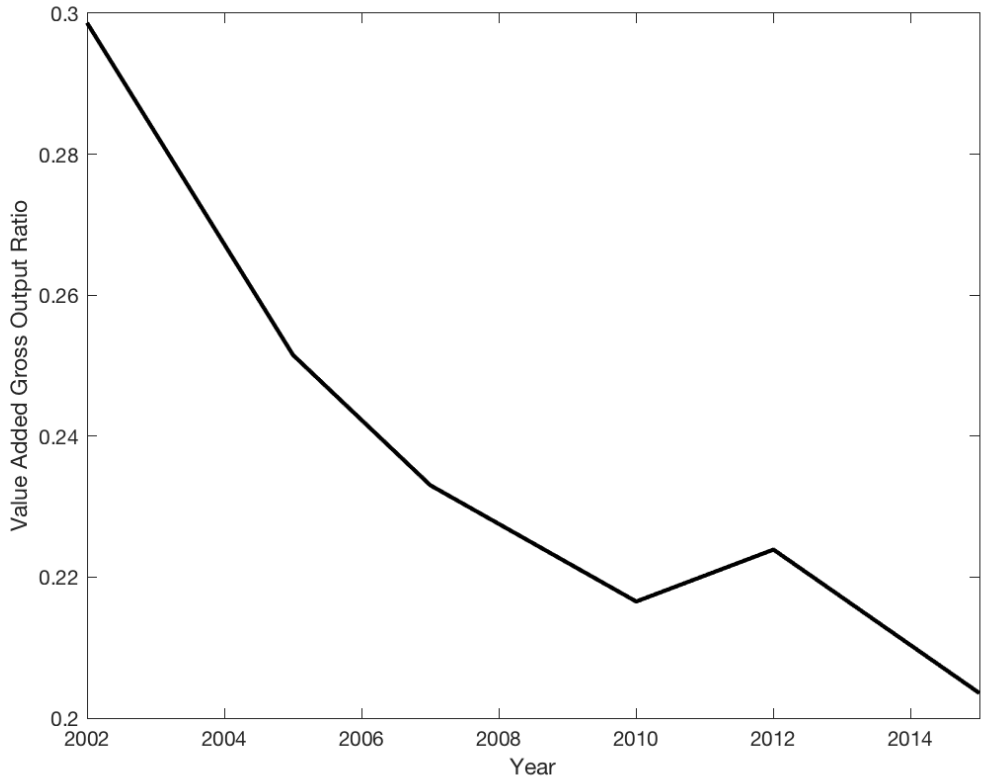
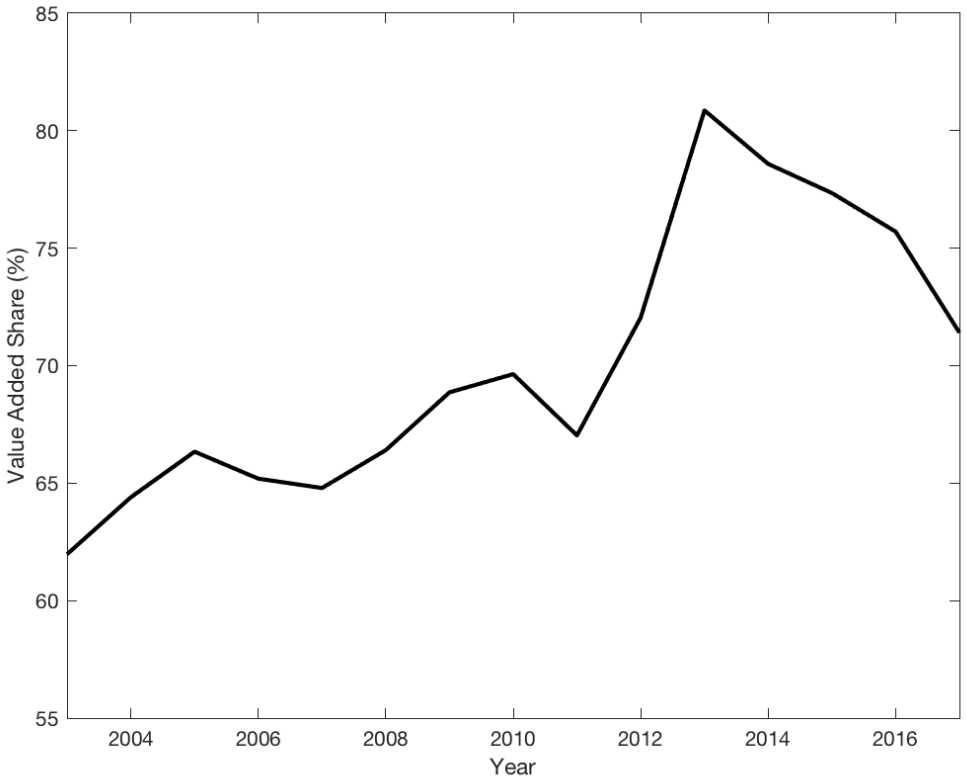
Appendix I: Figures

