
	[12,791]	[16,057]	[17,550]	[22,954]	[18,634]

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Table 3 – continued from previous page

Industry	2007	2008	2009	2010	2011
Other	20,820	24,987	42,977	41,660	48,979
	[1,756]	[2,787]	[6,195]	[7,816]	[7,979]
(C) Assets					
Agriculture	32,534	33,164	37,791	57,400	82,747
	[3,988]	[3,631]	[3,633]	[5,685]	[9,794]
Mining	97,484	113,487	141,852	161,056	197,510
	[10,443]	[13,046]	[15,931]	[17,330]	[23,510]
Manufacturing	66,086	66,178	77,720	92,414	118,672
	[6,790]	[6,762]	[8,772]	[10,762]	[17,030]
Utilities	330,224	340,536	355,008	384,058	417,477
	[55,809]	[53,748]	[52,310]	[53,914]	[64,515]
Wholesale/Retail	32,460	31,564	40,323	54,225	74,779
	[2,499]	[2,714]	[3,116]	[4,469]	[6,160]
Construction	95,291	110,514	128,828	146,316	177,961
	[17,992]	[20,708]	[24,886]	[28,166]	[32,814]
Finance/Insurance	1,131,008	1,196,557	1,220,267	1,256,477	1,177,810
	[503,674]	[533,294]	[500,587]	[433,214]	[164,035]
Real Estate	261,100	281,304	340,503	387,119	459,363
	[82,054]	[90,446]	[107,640]	[127,436]	[162,689]
Transport/Postal/Telecom	186,200	188,780	191,637	194,651	196,527
	[12,543]	[12,281]	[9,594]	[10,844]	[11,022]
Other	66,507	76,967	102,025	116,560	137,613
	[3,314]	[4,546]	[7,264]	[8,515]	[9,632]
(D) Employment					
Agriculture	67	57	61	73	89
	[19]	[15]	[15]	[18]	[22]
Mining	209	206	222	221	221
	[66]	[65]	[75]	[65]	[65]
Manufacturing	148	134	139	149	163
	[42]	[38]	[44]	[50]	[60]
Utilities	238	220	212	209	206

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Table 3 – continued from previous page

Industry	2007	2008	2009	2010	2011
	[99]	[84]	[78]	[71]	[70]
Wholesale/Retail	34	30	34	38	43
	[9]	[10]	[11]	[11]	[11]
Construction	189	181	193	195	193
	[40]	[40]	[50]	[49]	[47]
Finance/Insurance	146	151	159	167	168
	[50]	[49]	[52]	[55]	[50]
Real Estate	50	45	48	48	47
	[25]	[23]	[24]	[24]	[24]
Transport/Postal/Telecom	197	193	198	194	181
	[55]	[52]	[56]	[58]	[48]
Other	84	86	109	118	121
	[20]	[22]	[36]	[40]	[39]

Notes: This table presents summary statistics on the number of firms, business revenue, assets, and employment by industry from 2007 to 2011. Business revenue, reported in 1,000 RMB, is the revenue from main business activities and other business activities. Assets, reported in 1,000 RMB, are the end of year assets, which include both current and non-current assets. Employment is the average number of workers within a calendar year. Variables are winsorized at the 1% level. Medians are reported in brackets.

In Table 3, we summarize the overall importance of each sector in terms of tax, overall business revenues, and asset values. As shown in Panel A, firms in the manufacturing and in the wholesale and retail industries account for over 60% of the firms in our sample. The utilities, finance and insurance, and transportation, postal and telecommunication industries have the highest average business revenue per enterprise in the sample, as shown in Panel B. Although the average business revenue is small, the manufacturing and wholesale and retail industries represent 36.1% and 29.6% of the total business revenue, respectively. Next, as shown in Panel C, the finance and insurance and utilities and energy industries have the largest average value of assets, and the finance and insurance industry share represents more than 50% of the total value of assets. In terms of employment, the utilities, mining, quarrying, and oil and gas extraction, and transportation, postal and telecommunication industries have the largest average employment across the years, as shown in Panel D. However, the manufacturing industry represents over 50% of total employment across all industries.

2.2.2 Ownership Structure

In our sample, enterprises are reclassified into one of three ownership structure categories—state-owned enterprises (SOEs), FIEs or private enterprises—according to their Taxpayer Registration and Affiliation Codes. SOEs include state-owned non-corporate enterprises, shareholding corporations that are solely funded by the state, and state-owned joint ventures. Shareholding companies that are affiliated with a central, province-level or city-level government at any point during our sample period are also classified as SOEs. Enterprises with state-owned assets have faced relatively competitive product prices in non-regulated industries since the late 1990s, but they still have an advantageous status in markets for inputs such as land and capital. FIEs include all enterprises that receive equity funds from investors in Hong Kong, Macau, or Taiwan, or from other places abroad. Compared to domestic enterprises, FIEs generally enjoyed preferential tax treatment before 2008. Private corporations, collective-owned enterprises, sole proprietorships, non-SOE shareholding corporations and other enterprises are classified into the private group.

Table 4: **Summary Statistics by Ownership**

Ownership	2007	2008	2009	2010	2011
(A) Number of Observations					
State Owned Enterprise	45,568	43,439	44,033	43,820	47,832
Foreign Invested Enterprise	55,768	61,276	67,213	80,517	77,923
Private	349,334	387,980	406,439	442,453	467,417
Total	450,670	492,695	517,685	566,790	593,172
(B) Business Revenue					
State Owned Enterprise	140,729	171,851	185,004	224,937	225,767
	[17,503]	[21,966]	[25,474]	[36,200]	[28,280]
Foreign Invested Enterprise	142,443	149,658	143,260	156,898	172,651
	[31,683]	[32,218]	[30,021]	[33,116]	[37,565]
Private	43,001	50,008	58,793	72,276	81,691
	[5,136]	[6,349]	[8,878]	[11,814]	[12,963]
(C) Assets					
State Owned Enterprise	370,754	435,636	480,958	559,371	577,150
	[31,205]	[36,826]	[37,149]	[46,718]	[44,207]
Foreign Invested Enterprise	179,442	187,693	201,086	202,146	230,712

Continued on next page

Table 4 – continued from previous page

Ownership	2007	2008	2009	2010	2011
	[35,965]	[35,367]	[36,425]	[34,144]	[40,329]
Private	66,684	75,064	89,969	105,118	117,020
	[5,117]	[5,711]	[7,530]	[9,183]	[11,008]
(D) Employment					
State Owned Enterprise	235	237	248	254	246
	[65]	[66]	[71]	[75]	[66]
Foreign Invested Enterprise	265	255	243	233	234
	[110]	[103]	[100]	[96]	[97]
Private	88	86	90	94	92
	[20]	[20]	[24]	[25]	[25]

Notes: This table presents summary statistics on the number of firms, business revenue, assets, employment and production by firm ownership structure from 2007 to 2011, excluding observations from Beijing, Henan Province, Hebei Province and Hunan Province due to sample shrinkage. The "Foreign Invested Enterprise" category includes enterprises owned by either foreign investors or investors in Hong Kong, Macau or Taiwan. The "Private" category includes private corporations, collectively owned enterprises, sole proprietorship corporations and non-SOE shareholding companies. Business revenue, reported in 1,000 RMB, is the revenue from main business activities and other business activities. Assets, reported in 1,000 RMB, are the end of year assets, which include both current and non-current assets. Employment is the average number of workers within a calendar year. Variables are winsorized at the 1% level. Medians are reported in brackets.

Table 4 displays the number of observations and summary statistics on business revenue, assets and employment in each ownership structure group. This table drops firms in Beijing, Henan Province, Hebei Province and Hunan Province to alleviate the impact of sample shrinkage in 2011. As shown in Table 4 Panel A, about 80% of enterprises in the tax survey data are private enterprises. About 13% (10% in the full sample) of enterprises are FIEs, and less than 10% are SOEs. In addition, the number of SOEs generally remained stable during our sample period, while the number of FIEs and private enterprises expanded from 2007 to 2011. Panel B shows that the average business revenue size of SOEs and FIEs is more than three times that of private enterprises, and SOEs and FIEs account for 32.2% and 22.5%, respectively, of total business revenue in the full sample. In addition, SOEs have the highest average value of assets and represent approximately 60% of total assets on average across the years in the full sample, as shown in Panel C. In terms of employment, the average employment sizes of SOEs and FIEs are approximately three times that of private enterprises, and SOEs and FIEs account for 27.9% and 23.8% of total employment, respectively. The significant role of SOEs can be traced back to the

SOE reform started in the late 20th century, which was focused on "grasping the big, and letting go of the small"(Hsieh and Song, 2015). As a result, SOEs are concentrated in monopoly and upstream industries such as finance, energy and telecommunications (Li, Liu and Wang, 2015).

2.3 Tax Payment

In this section, we look at the tax payment structure within each industry. Tax payment is defined as the sum of all VAT, excise tax, business tax, and CIT payable amounts plus local taxes, VAT and excise tax on imported goods, duties, and social security funds contributions, excluding personal income tax, withholding excise tax, and refunded VAT and excise tax on exports, among all enterprises within the same industry classification group.

Due to data availability, in our tax calculations, we used the realized tax payment instead of the tax obligation.

The tax structure of the total tax payment across industries is shown in Figure 1. As can be seen from the figure, the VAT is the major tax type among the agriculture, mining, manufacturing, wholesale and retail, and utilities industries, while the business tax is the major tax among the construction and other service industries, which is consistent with the tax codes. The corporate income tax is in general the second largest tax payment category in all industries. In addition, within the manufacturing industry, the excise tax represents a large share of the total payment. In addition, the VAT and excise tax on imported goods take up a substantial share of total payments in agriculture, manufacturing and wholesale and retail industries. Noticeably, payments to social security funds compose a non-negligible share of enterprises' payment to the government in most industries. The tax payment structure of each industry group remains relatively stable over the sample period.

Figure 2 displays the breakdown of the tax payment by industry in the pooling sample from 2008 to 2011. More than 40% of the total tax payment and VAT amounts and about one-fourth of the CIT amount are paid by the manufacturing industry, followed by the wholesale and retail trade industry. In addition, the finance and insurance industry contributes one-quarter of the CIT liability. Moreover, the real estate, construction and finance and insurance industries are the main payers of the business tax. The breakdown of the tax payment by industry remains relatively stable across the whole sample period.

Similarly, we also break down the tax payment by ownership structure and region; the results are shown in Appendix A1.

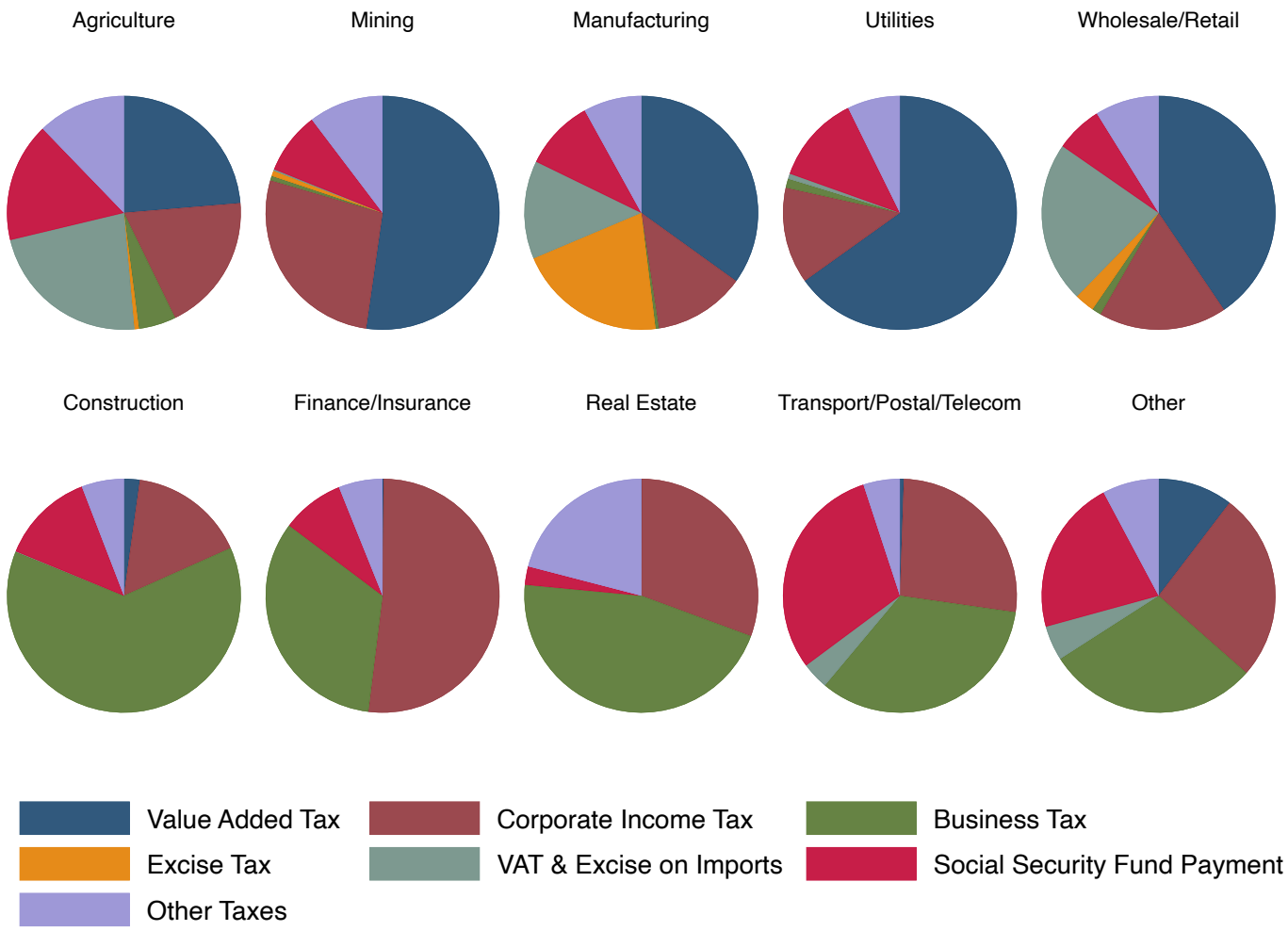
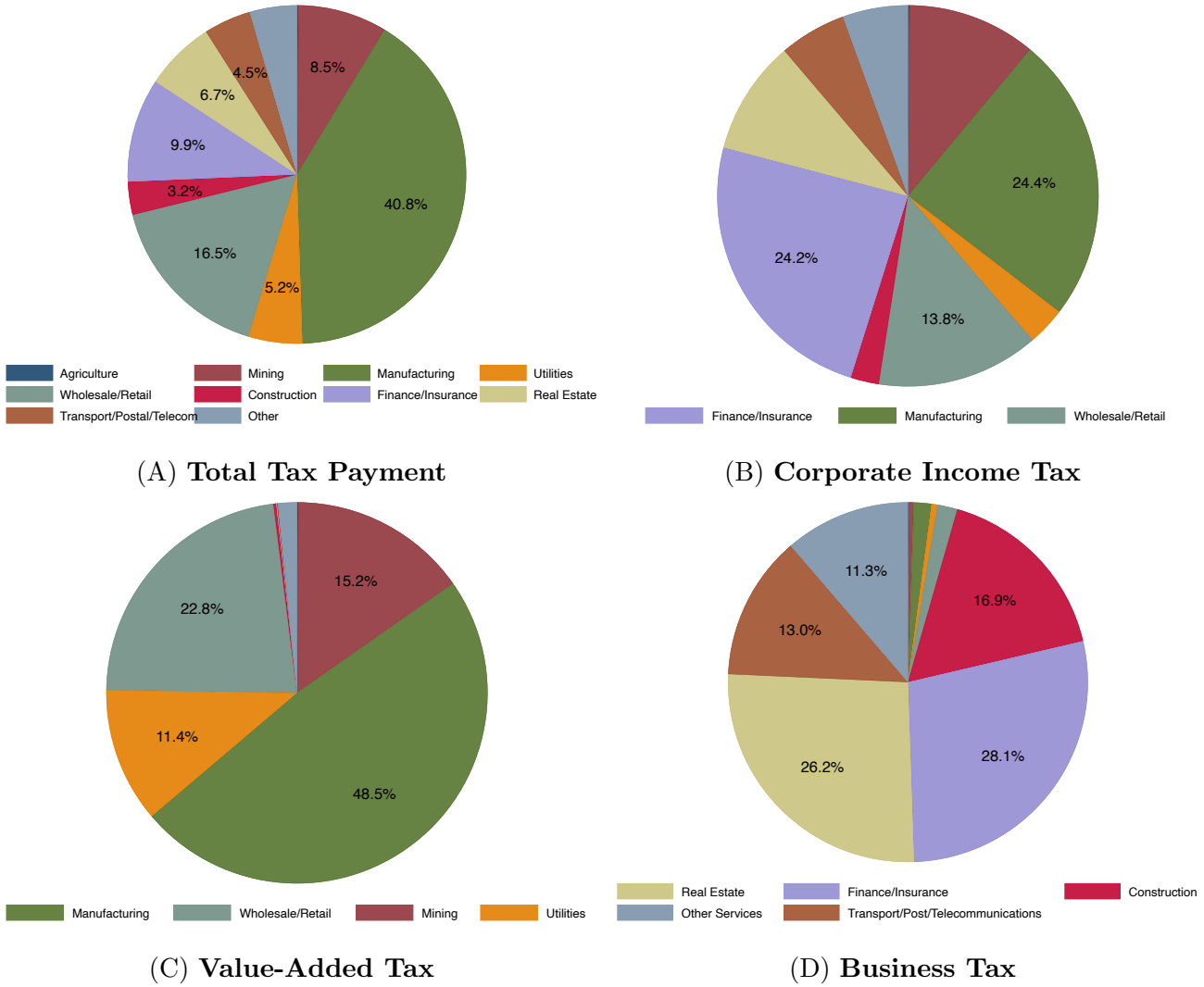


Figure 1: **Tax Payment Structure of Industries, 2008–2011**

Notes: This figure displays the structure of the total tax payment among each industry in the pooling sample from 2008 to 2011. The total tax payment is calculated as the sum of tax payable of domestic VAT, CIT, excise tax and business tax, actual paid amounts of VAT and excise tax on imports, other taxes, and payments to social security funds, excluding paid personal income tax, withholding business taxes and refunded VAT and excise tax on exports. The figure shows, first, that the tax payment structure varies across industries but remains quite stable over the years. Second, the excise tax represents a large share of the tax payment within the manufacturing industry, while the VAT and excise tax on imports account for substantial shares in agriculture, manufacturing and wholesale and retail industries. In addition, payments to social security funds are non-negligible across industries.

3 Development Stages as Drivers of Tax Structures

This section conducts a cross-country comparison of the sources of government revenue, following Gordon and Li (2009). We use data from the IMF's Government Finance Statistics and International Finance Statistics. Table 5 compares the sources of government revenue among 81 countries and regions with different levels of GDP per capita. We group countries and regions into one of three categories—a low-income and lower-middle-income group, an upper-middle-



(A) **Total Tax Payment** (B) **Corporate Income Tax**

(C) **Value-Added Tax** (D) **Business Tax**

Figure 2: **Tax Payment Breakdown by Industry, 2008–2011**

Notes: This figure displays the breakdown of the total tax payment, CIT payment, VAT payment and business tax payment by industry in the pooling sample from 2008 to 2011. The total tax payment is calculated as the sum of tax payable of domestic VAT, CIT, excise tax and business tax, actual paid amounts of VAT and excise tax on imports, other taxes, and payments to social security funds, excluding paid personal income tax, withholding business taxes and refunded VAT and excise tax on exports. This figure shows that more than half of the total tax payment and CIT and more than 70% of the VAT are paid by the manufacturing, wholesale and retail trade and mining industries. The finance and insurance industry is the second largest payer of CIT. In addition, the real estate, construction, and finance and insurance industries are the main payers of business tax.

income group and a high-income group—according to income thresholds from the World Bank's 2011 World Development Indicators. Table 5 shows that high-income countries and regions, which have a GDP per capita higher than $12,275 in 2011, have a higher tax revenue share of GDP and a higher share of government revenue from social contributions than those of their low- and middle-income counterparts. The sources of government revenue in China align well

with the average sources for the group of upper-middle-income countries. Specifically, tax revenue as a fraction of GDP in China is about three-quarters of that of high-income countries and regions. Social security contributions as a fraction of GDP in China are about two-thirds of the average level in high-income countries and regions. The difference in the government revenue share of GDP could result from differences in the capacity of the tax authorities or in the social preferences over public and private consumption.

Table 5: **Sources of Government Revenue, 2011**

GDP per capita	Revenue (% GDP)	Tax revenue (% revenue)	Social contribution[a] (% revenue)	Grants[b] (% revenue)	Other[c] (% revenue)
$\leq$ \$3,975	23.4	62.4	7.9	5.1	24.6
\$3,975 - \$12,275	27.6	68.2	14.6	0.5	16.7
China: mainland (\$5,465)	27.4	72.1	14.7	0.0	13.2
$>$ \$12,275	36.1	60.4	25.1	0.3	14.6
United States (\$49,882)	29.2	63.0	20.3	0.0	16.7

Notes: Calculations are based on available data for 2011 from 81 countries and regions from the Government Finance Statistics and International Finance Statistics of the IMF and the World Development Indicators of the World Bank. The ranges for GDP per capita follow the World Bank 2011 classification of low-income, lower-middle-income, upper-middle-income and high-income countries and regions. The revenue share is weighted by GDP, and other average calculations are weighted by total government revenue. [a] Social contribution includes contributions to social security from employers, employees, and self-employed and non-employed workers. [b] Grants include current capital from foreign governments or international organizations. [c] Other revenue includes but is not limited to property income, capital gains, fines, penalties and forfeits.

Table 6 shows the sources of tax revenue among countries of different income levels. Among low- and middle-income countries and regions, the main sources of government revenue are taxes on goods and services and income taxes from corporations. Specifically, over 66% of the tax revenue comes from taxes on goods and service, and 73.5% of income tax revenue (that is, 17.5% = 23.7% $\times$ 73.5% of tax revenue) comes from taxes on corporations in China. By comparison, these fractions in the United States are 22.6% and 15.9%, respectively. Anecdotal evidence shows that firms have incentives to relabel wages as expenses to undercut payroll tax liability in China. Specifically, employee welfare programs can be implemented through expenditure reimbursement, which would be accounted for as an administrative instead of employee welfare and bonus expense. To deal with the relabeling issue, the tax authority in China also sets an expenditure cap on itemized expenses. Nevertheless, the relabeling phenomena can partially

explain the low share of personal income tax in income taxes in China. In addition, taxes on international trade are higher as a fraction of tax revenue among low- and middle-income countries and regions than among high-income countries and regions. However, the fraction of taxes on international trade in China is less than the average level in upper-middle-income countries and regions. The reliance of tax revenue on taxes on goods and services in China might reflect the enforcement capability of the Chinese tax authority.

We next break down the components of taxes on goods and services in Table 7. As can be seen, the value-added tax represents about half of the amount of taxes on goods and services, followed by excise taxes. The second largest goods and services tax in China is the sales tax (business tax in the tax system). In contrast, there is no value-added tax in the United States, and about half of taxes on goods and services come from sales tax. Most OECD countries have only VAT or its equivalent as the major tax applied on general goods and services, in addition to excise taxes on specific goods and services (OECD, 2012).[11]

Table 6: **Breakdown of Tax Revenue, 2011**

GDP per capita	Income taxes[a] (% taxes)	Corporate income taxes[b] (% income taxes)	Taxes on goods and services[c] (% taxes)	Taxes on int'l trade[d] (% taxes)	Other[e] taxes (% taxes)
$\leq$ \$3,975	41.3	72.7	48.9	6.2	3.7
\$3,975 - \$12,275	28.6	61.7	60.9	3.4	7.1
China: mainland (\$5,465)	23.8	73.5	66.6	2.7	6.8
$>$ \$12,275	48.6	25.1	37.5	2.2	11.6
United States(\$49,882)	59.9	15.9	22.6	1.1	16.4

Notes: Calculations are based on available data from 2011 for 81 countries and regions from the Government Finance Statistics and International Finance Statistics of the IMF and the World Development Indicators of the World Bank. The ranges for GDP per capita follow the World Bank 2011 classification of low-income, lower-middle-income, upper-middle-income and high-income countries and regions. Corporate income tax shares are weighted by income tax revenue, and other average calculations are weighted by total tax revenue.
[a] Taxes on income, profits and capital gains. [b] Taxes payable by corporations and other enterprises.
[c] Taxes on goods and service include but are not limited to value-added taxes, sales tax, turnover taxes, taxes on financial and capital transactions, and excise taxes. [d] Taxes on international trade include but are not limited to customs and other import duties and taxes on exports. [e] Other taxes include but are not limited to property taxes and workforce taxes.