Figure A1: Industrial Value Added Share in Gross Output



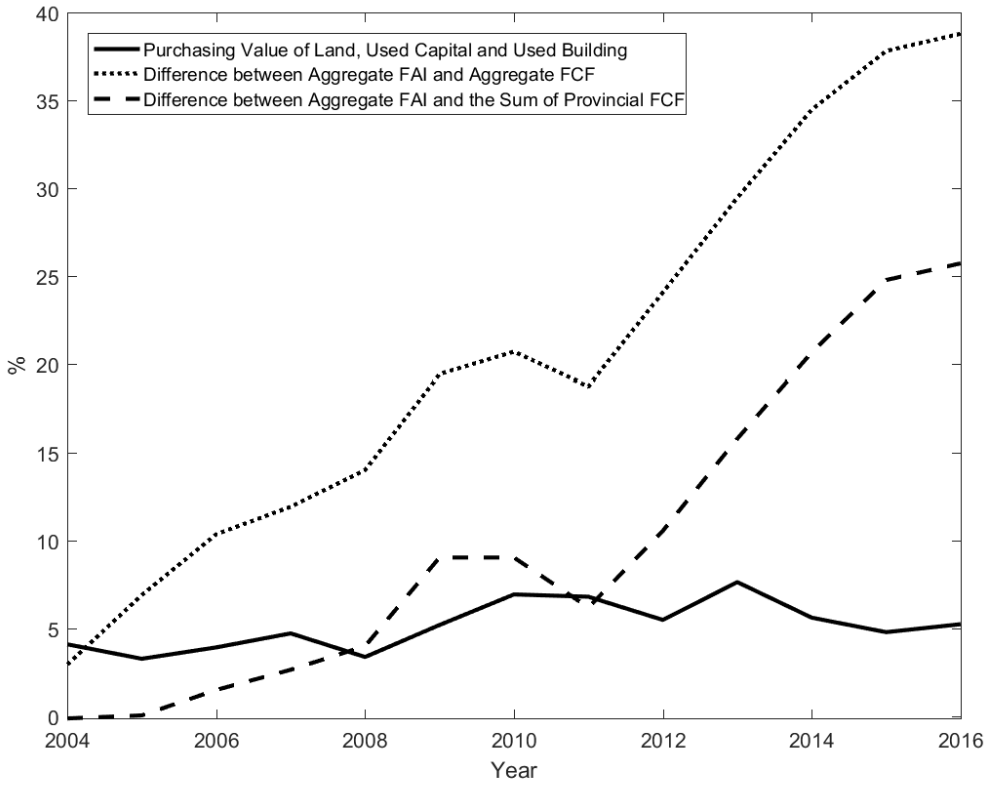
Note: Figure A1 plots industrial value added as percent of industrial gross output in the IO tables.

Figure A2: Total Value Added of Construction Firms with Qualification



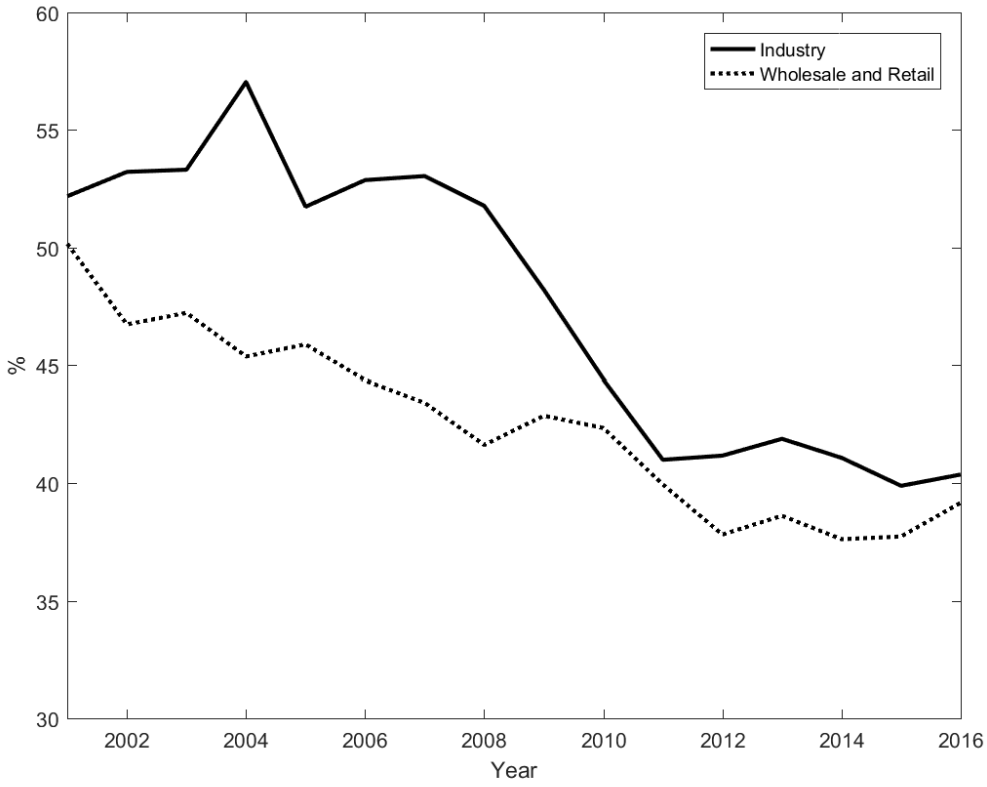
Note: This figure plots the value added share of construction firms with qualification in construction value added in the national account.