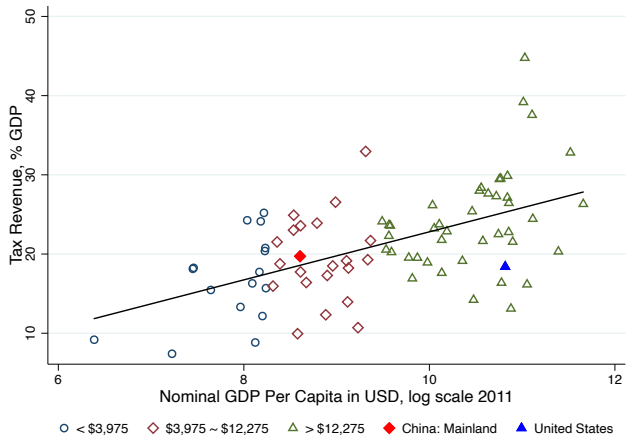
[11] Canada has a 5% goods and services tax at the federal level and a 7% retail sales tax in some provinces

Table 7: **Breakdown of Taxes on Goods and Services, 2011**

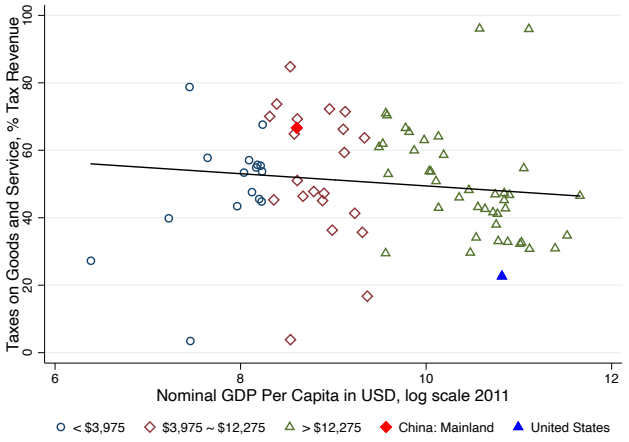
GDP per capita	Value-added tax (% GST)	Sales tax (% GST)	Excise (% GST)	Other[a] (% GST)
$\leq$ \$3,975	55.6	9.5	20.3	14.6
\$3,975 - \$12,275	48.0	16.1	19.3	16.6
China: mainland (\$5,465)	43.4	21.4	16.5	18.7
$>$ \$12,275	42.4	11.2	20.9	26.4
United States (\$49,882)	0.0	48.1	23.6	28.3

Notes: Calculations are based on available data from 2011 for 81 countries and regions from the Government Finance Statistics and International Finance Statistics of the IMF and the World Development Indicators of the World Bank. The ranges for GDP per capita follow the World Bank 2011 classification of low-income, lower-middle-income, upper-middle-income and high-income countries and regions. Average calculations are weighted by taxes on goods and services (GSTs).

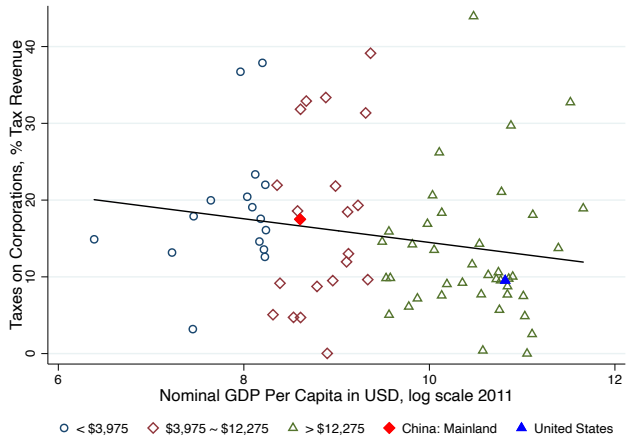
[a] Other GSTs include but are not limited to turnover and other general taxes on goods and services, taxes on financial and capital transactions, and taxes on the use of goods and on permissions to use goods or perform activities.



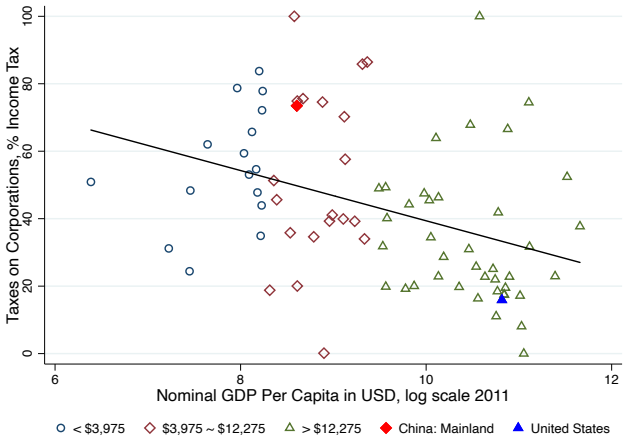
(A) **Share of Tax Revenue in GDP**



(B) **Share of Taxes on Goods and Services in Tax Revenue**



(C) **Share of CIT in Tax Revenue**



(D) **Share of CIT in Income Taxes**

Figure 3: **Government Revenue and GDP Per Capita, 2011**

Notes: This figure displays the relationship between the share of revenue in GDP and GDP per capita in 2011. Countries and regions are grouped into 3 categories—low- and lower-middle income, upper-middle income and high income — according to the 2011 World Development Indicator thresholds of the World Bank. This figure shows that tax revenue relied heavily on taxes on goods and services in China, while the share of income tax from CIT is higher than the average levels in the upper-middle-income and high-income groups and in the United States.

Figure 3 displays scatter plots of sources of government revenue against nominal GDP per capita in 2011. As seen in Panel A, the size of tax revenue in China as a fraction of GDP is at the average level for the upper-middle-income group. Note that the United States is below the average level in the high-income group. Next, Panel B shows that tax revenue in China relies heavily on taxes on goods and services, which is the opposite of the trend in the United States. In terms of taxes on corporations, as a fraction of total tax revenue, the size of CIT in China is in line with that in other upper-middle-income countries and regions. However, it is very high as a fraction of overall income taxes, as shown in Panels C and D. This pattern reflects the lack of capacity of Chinese tax authorities to enforce individual income taxes. In contrast, the size of taxes on corporations as a fraction of either tax revenue or income tax is smaller in the United States than in other countries and regions in the high-income group and in China.

Could the differences in the tax revenue share of GDP among countries come from differences in statutory rates? Table 8 displays the maximum statutory rates of corporate income tax, personal income tax and indirect taxes in 2011. As we can see, low- and middle-income countries and high-income countries share very similar maximum statutory corporate income tax rates (21.8% versus 24.0%) and indirect tax rates (15.5% versus 16.8%), while the average maximum statutory personal income tax rate among low- and middle-income countries and regions is less than two-thirds that of high-income countries and regions. Specifically, China has statutory CIT and VAT rates that are close to the average levels, while the maximum CIT rate is 25% and is above that in most low- and middle-income countries and regions. In contrast, the combined federal and state CIT in the United States is approximately 40%, which is one of the highest among high-income countries and regions, but there is no uniform national VAT. Given the similarity in the maximum statutory rates of corporate income taxes and indirect taxes, the difference in the share of government revenue is more likely driven by the tax authority's tax collection capacity and less by tastes for redistribution.

Finally, we add up the tax payable or paid amounts of all observations for 2011, calculate the tax shares and compare them with the aggregate statistics in Table 5 to Table 7. The results are shown in Appendix A2 Table A1. The detailed breakdown of tax revenue by income taxes, taxes on goods and services and taxes on international trade and the tax structure within goods and services taxes align well with the aggregate statistics above. In sum, similar conclusions to those in the cross-country comparison above hold here as well.

Table 8: **Statutory Tax Rates, 2011**

Country/Region	Taxes[a](% GDP)	CIT[b]	PIT	Indirect Taxes	Country/Region	Taxes (% GDP)	CIT	PIT	Indirect Taxes
GDP per capita $\leq 12,275$					*GDP per capita* $> 12,275$				
Afghanistan	9.2	20.0	20.0	-	Australia	24.4	30.0	45.0	10.0
Albania	18.8	10.0	10.0	20.0	Austria	27.1	25.0	50.0	20.0
Armenia	17.7	20.0	20.0	20.0	Belgium	29.5	34.0	50.0	21.0
Azerbaijan	12.3	*24.0*[c]	*35.0*	*18.0*	Brazil	24.1	34.0	27.5	19.0
Belarus	23.9	24.0	*17.0*	20.0	Bulgaria	18.5	10.0	10.0	20.0
Bosnia and Herzegovina	23.0	10.0	10.0	17.0	Canada	26.4	28.0	29.0	5.0
Cabo Verde	20.4	-	-	-	Chile	20.2	20.0	40.0	19.0
China: Mainland	**19.7**	**25.0**	**45.0**	**17.0**	China: Hong Kong	14.2	16.5	15.0	0.0
Colombia	17.3	33.0	33.0	16.0	China: Macao	37.6	12.0	12.0	0.0
Congo	8.8	*30.0*	-	*18.9*	Croatia	23.6	20.0	40.0	23.0
Costa Rica	14.0	30.0	15.0	13.0	Cyprus	23.8	10.0	35.0	15.0
Egypt	13.3	20.0	20.0	10.0	Czech Rep.	18.9	19.0	15.0	20.0
El Salvador	16.3	*30.0*	*30.0*	*13.0*	Denmark	44.8	25.0	55.4	25.0
Georgia	25.2	*0.0*	20.0	*18.0*	Estonia	19.5	21.0	21.0	20.0
Honduras	15.5	35.0	25.0	12.0	Finland	29.9	26.0	49.2	23.0
Indonesia	12.2	25.0	30.0	10.0	France	27.3	33.3	41.0	19.6
Jordan	15.7	14.0	14.0	16.0	Germany	22.5	29.4	45.0	19.0
Kazakhstan	21.7	20.0	10.0	12.0	Greece	22.9	20.0	45.0	23.0
Kiribati	18.3	-	-	-	Hungary	23.7	19.0	16.0	25.0
Kosovo	23.5	*10.0*	*0.0*	*18.0*	Iceland	29.5	20.0	46.2	25.5
Mauritius	18.2	15.0	15.0	15.0	Ireland	22.8	12.5	48.0	21.0
Mexico	10.7	30.0	30.0	16.0	Israel	25.4	24.0	45.0	16.0
Moldova	18.1	*12.0*	*12.0*	*20.0*	Italy	28.4	31.4	43.0	21.0
Mongolia	20.8	*10.0*	*10.0*	*10.0*	Japan	16.4	40.7	50.0	5.0
Morocco	24.3	*31.0*	*38.0*	*20.0*	Korea	17.6	22.0	35.0	10.0
Paraguay	9.9	10.0	*10.0*	10.0	Latvia	19.5	15.0	25.0	22.0
Peru	16.4	30.0	30.0	18.0	Lithuania	16.0	15.0	15.0	21.0
Serbia	23.6	10.0	15.0	18.0	Luxembourg	26.3	28.8	42.0	15.0
Seychelles	33.0	*40.0*	*15.0*	*15.0*	Malta	26.2	35.0	35.0	18.0
South Africa	26.6	34.6	40.0	14.0	Netherlands	21.5	25.0	52.0	19.0
Thailand	17.7	30.0	37.0	7.0	New Zealand	28.0	28.0	33.0	15.0
Timor-Leste	24.9	-	-	-	Norway	32.8	28.0	47.8	25.0
Tunisia	21.5	30.0	35.0	18.0	Poland	20.6	19.0	32.0	23.0
Turkey	19.3	20.0	35.0	18.0	Portugal	23.2	25.0	46.5	23.0
Ukraine	24.1	25.0	17.0	20.0	Romania	19.1	16.0	16.0	24.0
Uzbekistan	24.8	12.0	12.0	20.0	Russia	22.3	20.0	13.0	18.0
Yemen	7.4	20.0	15.0	5.0	San Marino	16.2	*17.0*	*50.0*	*0.0*
					Singapore	13.1	17.0	20.0	7.0
					Slovak Rep.	16.9	19.0	19.0	20.0
					Slovenia	21.8	20.0	41.0	20.0
					Spain	19.1	30.0	45.0	18.0
					Sweden	39.2	26.3	56.6	25.0
					Switzerland	20.3	18.3	40.0	8.0
					United Arab Emirates	21.6	55.0	0.0	*5.0*
					United Kingdom	27.6	26.0	50.0	20.0
					United States	**18.4**	**40.0**	**35.0**	**0.0**
All low- and middle-income	18.6	21.8	21.8	15.5	*All high-income*	23.7	24.0	35.3	16.8

Notes: Statutory tax rates for 2011 come from the tax rate tables in KPMG.org (2020). [a] Calculations are from Table 6. [b] The statutory rates displayed are the maximum statutory rates. If local CIT taxes exist, then the statutory rates are calculated by KPMG as the effective tax rates.
[c] Numbers in italic font represent missing values for 2011 that are replaced by the most current available statutory rates.