Figure A3: Value of Land Purchase and Used Capital and Building



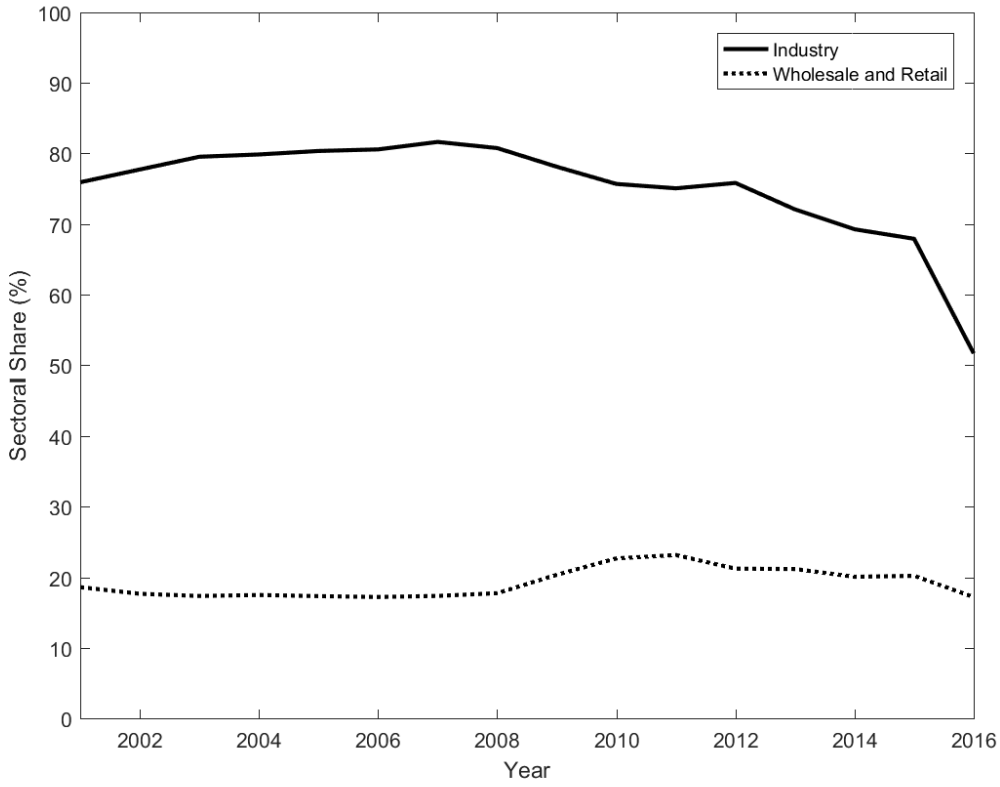
Note: This figure plots the purchasing value of land, used capital and building (solid line), the difference between aggregate FAI and aggregate FCF (the dotted line) and the difference between aggregate FAI and the sum of provincial FCF (the dashed line) as percent of aggregate GDP.

Figure A4: Value Added Tax Revenue Share in Industry, Wholesale and Retail



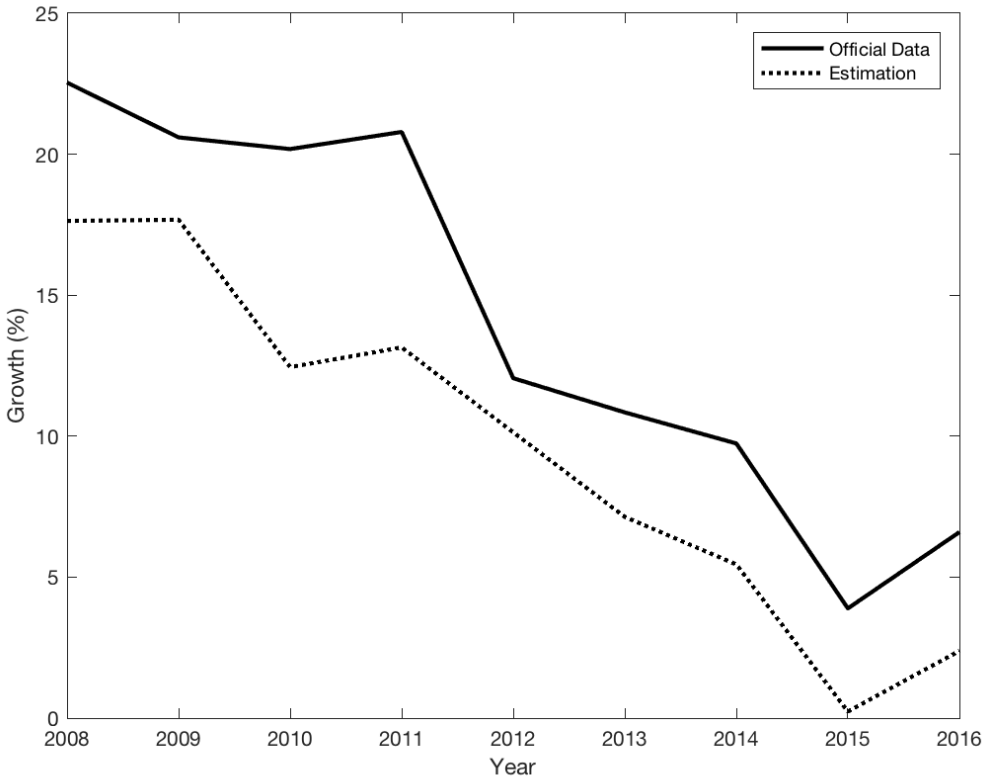
Note: The solid and dotted line plots value added tax revenue as percentage of total tax revenue from industry and wholesale and retail, respectively.

Figure A5: Sectoral Composition of Value Added Tax Revenue



Note: This figure plots the share of value added tax revenue from industry (the solid line) and wholesale and retail (the dotted line) as percentage of total value added tax revenue.

Figure A6: Construction Value Added Growth by (3)



Note: This figure plots the growth of construction value added implied by equation (3) in the body text.

Appendix II: The 2010 ASIF

Consider a stable distribution of firm output relative to the mean. If the average firm output increases (i.e., the total output outgrows the total firm number), a constant above-scale threshold would imply a larger proportion of above-scale firms in terms of both output and firm number. The official industrial value added growth was 19.6% between 2009 and 2010, while the number of all surviving industrial firms in the firm registration data at China's State Administration of Industry and Commerce increased by merely 6.7%. This means that the number of above-scale firms should substantially outgrow the total firm number in 2010. Nevertheless, the number of above-scale firms in ASIF only grew by 4.3% in 2010, which is 2.4 percentage points lower than the growth of the total firm number. The contrast suggests that the 2010 ASIF covers fewer above-scale firms than what it should.