4 Understanding Unequal Burdens from Business Taxation

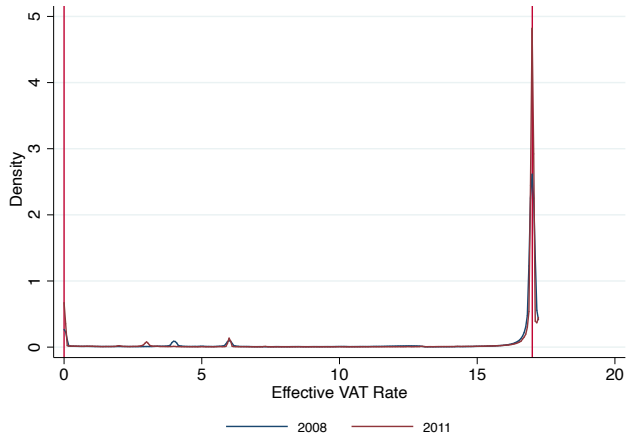
The previous sections show that China's stage of development may partly explain its tax mix. This mix features different taxes and tax rates that may encourage or discourage economic activity in different sectors. Importantly, China has a strong reliance on revenue from corporate income taxes. In this section, we delve into the details of the three main business taxes in China (CIT, VAT, and business tax). We first characterize the average rates and dispersion in rates across firms. Based on these results, we delve deeper into the sources of dispersion in the CIT and study whether these differences are major factors in the misallocation measures that are commonly studied in the literature (e.g., Hsieh and Klenow, 2009b).

4.1 Dispersion in Effective Tax Rates

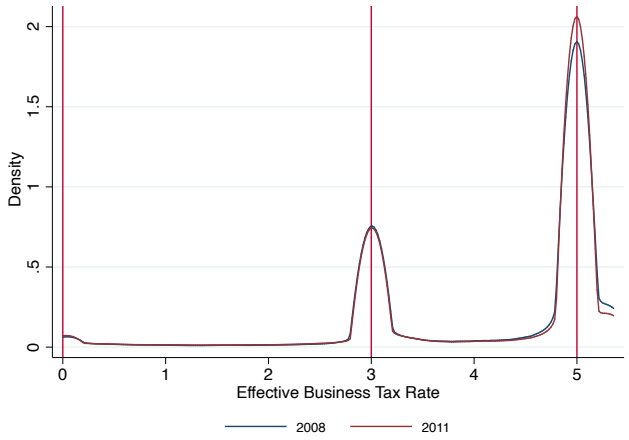
We first show the distribution of effective CIT, VAT and business tax rates in 2008 and 2011. The effective tax rates are defined as tax payable over the corresponding tax base. Specifically, the effective VAT rate is defined as VAT payable over the VAT base, which is constructed by subtracting the actually deducted VAT credit divided by the general 17% statutory VAT rate on VAT taxable sales. The effective business tax rate is the ratio between business tax payable and the business tax taxable revenue base. The effective CIT rates are defined as CIT payable over enterprise profit after tax adjustment. All calculations are limited to observations with a positive tax base. Finally, the effective VAT and business tax rates are winsorized at the 1% level, while the effective CIT rates are winsorized at the 5% level.

The distributions of effective VAT and business tax rates are shown in Panels A and B, respectively, in Figure 4. The effective VAT and business tax rates are heavily concentrated around the corresponding statutory rates. As shown in Panel C, the distribution of the effective CIT rate is more dispersed than that of the statutory rate. Next, we look in detail at the effective CIT rates for one year. As shown in Figure 5 Panel A, around 40% of enterprises in 2011 had non-positive profits after tax adjustment, which implies no CIT liability. After omitting these enterprises, we find that the majority of the effective CIT rates are concentrated around 25%, the statutory rate, while the rates of small groups of enterprises concentrate around 15% and 20%, as shown in 5 Panel B. The 15% and 20% CIT rates reflect the preferential treatment of high-tech companies and small firms, as explained in further detail in the next section.

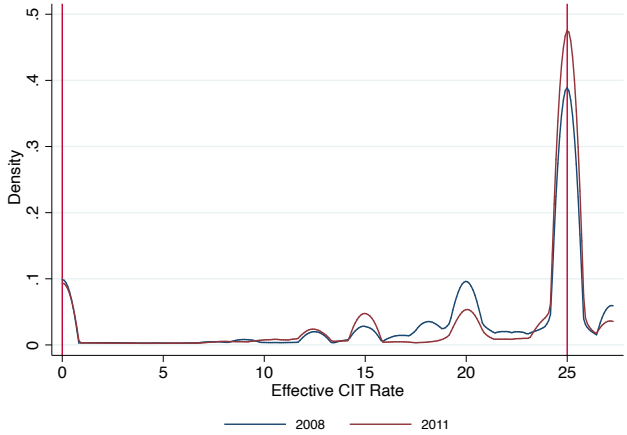
Since the effective CIT is the only tax that deviates considerably from the statutory rate, we focus solely on this tax in the following sections.



(A) **VAT**



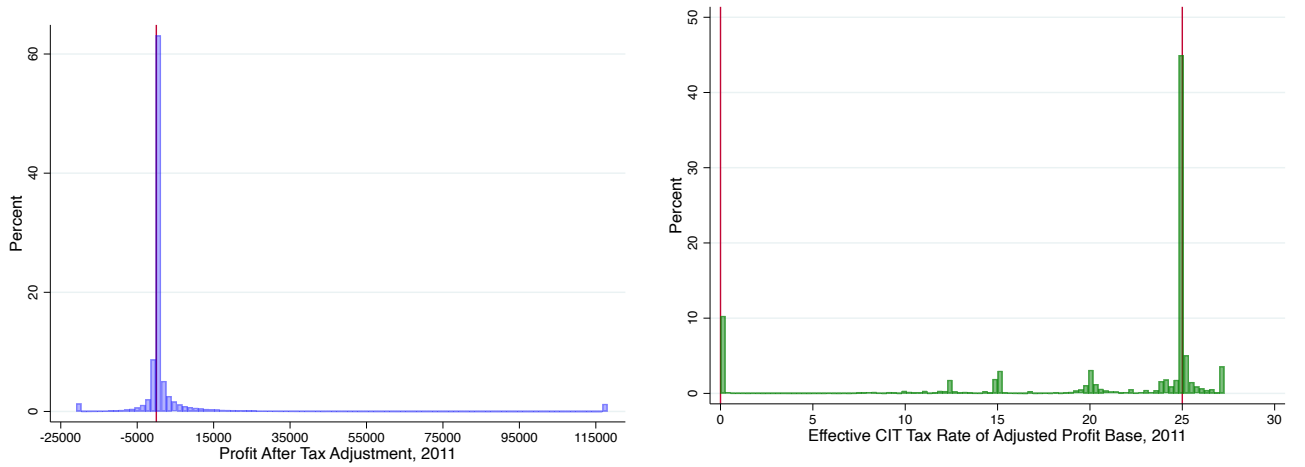
(B) **Business Tax**



(C) **CIT**

Figure 4: **Dispersion in Effective Tax Rates, 2008 & 2011**

Notes: This figure shows the distribution of effective VAT, business tax, and CIT rates in 2008 and 2011. The effective VAT rate is defined as VAT payable over the VAT base, and the effective business tax rate is the ratio between business tax payable and the business tax base. The effective CIT rate is defined as CIT payable over profits after tax adjustment. All calculations are limited to observations with a positive tax base. The effective rates of VAT and business tax are winsorized at the 1% level, while the effective CIT rates are winsorized at the 5% level. This figure shows that there is much more dispersion in effective CIT rates than in effective VAT and business tax rates.



(A) **Profit after Tax Adjustment**

(B) **Effective CIT Rate, Adjusted Profit Base**

Figure 5: **Distribution of Profits and Effective CIT Rate, 2011**

Notes: This figure displays the distributions of profits after tax adjustment and the effective CIT rate in 2011. The effective CIT rate is defined as the ratio of CIT payable over profit after tax adjustment and is only available for firms with positive adjusted profits.

4.2 The Role of Loss Carry-forwards and Tax Credits

We first describe two sets of policies that can impact effective tax rates: loss carry-forwards and tax credits.

After tax adjustment, a preliminary CIT payable is calculated by multiplying the statutory CIT rate and the adjusted profits. Subtracting loss carry-forwards from prior years and various tax credits from the preliminary CIT payable gives the actual CIT liability.[12] In our 2008–2011 sample, 9% of firms have a positive balance of loss carry-forwards.

Among the different tax credits, there are four main tax credit programs that allow deductions from CIT liability. The first tax credit is for "enterprises-in-transition." Tax credits for production FIEs and tax credits for enterprises participating in Western Development Programs are major sub-categories of these enterprise-in-transition tax credits.[13] Specifically, before 2008, qualified FIEs established in open areas and involved in eligible industries could enjoy a 15% or 24% (or "2-year free and 3-year half"[14]) preferential CIT rate. Enterprises that operate in eligible industries in the western region of China can claim Western Development tax credits

[12] According to the corporate income tax code (The National People's Congress, 2007), losses incurred by an enterprise in previous tax years (up to five years) are allowed to be carried forward to the following year and to be made up with the income of the subsequent year.

[13] According to a detailed breakdown of data (available only for 2009) on enterprise-in-transition tax credits by policy.

[14] This policy waives an enterprise's entire CIT liability for the first two years after it begins to turn a profit and half of its CIT liability for the next three years thereafter.

(State Taxation Administration, 2002). As mentioned in Section 2, FIEs that were taxed at the 15% CIT rate prior to 2008 were taxed at 18% in 2008, 20% in 2009, 22% in 2010, 24% in 2011 and 25% from 2012. Enterprises that were taxed at the 24% CIT rate prior to 2008 were taxed at 25% from 2008(The State Council, 2008a). As can be seen in Figure 4C, the density of firms that had effective tax rates between 15% and 20% in 2008 flattened in 2011, which reflects the groups of firms claiming in-transition tax credits. About 2.5% of all enterprises in the sample claimed the transition tax credit, and the average[15] size of the claimed transition tax credit[16] is 2.3 million RMB, which is about 42% of the preliminary CIT payable.[17]

The second tax credit is for enterprises located in minority autonomous areas. Local governments can decide to waive or deduct the CIT liability to be paid into local fiscal revenue for enterprises located in national autonomous area(State Taxation Administration, 2018). Only 0.06% of the enterprises in our sample have claimed these minority tax credits. The average size of minority tax credit claims is 1.6 million RMB, which accounts for 38% of the preliminary CIT payable of the eligible firms.[18]

The third tax credit is for high-tech enterprises,[19] who pay CIT at a preferential rate of 15% (The National People's Congress, 2007). About 1.1% of the enterprises in our sample have claimed the high-tech tax credits. The average size of the claimed high-tech tax credits is around 4 million RMB, accounting for 47% of the preliminary CIT payable of the eligible firms.[20] These firms are reflected in the density around 15% in 2008 and 2011 in Figure 4C.

The fourth tax credit is for small firms. According to the corporate income tax code in 2008, small firms paid CIT at a preferential rate of 20% (The State Council, 2008b).[21] About 4.2% of the enterprises in our sample have claimed the small-firm tax credit. The average size of these credits is around 4 thousand RMB, accounting for 27% of the preliminary CIT payable of the eligible firms. Groups of small firms are clustered around the 20% effective CIT rate in Figure 4C.

[15]The sample average from 2009 to 2011.

[16]The transition tax credits are winsorized at the 1% level for positive credit observations only.

[17]Preliminary CIT payable is winsorized at the 1% level.

[18]The minority tax credits are winsorized at the 1% level for positive credit observations only.

[19]The scope of eligibility for high-tech companies can be found in Ministry of Finance, Ministry of Science and Technology and State Taxation Administration (2008).