Appendix III: Low-Value-Added-Tax Goods

Some industrial goods, including food, public utilities, animal feed and fertilizers, are subject to 13% value added tax. We want to know to what extent the value added tax revenue growth was affect by the compositional change of the low-tax goods. Table A1 maps the low-tax goods to four-digit industry code. Using the 1998-2007 ASIF data, we can directly calculate the value added share of the low-tax four-digit industries. For the 2007-2016 period, the value added share is estimated as follows. We first use the 2011-13 ASIF data to compute the average sales share of the low-tax four digit industries in the corresponding two-digit industry. Assuming the average sales share to be stationary between 2007 and 2016, we can back out the sales of the low-tax industries and convert them into value added. Figure A9 plots the value added share of the low-tax industries in the industrial sector from 1998 to 2016, which is around 5% and has increased a bit since 2007. Yet, the recent increase in the share of the low-tax industries has a negligible compositional effect of value added tax revenue. Table A2 reports the counterfactual value added tax revenue growth by assuming constant share of the low-tax industries. The difference is never larger than 0.1 percentage points. So, we decide to ignore the compositional effect of the low-tax goods.

Table A1: Mapping of Low-Value-Added-Tax Goods into Four-Digit Industries

Low-Tax Goods	Industry Classification Code (1994)		Industry Classification Code (2002)	
Edible Vegetable Oils	1321	Manufacture of Edible Vegetable Oils	1331	Manufacture of Edible Vegetable Oils
Tap water, hot water	46	Production and Distribution of Tap Water	46	Production and Distribution of Tap Water
Coal Gas, Liquefied Petroleum Gas, Natural Gas, Biogas	45	Production and Distribution of Gas	45	Production and Distribution of Gas
Residential-use Coal Products	-	-	4230	Manufacture of Coal Products
Books, Newspapers, Magazines	23	Copying of Printing and Recorded Media	23	Copying of Printing and Recorded Media
	1314	Manufacture of Mixed Feeds	-	-
Animal Feeds	1315	Manufacture of Protein Feeds	1320	Manufacture of Feeds
	1319	Manufacture of Other Feeds	-	-
Fertilizer	262	Manufacture of Fertilizer	262	Manufacture of Fertilizer
Pesticide	263	Manufacture of Pesticide	263	Manufacture of pesticide
	364	Manufacture of Special Machinery for Agriculture, Forestry, Animal Husbandry, Fishery and Water Transportation	367	Manufacture of Special Machinery for Agriculture, Forestry, Animal Husbandry and Fishery
Agricultural Machinery	3626	Manufacture of Special Machinery for Forest Industry	-	-
	4224	Manufacture of Instrumentation for Agriculture, Forestry, Animal Husbandry and Fishery	4124	Manufacture of Instrumentation for Agriculture, Forestry, Animal Husbandry and Fishery