[20]The minority tax credits are winsorized at the 1% level for positive credit observations only.

[21]Manufacturing firms with less than 300 thousand RMB CIT payable, fewer than 100 employees, and less than 30 million RMB in assets or other firms with less than 300 thousand RMB CIT payable, fewer than 80 employees, and less than 10 million RM in assets are small firms.

4.3 What Explains the Differences in Effective CIT Rates?

To see what explains the level differences in effective CIT rates across firms, we regress the effective CIT rates on industry dummies, ownership dummies, region dummies; indicators for export, claiming of tax credits and use of loss carry-forwards; and standardized asset, employment and R&D values.[22] The results are shown in Table 9. The baseline group is private enterprises in agriculture, fishing and forestry in the northeast of China.

Table 9: **Level Differences in Effective CIT Rates**

	Effective CIT Rate
Industry	
Mining, Quarrying, and Oil and Gas Extraction	5.41***
	[0.12]
Manufacturing	4.51***
	[0.11]
Utilities	4.21***
	[0.12]
Construction	5.76***
	[0.11]
Transportation and Warehousing	5.44***
	[0.12]
Information	2.27***
	[0.13]
Wholesale and Retail Trade	4.65***
	[0.11]
Accommodation and Food Services	5.18***
	[0.12]
Finance and Insurance	3.67***
	[0.14]
Real Estate	6.78***
	[0.11]
Leasing and Business Services	5.29***
	[0.12]

Continued on next page

[22]The means (standard deviations) for assets, employment and R&D are 131,449,400 RMB, 203,700 RMB and 126 people (452,602,500 RMB, 1,032,700 RMB and 271 people), respectively.

Table 9 – continued from previous page

	Effective CIT Rate
Professional, Scientific, and Technical Services	5.20***
	[0.12]
Water, Environment and Public Facilities Management	4.78***
	[0.22]
Resident Services and Other Services	5.07***
	[0.12]
Educational Services	4.03***
	[0.23]
Health Care and Social Assistance	3.61***
	[0.27]
Arts, Entertainment, and Recreation	2.01***
	[0.16]
Ownership	
State Owned Enterprise	-0.75***
	[0.03]
Foreign Invested Enterprise	-1.35***
	[0.02]
Region	
East	0.72***
	[0.02]
Middle	0.01
	[0.02]
West	-0.73***
	[0.02]
Indicators	
Loss Carry-forward	-17.58***
	[0.02]
High-tech Tax Credit	-7.04***
	[0.03]
Small Firm Tax Credit	-4.42***

Continued on next page

Table 9 – continued from previous page

	Effective CIT Rate
	[0.02]
Enterprise-in-transition Tax Credit	-7.31***
	[0.03]
Minority Region Tax Credit	-6.02***
	[0.16]
Export	0.08**
	[0.02]
Controls	
Asset	X
R&D	X
Year Fixed Effect	X
Constant	15.85***
	[0.12]
Observations	1,183,048
Adjusted R^2	0.563

Standard errors in brackets

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: Regression of the effective CIT rate is conducted on a pooling sample of enterprises with positive net profit after adjustment, with data from 2008 to 2011. The effective CIT rate variable is winsorized at the bottom 1% and top 5% levels. Loss carry-forwards, high-tech tax credit, small-firm tax credit, enterprise-in-transit tax credit, minority region tax credit, and export are indicator variables. Assets and R&D are standardized values and are winsorized at the 1% level. Year fixed effects are included. The baseline group is private enterprises in agriculture, fishing and forestry in the northeast of China.

As can be seen from Table 9, there are pronounced level differences in the effective CIT rates across industries, regions, and ownership types. Specifically, the effective CIT rates in the real estate, leasing and business services, professional, scientific and technical services, mining, manufacturing, construction and transportation and warehousing industries are on average approximately $\frac{4}{3}$ times the baseline level, while the effective CIT rates in the information and

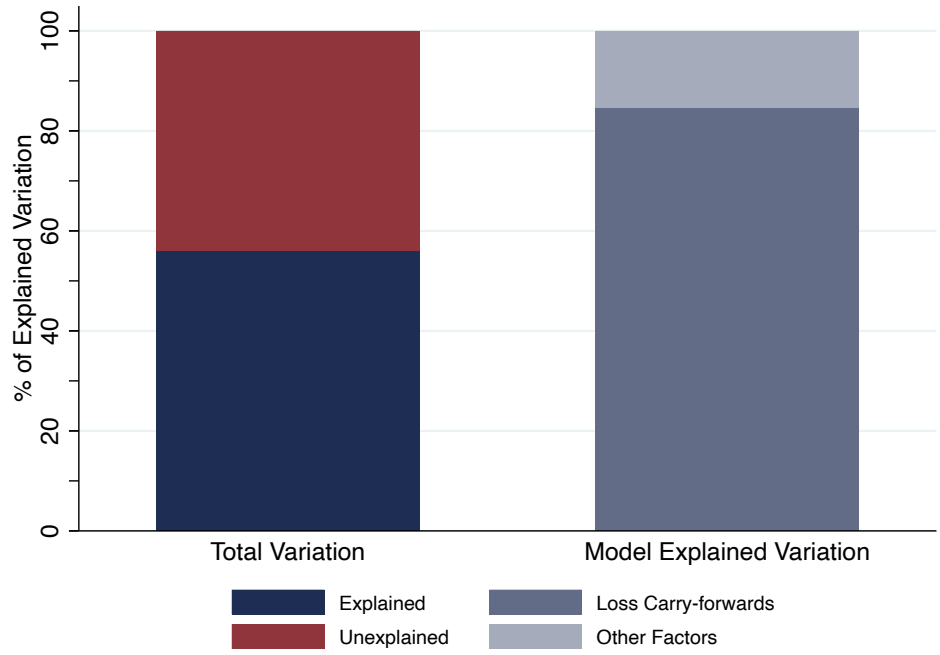
art, entertainment and recreation industries are roughly 1.1 times the baseline level. Next, the effective CIT rates on SOEs and FIEs are in general 0.75 and 1.35 percentage points lower than those in the baseline groups. In addition, we find that the effective CIT rates among enterprises in the east are on average 0.72 percentage points (5% on a relative scale) higher than those at the baseline level, while those in the west are on average 0.73 percentage points (5% on a relative scale) lower than the baseline rates.

Second, we explore how much government tax policies could influence the effective CIT rate level. As shown in Table 9, whether an enterprise has loss carry-forwards from prior years has a great impact on the effective CIT rates. For example, the predicted effective CIT rate for a private manufacturing enterprise located in the east of China and with an average level of assets, employment and R&D declines from 21.08% (15.85%+4.51%+0.72%) to 3.50% (15.85%+4.51%+0.72%-17.58%) if the enterprise has loss carry-forwards from prior years. In addition, the various tax credit programs can reduce the effective CIT rates by an amount varying from 4.42 to 7.31 percentage points, representing 25% to 50% of the baseline value.

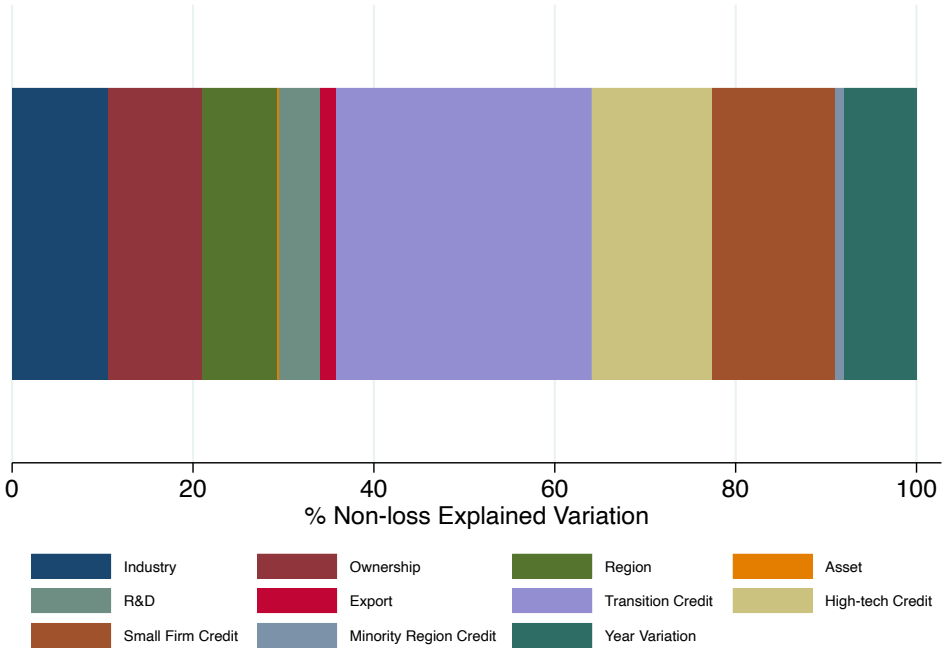
To understand what drives the dispersion in effective CIT rates, we conduct a variance decomposition analysis. The dependent variable is the effective CIT rate, and the explanatory variables include indicators for industry, ownership structure, and region as well as firm characteristics such as assets, R&D, and indicators for whether the enterprise exports, has loss carry-forwards from prior years, or claims a transition tax credit, high-tech tax credit, small-firm tax credit or minority region tax credit; we also include year fixed effects. Asset, employment and R&D are standardized values.

Figure 6 shows the variance decomposition of effective CIT rates defined based on the adjusted profit base using the 2008–2011 pooling sample. As seen in Panel A, more than half of the total variation can be explained by the selected explanatory variables. Out of the model-explained variation, over 80% of the R^2 is explained by loss carry-forwards. Panel (B) further breaks down the explanatory share of the R^2 by factors other than loss carry-forwards. Among these other explanatory factors, the enterprise-in-transition, high-tech and small-firm tax credits are all main factors that explain the variation in effective CIT rates. This indicates that government tax policies play an important role even within industry-region-ownership categories. In addition, industry, ownership structure, region and R&D expenses can also partially explain the variation in effective CIT rates.[23]

[23]According to the corporate income tax code (The National People's Congress, 2007), if R&D expenses have been included in the current profits and losses and no intangible assets are formed, firms are allowed to directly deduct 50% of the actual R&D expenses incurred from their taxable income for the current year. If R&D expenses form intangible assets, they are amortized before tax at 150% of the cost of the intangible assets. Unless otherwise provided for by law, the amortization period is not less than 10 years.



(A) **Variance Decomposition**



(B) **Share of Model-explained Variance**

Figure 6: **Effective Corporate Income Tax Rate Variance Decomposition**

Notes: This figure decomposes the variation in the effective CIT rate from 2008 to 2011. The effective CIT rate is defined as the ratio of CIT payable over profit after tax adjustment. This figure shows that the main factor driving the variation in effective CIT rates is loss carry-forwards and the transition, high-tech and small-firm tax credits.

4.4 Effective CIT Rates and Returns to Production Factors

The dispersion in effective tax rates raises the possibility that the CIT may be a source of factor misallocation across firms. We explore this possibility by investigating whether the effective CIT rates could explain differences in enterprises' measured returns to production factors.

To do so, we follow the setup in Hsieh and Klenow (2009b), where firms with heterogeneous productivity engage in monopolistic competition. In this setup, the marginal revenue product of capital (MRPK) and labor (MRPL) are given by:

$$MRPL_{si} = (1-\alpha_s)\frac{\sigma-1}{\sigma}\frac{P_{si}Y_{si}}{L_{si}} = w\frac{1}{1-\tau} \tag{1}$$

$$MRPK_{si} = \alpha_s\frac{\sigma-1}{\sigma}\frac{P_{si}Y_{si}}{K_{si}} = R\frac{1}{1-\tau}, \tag{2}$$

where α_s is the capital share in the Cobb-Douglas production technology for good i in sector s and σ is the downward-sloping demand elasticity. P_{si} and Y_{si} are the price and output, respectively, for good i in sector s. Therefore, $P_{si}Y_{si}$ is the revenue of good i in sector s. w is the market price of labor, and it is assumed that all firms face the same wage. R is the rental rate for capital, and τ is the corporate income tax rate.

By taking logs on both sides of Equations 1 and 2 and rearranging terms, we can obtain the elasticity of returns to production factors with respect to the return after corporate income tax.

$$\frac{\partial \log\left(\frac{P_{si}Y_{si}}{wL_{si}}\right)}{\partial \log(1-\tau)} = -1 \tag{3}$$

$$\frac{\partial \log\left(\frac{P_{si}Y_{si}}{RK_{si}}\right)}{\partial \log(1-\tau)} = -1 \tag{4}$$

The elasticity is a constant -1, which implies that the marginal revenue product of either capital or labor increases (decreases) on a one-for-one percentage basis when the return after corporate income tax decreases.

Following the results above, we construct the returns to capital and labor by dividing business income over assets and total wage expenses, respectively. Then we regress the log returns to capital and labor on $\ln(1-\tau)$, where τ is the effective CIT rate, using the following specification:

$$\log(MRP_{c,i,t}) = \alpha + \beta\log(1-\tau_{c,i,t}) + \phi_c + \gamma_i + \theta_t + \varepsilon_{c,i,t}, \tag{5}$$

where $MPR_{c,i,t}$ is the logarithm of the marginal revenue product of either capital or labor of firm c in industry i and year t, $\tau_{c,i,t}$ is the effective CIT rate, ϕ_c is the firm effect, γ_i is the industry effect, and θ_t is the year effect. The sample for these regressions is the set of firms that

have non-negative after-adjustment profits in the current year. β is the parameter of interest and captures the relation between the marginal revenue products of capital and labor and the after-tax return.

Table 10: **Regression of Returns to Capital and Labor on Effective CIT Rates**

(A) Returns to Capital, Log Scale

	(1)	(2)	(3)	(4)
$\log(1-\tau_{CIT})$	-0.584***	-0.550***	-0.136***	-0.182***
	[0.007]	[0.006]	[0.008]	[0.008]
Year FE	Y	Y		Y
Industry FE		Y		
Firm FE			Y	Y
Observations	1,592,413	1,592,333	1,151,281	1,151,281
Adjusted R^2	0.006	0.227	0.760	0.764
Adjusted R^2-within	0.005	0.005	0.000	0.001

(B) Returns to Labor, Log Scale

	(1)	(2)	(3)	(4)
$\log(1-\tau_{CIT})$	-0.899***	-0.613***	-0.161***	-0.201***
	[0.009]	[0.008]	[0.011]	[0.011]
Year FE	Y	Y		Y
Industry FE		Y		
Firm FE			Y	Y
Observations	1,587,671	1,587,591	1,148,144	1,148,144
Adjusted R^2	0.006	0.334	0.759	0.760
Adjusted R^2-within	0.006	0.004	0.000	0.001

Standard errors in brackets

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: Regressions of returns to production factors are conducted on a pooling sample of enterprises with positive net profit after adjustment with data from 2008 to 2011. The dependent variables for Panels A and B are the marginal business revenue product of assets, and wages and bonuses, respectively. The independent variable is 1 deducting the effective CIT rate. Both the dependent and independent variables are in log scale and are winsorized at the 10% level. Robust standard errors are applied.

Table 10 reports the results of these regressions. In Panel A, Column (1) reports the overall

variation in the returns to capital that can be explained by the effective after-CIT return with year fixed effects. The coefficient is -0.584, which is about half of the theoretical value. Although the coefficient of the effective after-CIT rates is statistically significant and has the expected sign, the adjusted R^2 of this model is low (0.005). The conclusion holds in Column (2) with industry fixed effects. Column (3) explores the variation of returns to capital within firms that can be explained by effective after-CIT rates. The coefficient of effective after-CIT return is statistically significant, but the magnitude is lowered to -0.136. In addition, the adjusted within-R^2 of this model becomes minimal. Column (4) adds year fixed effects, and the conclusion remains. In conclusion, $(1 - \tau_{CIT})$ has a negative impact on returns to capital, and the dispersion can be mostly attributed to firm heterogeneity, although the power in explaining the total variance of returns to capital is limited.

Panel (B) shows the results of regressing log returns to labor on the log effective after-CIT returns. Column (1) reports the estimated elasticity of returns to labor with respect to effective after-CIT rates with year fixed effects. The coefficient of effective after-CIT rates is -0.899, which is statistically significant and is close the theoretical value. However, the adjusted R^2 of this model is only 0.006. Column (2) explores the variation within industries that could be explained by effective after-CIT rates. The estimated elasticity is statistically significant, but the magnitude is lowered to -0.613, and the adjusted within-R^2 of this model is moderate (0.004). Column (3) investigates the within-firm variation of returns to labor. The coefficient of effective after-CIT rates is significant, but the magnitude is further reduced to -0.161, and the adjusted within-R^2 of this model is minimal. After adding year fixed effects, the result in Column (4) is no longer statistically significant, and the adjusted within-R^2 is negligible. In sum, the estimated elasticity of returns to labor with respect to corporate income tax policy is significant, but compared to firm and industry heterogeneity, the corporate income tax level explains little of the dispersion of returns to labor.

As firms could use loss carry-forwards from previous years to reduce their CIT liability in the current year, we might worry that the effective after-CIT return could incorporate information about firm productivity and be correlated with the error term. Thus, instead of using the current effective after-CIT return, we use the one-period-ahead effective after-CIT return as the explanatory variable in the fixed effects models. The results are reported in Table 11.

Table 11: **Regression of Returns to Capital and Labor on Lagged Effective CIT Rates**

(A) Returns to Capital, Log Scale

	(1)	(2)	(3)	(4)
Lag of $\log(1-\tau_{CIT})$	-0.510***	-0.405***	0.047***	0.005
	[0.010]	[0.009]	[0.012]	[0.012]
Year FE	Y	Y		Y
Industry FE		Y		
Firm FE			Y	Y
Observations	664,649	664,572	453,805	453,805
Adjusted R^2	0.004	0.252	0.808	0.809
Adjusted R^2-within	0.004	0.003	0.000	-0.000

(B) Returns to Labor, Log Scale

	(1)	(2)	(3)	(4)
Lag of $\log(1-\tau_{CIT})$	-0.799***	-0.356***	0.093***	0.074***
	[0.014]	[0.012]	[0.017]	[0.017]
Year FE	Y	Y		Y
Industry FE		Y		
Firm FE			Y	Y
Observations	661,645	661,566	452,097	452,097
Adjusted R^2	0.006	0.358	0.792	0.792
Adjusted R^2-within	0.005	0.001	0.000	0.000

Standard errors in brackets

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: Regressions of returns to production factors are conducted on a pooling sample of enterprises with positive net profit after adjustment with data from 2008 to 2011. The dependent variables for Panels A and B are the marginal business revenue product of assets, and wages and bonuses, respectively. The independent variable is the one-period-ahead effective after-CIT rate. Both the dependent and independent variables are in log scale and are winsorized at the 10% level. Robust standard errors are applied.

As shown in Table 11 Columns (1) and (2) in both panels, before we add firm fixed effects, the estimated elasticities of returns to capital and labor are statistically significant, and compared to that of the estimates in Table 10, the magnitude is slightly reduced. The main difference is that the estimated elasticities either have opposite signs to the ones predicted by theory or become insignificant after we add firm fixed effects, as shown in Columns (3) and (4) in both panels. However, the explained variation in returns to production factors by effective after-CIT returns is modest in all specifications.

On the whole, the estimated elasticity of returns to production factors with respect to after-CIT returns varies from 14% to 89% of the theoretical values. However, compared to the explanatory power of industry and firm heterogeneity, that of effective CIT rates with regard to the dispersion in returns to production factors is quite limited. As a robustness check, we conduct regressions of returns to production factors on predicted effective CIT rates from the linear regression specification in Table 9 and use alternative definition of returns to production factors within the manufacturing sample. The results are displayed in Appendix A3, and similar conclusions hold.

Finally, we estimate the elasticity β while accounting for the time variation of returns to production factors within a dynamic panel. We estimate the following specification:

$$\log(MRP_{c,i,t}) = \alpha + \beta \log(1 - \tau_{c,i,t}) + \rho \log(MRP_{c,i,t-1}) + \phi_c + \gamma_i + \theta_t + \varepsilon_{c,i,t}, \tag{6}$$

where we add the one-period-ahead marginal revenue product of capital or labor on the right-hand side to capture how firm productivity persists over time, and where ρ measures the degree of persistence. In this case, we might be worried that the correlation between the lagged returns to production factors and error terms would violate the exogeneity restriction. As a result, we adopt the Arellano–Bond method of taking the first difference to eliminate the firm fixed effect and use further-period-ahead returns to production factors as instrumental variables. We report the results of this procedure in Table 12.

As shown in Table 12, the auto-correlation coefficient of returns to capital is 0.170, while that of returns to labor is 0.103. After we account for time variation, the estimated elasticity of returns to capital with respect to the effective after-CIT rate is -0.138, and that of returns to labor is -0.110. These estimated elasticities are statistically significant, but the magnitude is lower than the estimated results of a fixed effects model in Table 10.

Table 12: **Regression of Returns to Capital and Labor on Effective CIT Rates, Dynamic Panel**

	Marginal Revenue Product of Capital	Marginal Revenue Product of Labor
$\log(1-\tau_{CIT})$	-0.138***	-0.110***
	[0.014]	[0.019]
Lag of MRPK	0.170***	
	[0.005]	
Lag of MRPL		0.103***
		[0.010]
Observations	272,610	272,256

Standard errors in brackets

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: Regressions of returns to production factors are conducted on a pooling sample of enterprises with positive net profit after adjustment with data from 2008 to 2011. The dependent variables for Panels A and B are the marginal business revenue product of assets, and wages and bonuses, respectively. The independent variables are the effective after-CIT return and one-period-ahead returns to production factors, instrumented by deeper lags of the dependent variables. Both the dependent and independent variables are in log scale and are winsorized at the 10% level. Robust standard errors are applied.

5 Conclusion

This paper presented facts describing the business tax environment in China. While academic research has focused on manufacturing firms, our detailed tax data show that business tax policies in other sectors are subject to various forms of taxation that require additional research. With regard to the view of China as a quickly developing country, we find that China's tax system mirrors that of other counties at a similar stage of development. Two Chinese characteristics are an over-reliance on both sales taxes and VAT as well as an under-reliance on personal income tax as part of general income tax. As a result, it is not surprising that these two areas have been the focus of active policy reforms in recent years. Finally, we evaluate the possibility that tax policy is a major contributor to differences in the returns to factors of production across firms. While a prevalent literature points to government intervention as a source of misallocation, our data show that corporate income tax policy explains a very small fraction of this dispersion.

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Appendix

A1 Tax Payment by Ownership and Region

A1.1 By Ownership

The tax structure of total tax payment varies across SOEs, FIEs and private enterprises. As seen in Figure A1, the VAT and CIT are the dominant taxes across all ownership structures. The relative share of excise tax in the tax payment is largest among SOEs, while the relative shares of VAT and excise tax on imported goods represent substantial shares within FIEs. In addition, business tax is the third largest tax within private enterprises.

The breakdown of the tax payment by SOEs, FIEs and private enterprises is shown in Figure A2. As shown in Table 4, SOEs and FIEs make up less than 20% of the total enterprises in the sample, but disproportionately represent around half of the total tax payment and CIT, VAT and business tax payments on average. In detail, SOEs account for over one-third of the total tax payment and CIT and VAT payments, while FIEs represent more than 20% of the total tax payment and CIT and VAT payments. In addition, the tax payment breakdown by ownership structure remains relatively stable across years.