Figure A9: Value Added Share of the Low-Tax Industries

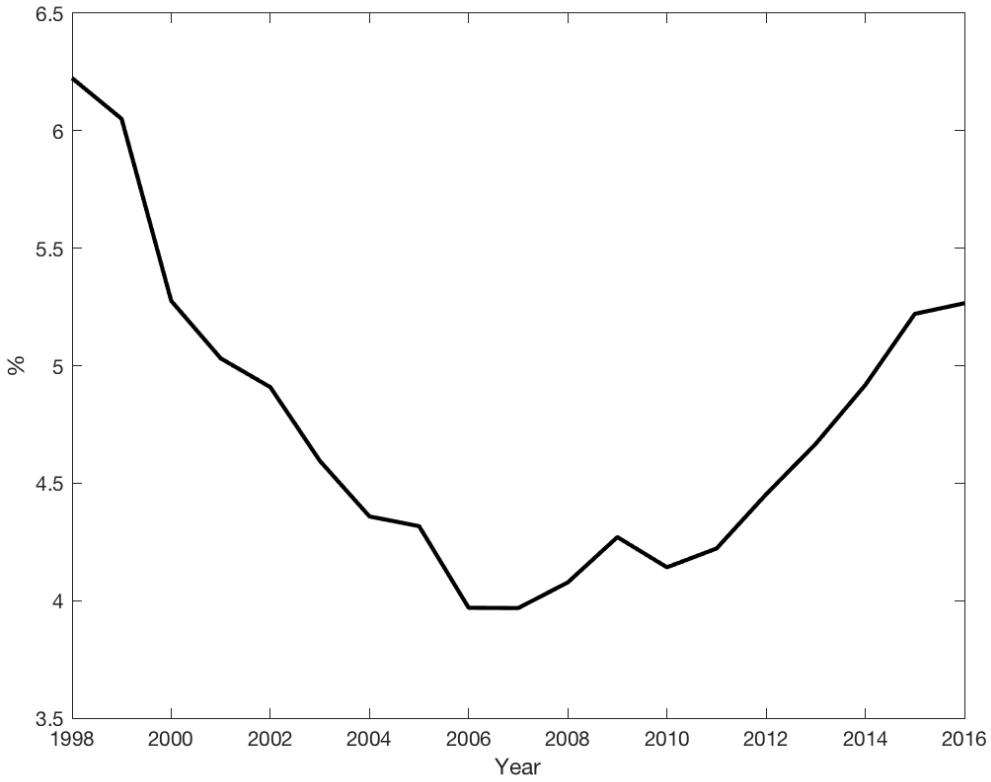


Table A2: Domestic Industrial Value Added Tax Revenue Growth

Year	Actual Industrial VAT Revenue Growth	Counterfactual Industrial VAT Revenue Growth I	Counterfactual Industrial VAT Revenue Growth II
2002	17.84%	17.80%	17.80%
2003	19.70%	19.61%	19.65%
2004	22.14%	22.07%	22.16%
2005	20.54%	20.53%	20.59%
2006	20.87%	20.77%	20.78%
2007	22.64%	22.64%	22.74%
2008	14.96%	14.99%	14.99%
2009	0.35%	0.40%	0.37%
2010	11.23%	11.20%	11.15%
2011	12.69%	12.71%	12.75%
2012	9.17%	9.23%	9.20%
2013	3.65%	3.70%	3.64%
2014	2.90%	2.96%	2.90%
2015	-1.18%	-1.11%	-1.17%
2016	-0.54%	-0.53%	-0.60%

Note: Counterfactual industrial value added tax revenue growth I is obtained by assuming the value added share of low-tax industries to be identical to the share in 2001. Counterfactual industrial value added tax revenue growth II is obtained by assuming the value added share of low-tax industries to be identical to the share in the previous year.

Appendix IV: Pilot "Modern" Service Sectors in Value Added Tax Reform

Table A3: List of Pilot "Modern" Service Sectors

Sector Code in 2012 I-O Table	Sector Name
59110	Storage
60111	Postal Services
63114	Telecommunications and other information transmission services
65115	Software and information technology services
71120	Leasing
72121	Commercial services
73122	Research and experimental development
74123	Polytechnic services
75124	Science and technology promotion and application
86134	Radio, television, film, and television recording and production

Note: The sector code follows the 2012 IO table. We identify the ten sectors that cover the "modern" service sectors in the pilot reform that replaces business tax with value added tax.

(This table is new, please check it)

Appendix V: Statistical Models

Table A4: Regression Results with Provincial Industrial GDP, 2000-2007

	(1)	(2)	(3)
Night lights	0.190 (0.0525)		
National tax	0.468 (0.0692)	0.483 (0.0744)	
Exports	0.0804 (0.0364)	0.0943 (0.0407)	0.225 (0.0542)
Imports	0.0485 (0.0252)	0.0425 (0.0268)	0.118 (0.0386)
Electricity consumption	0.260 (0.0809)	0.290 (0.0852)	0.632 (0.0966)
Rail cargo	0.130 (0.0703)	0.153 (0.0754)	0.272 (0.0964)
Province Effect	YES	YES	YES
N	240	240	240
R^2	0.976	0.975	0.958

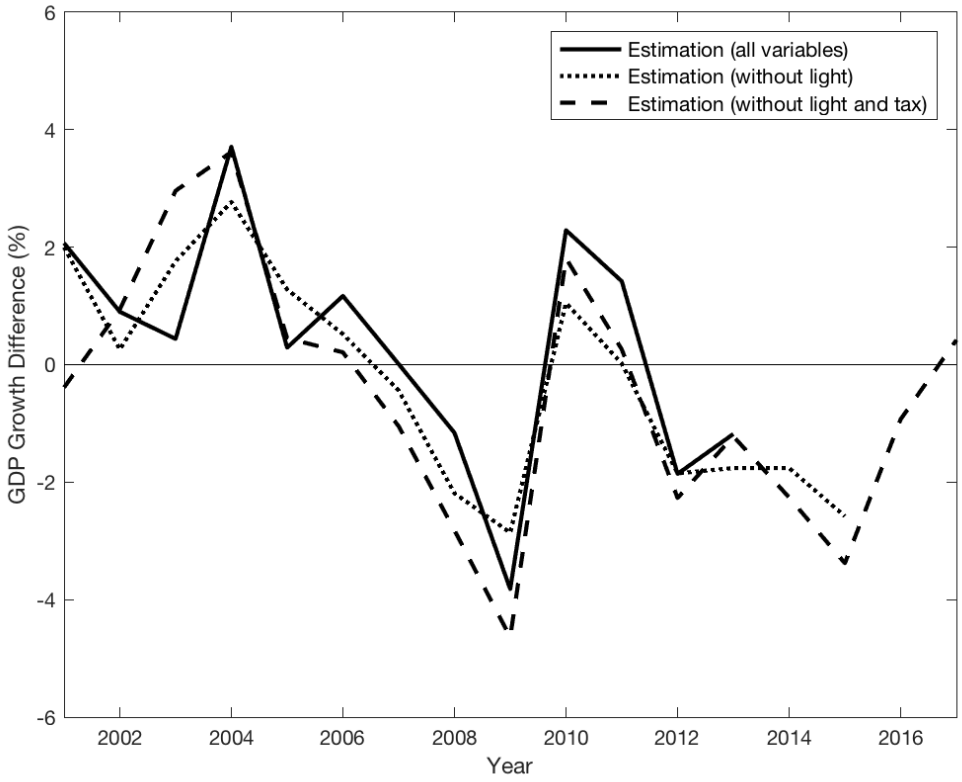
Note: Standard errors clustered by province in parentheses.

Table A5: Regression Results with Provincial Industrial GDP, 2000-2007, with Price Adjustments

	(1)	(2)	(3)
Night lights	0.199 (0.0503)		
National tax	0.388 (0.0682)	0.402 (0.0739)	
Exports	0.0476 (0.0317)	0.0623 (0.0360)	0.141 (0.0449)
Imports	0.0422 (0.0243)	0.0356 (0.0260)	0.0806 (0.0342)
Electricity consumption	0.293 (0.0763)	0.334 (0.0803)	0.618 (0.0786)
Rail cargo	0.144 (0.0654)	0.168 (0.0701)	0.262 (0.0867)
Province Effect	YES	YES	YES
N	240	240	240
R^2	0.969	0.967	0.951

Notes: Standard errors clustered by province in parentheses. The industrial GDP is adjusted by industrial GDP deflator and national tax, export and import are adjusted by total GDP deflator. All the deflators are at the national level.

Figure A10: The Gap between Estimated and Official Nominal GDP Growth (Based on the Statistical Model for Provincial Industrial GDP with Price Adjustments)



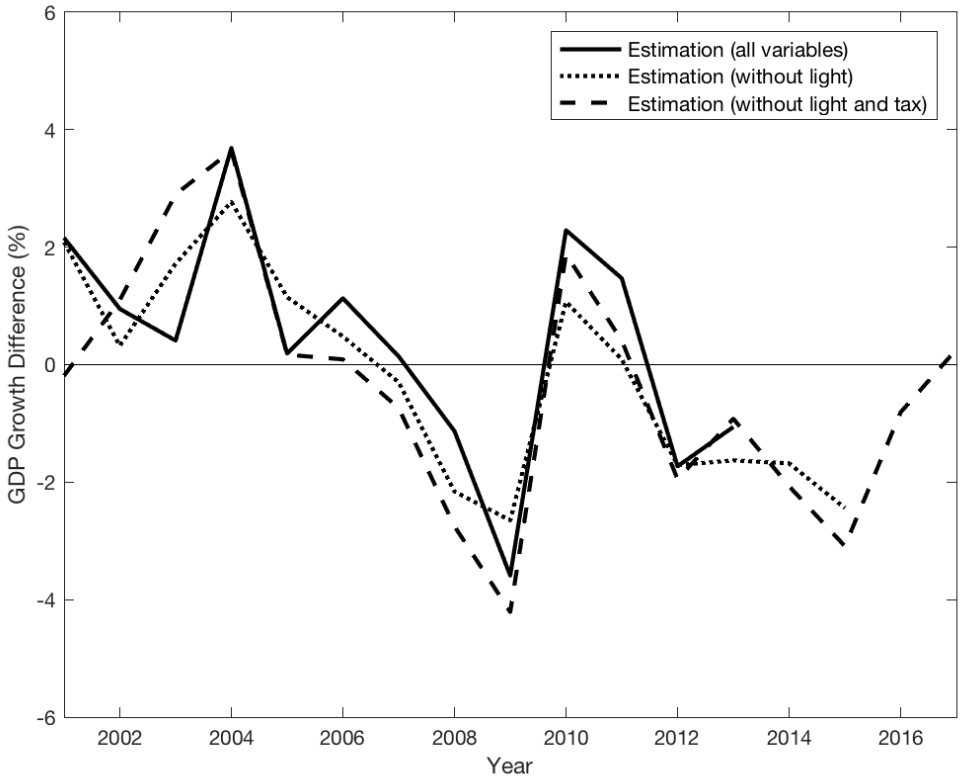
Note: This figure plots estimated nominal GDP growth - official nominal GDP growth. The solid line uses the estimated GDP growth with night lights data (up to 2013). The dotted line uses estimated GDP growth without night lights data (up to 2015). The dashed line uses estimated GDP growth without nigh lights and national tax revenue data (up to 2017). The industrial GDP is adjusted by industrial GDP deflator and national tax, export and import are adjusted by total GDP deflator. All the deflators are at the national level.

Table A6: Regression Results with Provincial Industrial GDP, 2000-2007, with Price Adjustments 2

	(1)	(2)	(3)
Night lights	0.197 (0.0502)		
National tax	0.391 (0.0687)	0.404 (0.0744)	
Exports	0.0453 (0.0323)	0.0612 (0.0368)	0.141 (0.0456)
Imports	0.0395 (0.0242)	0.0336 (0.0259)	0.0781 (0.0343)
Electricity consumption	0.297 (0.0757)	0.336 (0.0799)	0.620 (0.0790)
Rail cargo	0.143 (0.0653)	0.167 (0.0699)	0.262 (0.0860)
Province Effect	YES	YES	YES
N	240	240	240
R^2	0.969	0.967	0.951

Notes: Standard errors clustered by province in parentheses. The industrial GDP, export and import are adjusted by industrial GDP deflator and national tax is adjusted by total GDP deflator. All the deflators are at the national level.

Figure A11: The Gap between Estimated and Official Nominal GDP Growth (Based on the Statistical Model for Provincial Industrial GDP with Price Adjustments 2)