A1.2 By Region

Next, we decompose the structure of the tax payment among four regions (East, Middle, West and Northeast[24]).Specifically, CIT exceeds VAT to become the largest tax payment category in

[24]According to the classification system of the 2008 China Economic Census, the East area includes Beijing, Tianjin, Hebei Province, Shanghai, Jiangsu Province, Zhejiang Province, Fujian Province, Guangdong Province

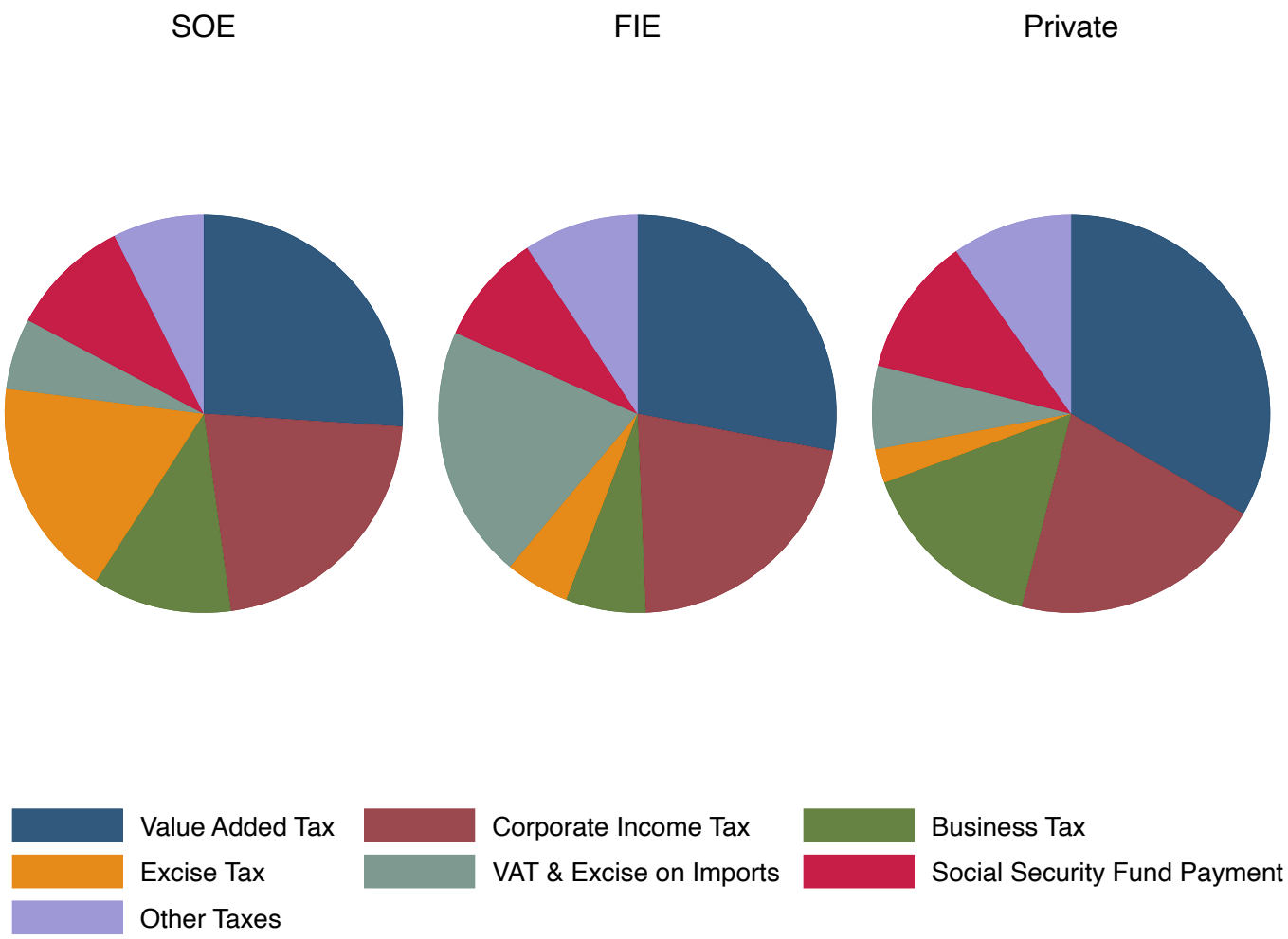
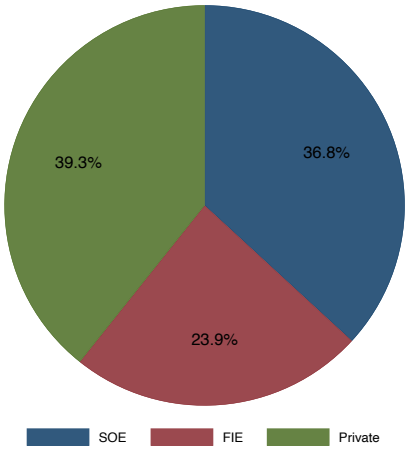
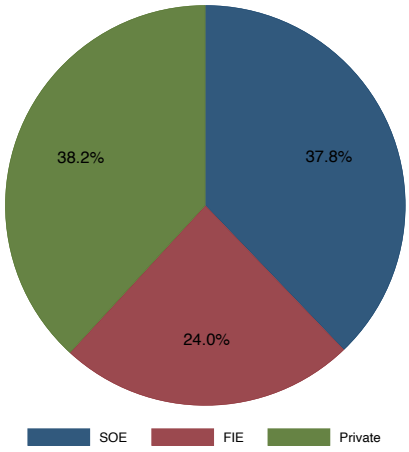


Figure A1: **Tax Payment Structure of Ownership, 2008–2011**

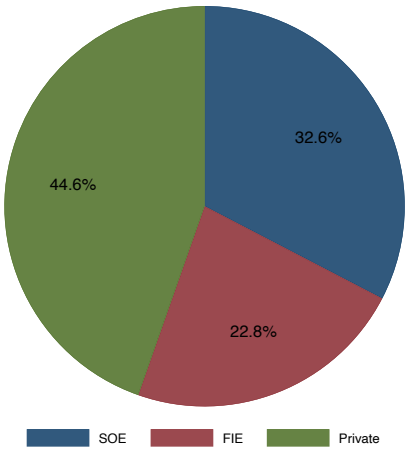
Notes: This figure displays the structure of total tax payment among SOEs, FIEs and private enterprises in the pooling sample from 2008 to 2011. The total tax payment is calculated as the sum of tax payable of domestic VAT, CIT, excise tax and business tax, actual paid amounts of VAT and excise tax on imports, other taxes, and payments to social security funds, excluding paid personal income tax, withholding business taxes and refunded VAT and excise tax on exports. The figure shows that the 3 largest taxes within SOEs are the VAT, CIT and excise tax. Within FIEs, the 3 largest taxes are the VAT, CIT, and VAT and excise tax on imported goods, while the top three taxes are the VAT, CIT and business tax within private enterprises.



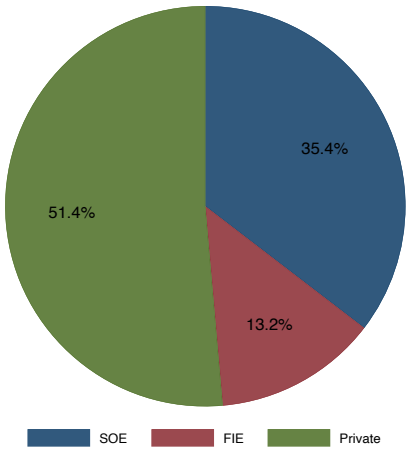
(A) **Total Tax Payment**



(B) **Corporate Income Tax**



(C) **Value-Added Tax**



(D) **Business Tax**

Figure A2: **Tax Payment Breakdown by Ownership Structure, 2008–2011**

Notes: This figure displays the breakdown of total tax payment and CIT, VAT and business tax payments by SOEs, FIEs and private enterprises in the pooling sample from 2008 to 2011. The total tax payment is calculated as the sum of tax payable of domestic VAT, CIT, excise tax and business tax, actual paid amounts of VAT and excise tax on imports, other taxes, and payments to social security funds, excluding paid personal income tax, withholding business taxes and refunded VAT and excise tax on exports. This figure shows that SOEs and FIEs disproportionately contribute to the total tax payment and CIT, VAT and business tax payments.

the East, while VAT is the dominant category in the rest of the regions. In the Middle, West and Northeast areas, the excise tax makes up a larger share of the tax payment than in the East.

According to the breakdown of the tax payment by region, as shown in Figure A4, enterprises in East China contribute more than half of the total tax payment and CIT, VAT and business tax payments on average, while the Northeast of China displays the smallest shares. The breakdown of the tax payment by region remains relatively stable across the whole sample period.

and Hainan Province. The Middle area includes Shanxi Province, Anhui Province, Jiangxi Province, Henan Province, Hubei Province and Hunan Province. The West area includes Inner Mongolia Autonomous Region, Guangxi Zhuang Autonomous Region, Chongqing, Szechuan Province, Guizhou Province, Yunnan Province, Tibet Autonomous Region, Shaanxi Province, Gansu Province, Qinghai Province, Ningxia Hui Autonomous Region and Xinjiang Uyghur Autonomous Region. The Northeast area includes Liaoning Province, Jilin Province and Heilongjiang Province.

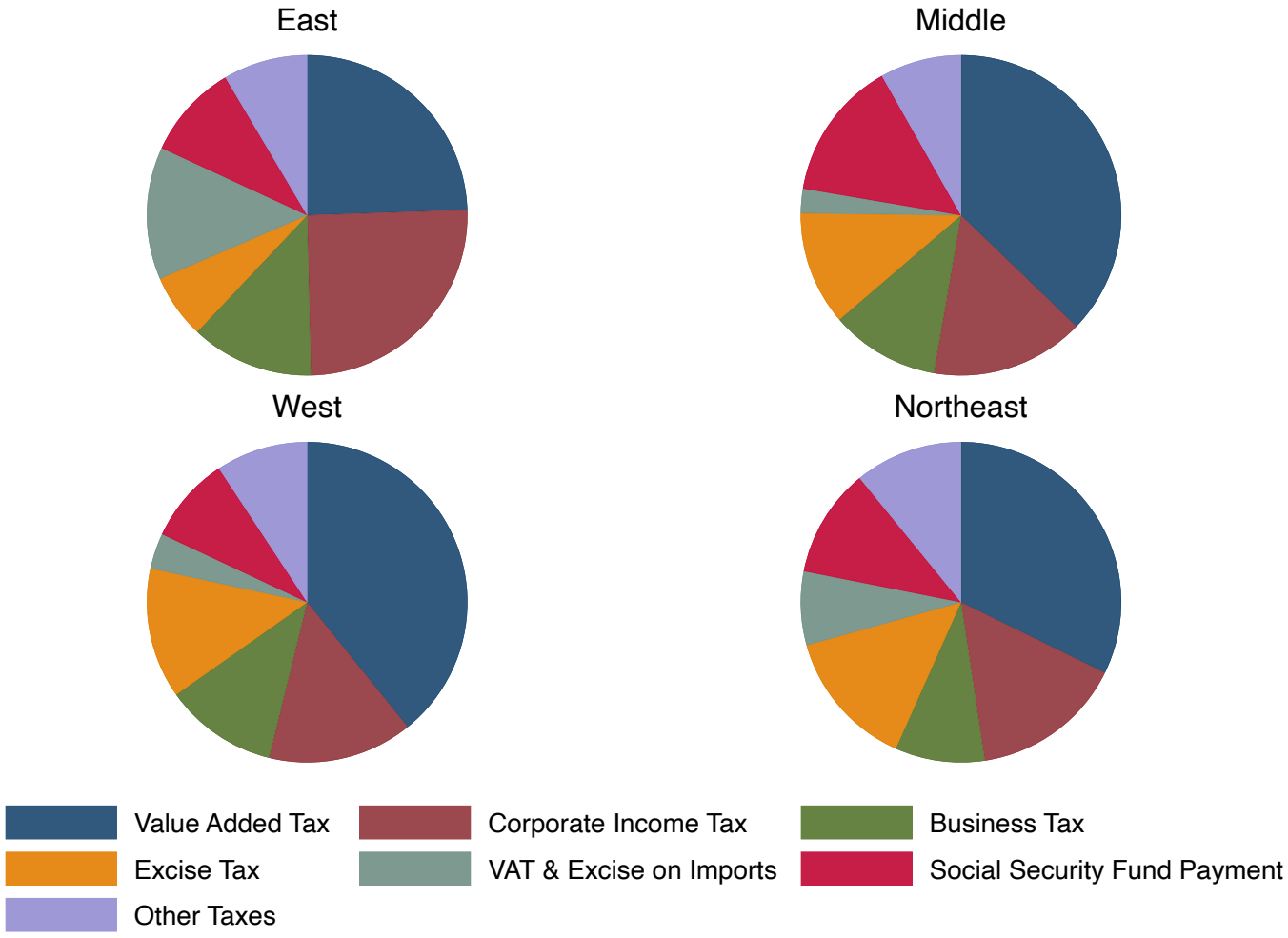
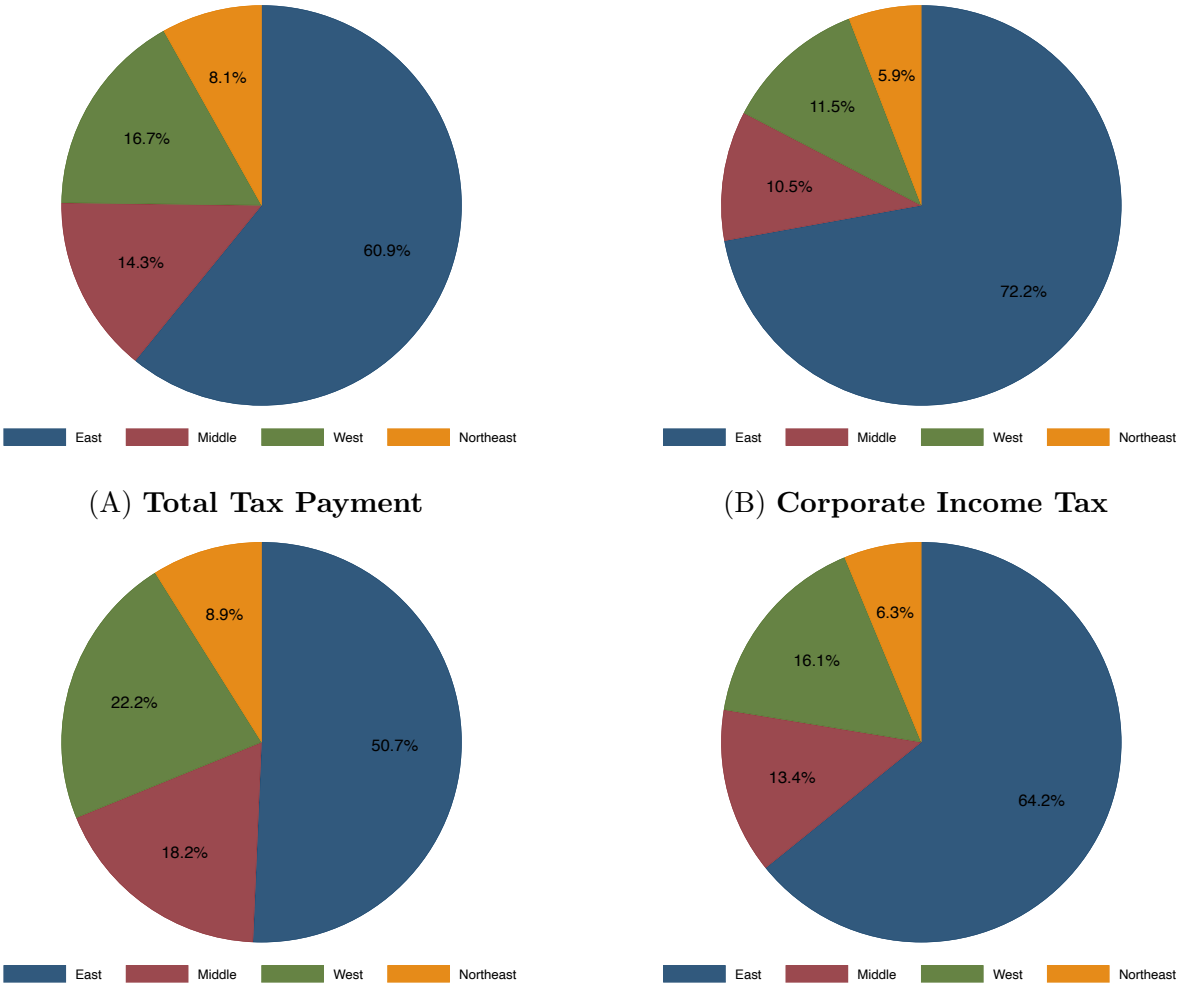