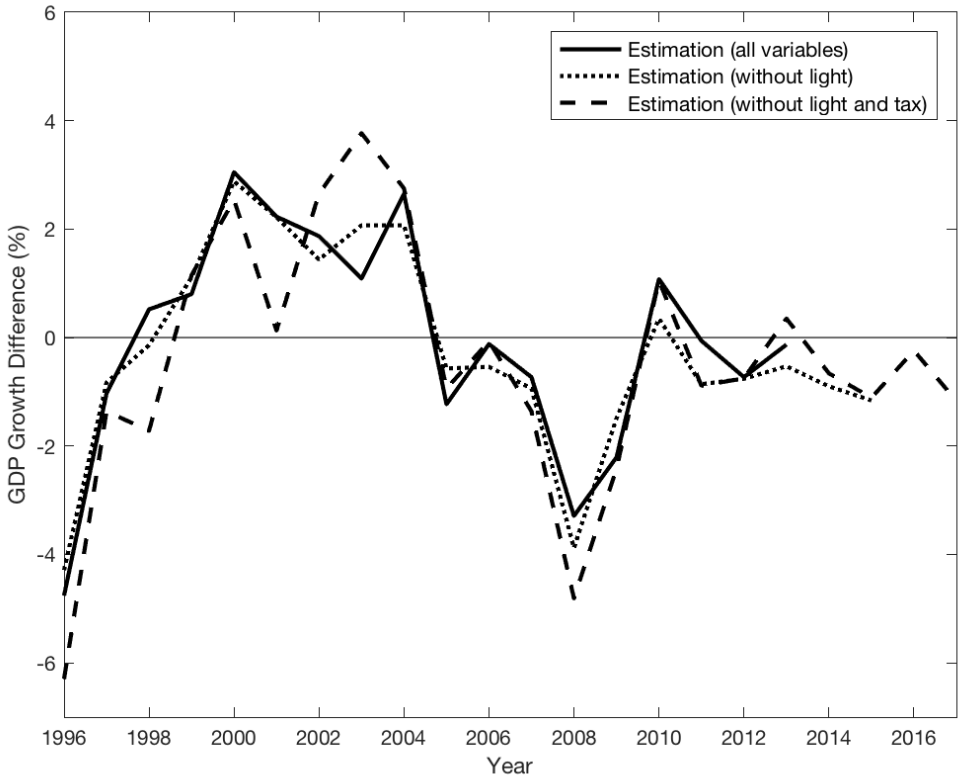
Note: This figure plots estimated nominal GDP growth - official nominal GDP growth. The solid line uses the estimated GDP growth with night lights data (up to 2013). The dotted line uses estimated GDP growth without night lights data (up to 2015). The dashed line uses estimated GDP growth without nigh lights and national tax revenue data (up to 2017). The industrial GDP, export and import are adjusted by industrial GDP deflator and national tax is adjusted by total GDP deflator. All the deflators are at the national level.

Table A7: Regression Results with Provincial Industrial GDP, 1995-2007

	(1)	(2)	(3)
Night lights	0.132 (0.0980)		
National tax	0.324 (0.0682)	0.334 (0.0683)	
Exports	0.105 (0.0507)	0.104 (0.0555)	0.170 (0.0509)
Imports	0.0383 (0.0330)	0.0422 (0.0321)	0.0725 (0.0480)
Electricity consumption	0.389 (0.119)	0.421 (0.108)	0.855 (0.110)
Rail cargo	0.175 (0.0724)	0.195 (0.0770)	0.155 (0.0999)
Province Effect	YES	YES	YES
N	388	388	388
R^2	0.961	0.960	0.942

Note: Standard errors clustered by province in parentheses.

Figure A12: The Gap between Estimated and Official Nominal GDP Growth (Based on the Statistical Model for Provincial Industrial GDP, 1995-2007)



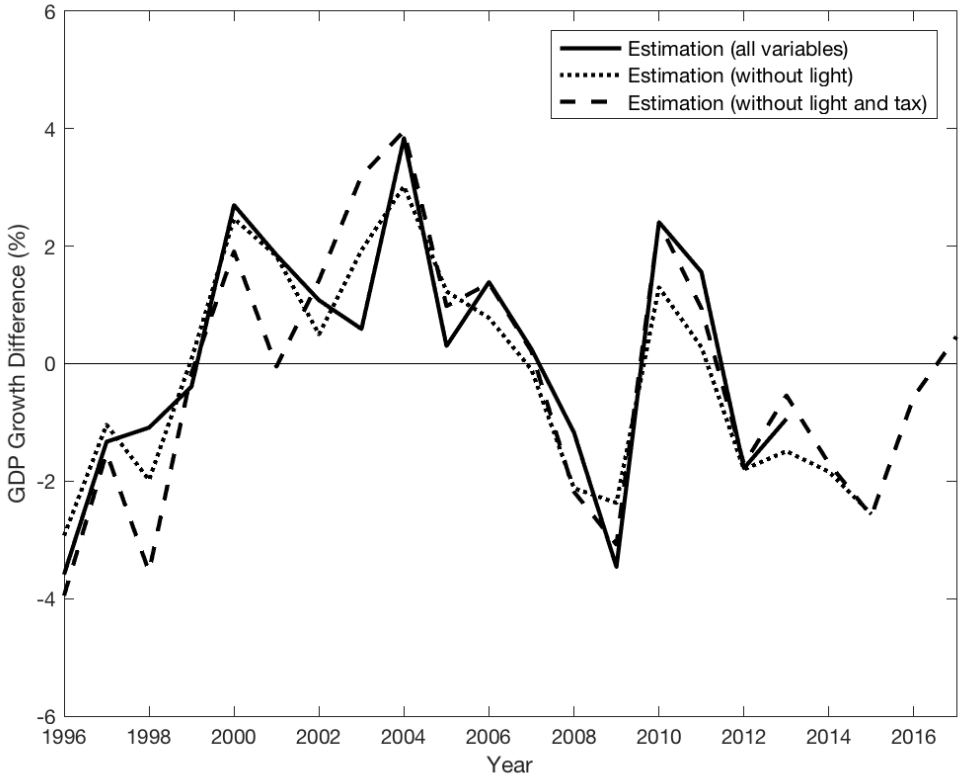
Note: This figure plots estimated nominal GDP growth - official nominal GDP growth. The solid line uses the estimated GDP growth with night lights data (up to 2013). The dotted line uses estimated GDP growth without night lights data (up to 2015). The dashed line uses estimated GDP growth without nigh lights and national tax revenue data (up to 2017).