Figure A3: **Tax Payment Structure of Regions, 2008–2011**

Notes: This figure displays the structure of the total tax payment across regions in the pooling sample from 2008 to 2011. The total tax payment is calculated as the sum of tax payable of domestic VAT, CIT, excise tax and business tax, actual paid amounts of VAT and excise tax on imports, other taxes, and payments to social security funds, excluding paid personal income tax, withholding business taxes and refunded VAT and excise tax on exports. The figure shows that CIT is the main tax category in the East, while VAT is the largest tax payment category in the other regions.



(A) **Total Tax Payment**

(B) **Corporate Income Tax**

(C) **Value-Added Tax**

(D) **Business Tax**

Figure A4: **Tax Payment Breakdown by Region, 2008–2011**

Notes: This figure displays the breakdown of the total tax payment and CIT, VAT and business tax payments by region in the pooling sample from 2008 to 2011. The total tax payment is calculated as the sum of tax payable of domestic VAT, CIT, excise tax and business tax, actual paid amounts of VAT and excise tax on imports, other taxes, and payments to social security funds, excluding paid personal income tax, withholding business taxes and refunded VAT and excise tax on exports. This figure shows that East China represents more than 50% of the total tax payment and CIT, VAT and business tax payments for 2008, while the Northeast of China contributes the smallest shares.

A2 Breakdown of Tax Revenue in Tax Survey Data

Table A1: **Comparison of Tax Survey Sample Statistics with Aggregate Statistics from the IMF, 2011**

(A) Breakdown of Tax Revenue

Data	Income taxes[a] (% taxes)	Corporate income taxes (% income taxes)	Taxes on goods and services (% taxes)	Taxes on int'l trade[b] (% taxes)	Other[c] taxes (% taxes)
IMF	23.8	73.5	66.6	2.7	6.8
Tax Survey	27.4	83.4	66.0	2.5	4.1

(B) Breakdown of Taxes on Goods and Services

Data	Value-added tax[d] (% GST)	Sales tax (% GST)	Excise[e] (% GST)	Other[f] (% GST)
IMF	43.4	21.4	16.5	18.7
Tax Survey	58.9	19.3	15.8	6.0

Notes: The total tax revenue from the tax survey data is calculated as the sum of payable amounts of VAT, CIT, excise tax and business tax, paid amounts of personal income tax, local taxes, and other taxes net of refunded VAT and excise tax on exports from tax survey data.
[a] Income tax from the tax survey data is the sum of CIT payable and paid withholding personal income tax and paid personal income tax from sole proprietorship, private proprietorship and private partnership enterprises. [b] Taxes on international trade from the tax survey data are the sum of duty paid on imports and exports. [c] Other taxes from the tax survey data include paid vehicle and vessel tax, farmland occupation tax, deed tax, land appreciation tax, urban land use tax, resources tax, and vehicle purchase tax. [d] VAT from the tax survey data is the sum of domestic VAT payable and paid VAT on imports, net of refunded VAT on exports. [e] Excise tax from the tax survey data is the sum of domestic excise tax payable and paid excise tax on imports, net of refunded excise tax on exports.
[f] Other taxes on goods and services from the tax survey data are the sum of paid stamp tax, tobacco tax, and city maintenance and construction tax.

The total tax revenue is calculated from the tax survey data as the sum of payable amounts of VAT, CIT, excise tax and business tax, paid amounts of personal income tax, local taxes, and other taxes net of refunded VAT and excise tax on exports. As shown in Table A1, the aggregate breakdowns using the tax survey data generally align well with the statistics from the IMF data. In Panel A, the tax survey data show that about two-thirds of tax revenue comes from taxes on goods and services. Income tax revenue is calculated as the sum of CIT payable and paid personal income tax due to data availability, which results in a higher share of CIT within income tax from the tax survey data than the 73.5% in the IMF data. In Panel B, VAT and excise tax

are calculated as the sum of domestic payable amounts and paid amounts on imports, net of refunded amounts on exports. The total taxes on goods and services are calculated as the sum of VAT, business tax payable, excise tax, and paid stamp tax, tobacco tax, and city maintenance and construction tax in the 2011 sample. As can be seen, the sizes of VAT, business tax and excise tax as a fraction of taxes on goods and services are similar to the IMF aggregate statistics. The higher share of VAT and lower share of other taxes on goods and services in the tax survey data than in the IMF aggregates could be attributed either to sampling issues or to the fact that only paid amounts instead of payable amounts are available to calculate VAT and excise tax on imports and exports and other taxes on goods and services. Nevertheless, the overall data pattern is consistent with our conclusions in the cross-country comparison above.

A3 Regression of Returns to Production Factors on Effective CIT Rates, Alternative Specification

Table A2: **Regression of Returns to Capital and Labor on Predicted Effective CIT Rates**

(A) Returns to Capital, Log Scale

	(1)	(2)	(3)	(4)
$\log(1-\hat{\tau}_{CIT})$	-0.512***	-0.398***	0.089***	0.066***
	[0.011]	[0.010]	[0.013]	[0.013]
Year FE	Y	Y		Y
Industry FE		Y		
Firm FE			Y	Y
Observations	1,172,798	1,172,735	789,960	789,960
Adjusted R^2	0.003	0.224	0.768	0.770
Adjusted R^2-within	0.002	0.001	0.000	0.000

(B) Returns to Labor, Log Scale

	(1)	(2)	(3)	(4)
$\log(1-\hat{\tau}_{CIT})$	-0.789***	-0.459***	0.069***	0.045*
	[0.015]	[0.012]	[0.017]	[0.018]
Year FE	Y	Y		Y
Industry FE		Y		
Firm FE			Y	Y
Observations	1,165,750	1,165,681	786,492	786,492
Adjusted R^2	0.003	0.333	0.767	0.767
Adjusted R^2-within	0.003	0.001	0.000	0.000

Standard errors in brackets

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: Regressions of returns to production factors are conducted on a pooling sample of enterprises with positive net profit after adjustment with data from 2008 to 2011. The dependent variables for Panels A and B are the marginal business revenue products of assets, and wages and bonuses, respectively. The independent variable is 1 minus the predicted effective CIT rate from the specified linear regression in Table 9. Both the dependent and independent variables are in log scale and are winsorized at the 10% level. Robust standard errors are applied.

Table A3: **Regression of Returns to Capital and Labor on Effective CIT Rates, Manufacturing**

(A) Returns to Capital, Log Scale

	(1)	(2)	(3)	(4)
$\log(1-\tau_{CIT})$	-0.662***	-0.615***	-0.083***	-0.144***
	[0.009]	[0.009]	[0.011]	[0.011]
Year FE	Y	Y		Y
Industry FE		Y		
Firm FE			Y	Y
Observations	705,796	705,770	537,929	537,929
Adjusted R^2	0.010	0.069	0.741	0.747
Adjusted R^2-within	0.008	0.007	0.000	0.001

(B) Returns to Labor, Log Scale

	(1)	(2)	(3)	(4)
$\log(1-\tau_{CIT})$	-0.304***	-0.354***	-0.030*	-0.091***
	[0.011]	[0.010]	[0.015]	[0.015]
Year FE	Y	Y		Y
Industry FE		Y		
Firm FE			Y	Y
Observations	704,072	704,046	536,692	536,692
Adjusted R^2	0.002	0.149	0.693	0.694
Adjusted R^2-within	0.001	0.002	0.000	0.000

Standard errors in brackets

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: Regressions of returns to production factors are conducted on a manufacturing sample of enterprises with positive net profit after adjustment with data from 2008 to 2011. The dependent variables for Panels A and B are the marginal business revenue products of assets, and wages and bonuses, respectively. The independent variable is 1 minus the effective CIT rate. Both the dependent and independent variables are in log scale and are winsorized at the 10% level. Robust standard errors are applied.

Table A4: **Regression of Returns to Capital and Labor on Effective CIT Rates, Manufacturing Sample and Constructed Value-added Base**

(A) Returns to Capital, Log Scale

	(1)	(2)	(3)	(4)
$\log(1-\tau_{CIT})$	-0.855***	-0.839***	0.036*	-0.149***
	[0.013]	[0.013]	[0.016]	[0.017]
Year FE	Y	Y		Y
Industry FE		Y		
Firm FE			Y	Y
Observations	662514	662488	496887	496887
Adjusted R^2	0.009	0.068	0.717	0.723
Adjusted R^2-within	0.007	0.007	0.000	0.000

(B) Returns to Labor, Log Scale

	(1)	(2)	(3)	(4)
$\log(1-\tau_{CIT})$	-0.339***	-0.449***	0.042*	-0.114***
	[0.013]	[0.012]	[0.018]	[0.018]
Year FE	Y	Y		Y
Industry FE		Y		
Firm FE			Y	Y
Observations	661,715	661,689	496,274	496,274
Adjusted R^2	0.004	0.148	0.644	0.647
Adjusted R^2-within	0.001	0.002	0.000	0.000

Standard errors in brackets

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: Regressions of returns to production factors are conducted on a manufacturing sample of enterprises with positive net profit after adjustment with data from 2008 to 2011. The dependent variables for Panels A and B are the marginal value-added products of assets, and wages and bonuses over assets and business revenue over wages and bonuses, respectively, where value-added variables are constructed based on VAT sales and VAT input purchases. The independent variable is 1 minus the effective CIT rate. Both the dependent and independent variables are in log scale and are winsorized at the 10% level. Robust standard errors are applied.