Table A8: Regression Results with Provincial Industrial GDP, 1995-2007, with Price Adjustments

	(1)	(2)	(3)
Night lights	0.192 (0.102)		
National tax	0.326 (0.0710)	0.339 (0.0689)	
Exports	0.0451 (0.0494)	0.0441 (0.0580)	0.0902 (0.0533)
Imports	0.0232 (0.0308)	0.0285 (0.0302)	0.0527 (0.0449)
Electricity consumption	0.423 (0.107)	0.475 (0.0897)	0.895 (0.101)
Rail cargo	0.150 (0.0644)	0.178 (0.0714)	0.137 (0.0957)
Province Effect	YES	YES	YES
N	388	388	388
R^2	0.953	0.950	0.928

Notes: Standard errors clustered by province in parentheses. The industrial GDP is adjusted by industrial GDP deflator and national tax, export and import are adjusted by total GDP deflator. All the deflators are at the national level.

Figure A13: The Gap between Estimated and Official Nominal GDP Growth (Based on the Statistical Model for Provincial Industrial GDP, 1995-2007, with Price Adjustments)



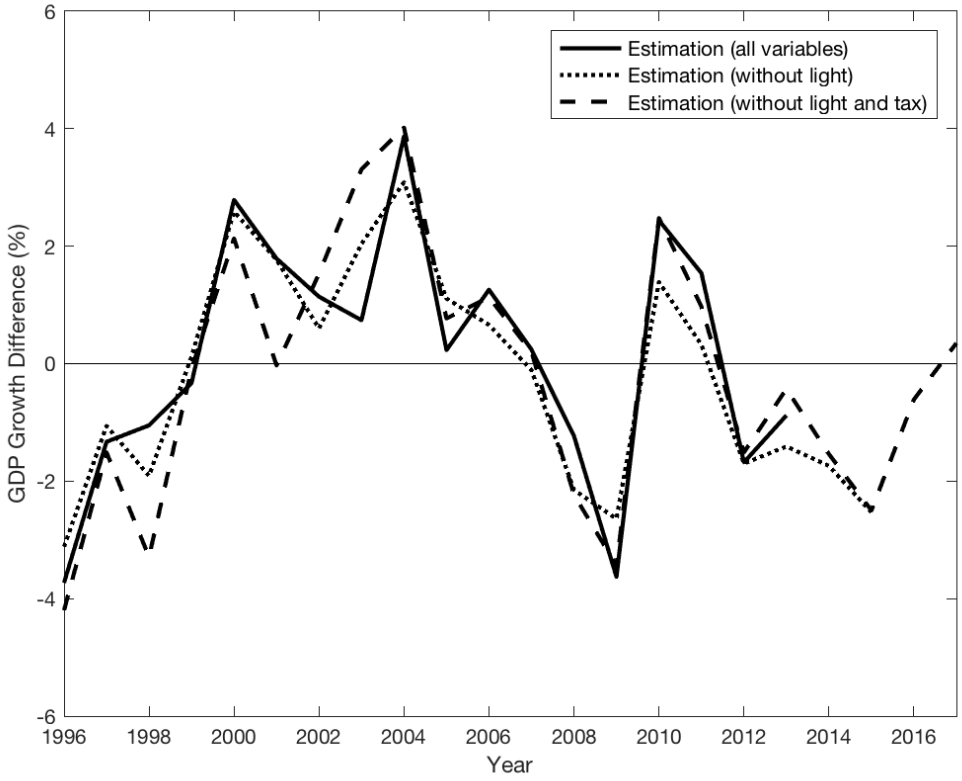
Note: This figure plots estimated nominal GDP growth - official nominal GDP growth. The solid line uses the estimated GDP growth with night lights data (up to 2013). The dotted line uses estimated GDP growth without night lights data (up to 2015). The dashed line uses estimated GDP growth without nigh lights and national tax revenue data (up to 2017). The industrial GDP is adjusted by industrial GDP deflator and national tax, export and import are adjusted by total GDP deflator. All the deflators are at the national level.

Table A9: Regression Results with Provincial Industrial GDP, 1995-2007, with Price Adjustments 2

	(1)	(2)	(3)
Night lights	0.184 (0.0978)		
National tax	0.315 (0.0701)	0.327 (0.0677)	
Exports	0.0634 (0.0482)	0.0651 (0.0567)	0.122 (0.0497)
Imports	0.0309 (0.0311)	0.0372 (0.0302)	0.0653 (0.0446)
Electricity consumption	0.399 (0.103)	0.445 (0.0894)	0.820 (0.0998)
Rail cargo	0.151 (0.0653)	0.179 (0.0722)	0.140 (0.0932)
Province Effect	YES	YES	YES
N	388	388	388
R^2	0.953	0.951	0.931

Notes: Standard errors clustered by province in parentheses. The industrial GDP, export and import are adjusted by industrial GDP deflator and national tax is adjusted by total GDP deflator. All the deflators are at the national level.

Figure A14: The Gap between Estimated and Official Nominal GDP Growth (Based on the Statistical Model for Provincial Industrial GDP, 1995-2007, with Price Adjustments 2)



Note: This figure plots estimated nominal GDP growth - official nominal GDP growth. The solid line uses the estimated GDP growth with night lights data (up to 2013). The dotted line uses estimated GDP growth without night lights data (up to 2015). The dashed line uses estimated GDP growth without nigh lights and national tax revenue data (up to 2017). The industrial GDP, export and import are adjusted by industrial GDP deflator and national tax is adjusted by total GDP deflator. All the deflators are at the national level.

Table A10: Regression Results with Provincial GDP, 2000-2007

	(1)	(2)	(3)	(4)	(5)	(6)
	Group 1	Group 2	Group 1	Group 2	Group 1	Group 2
Night lights	0.118 (0.0777)	0.0143 (0.0451)				
National tax	0.351 (0.0735)	0.588 (0.0454)	0.477 (0.0764)	0.496 (0.0722)		
Exports	0.0870 (0.0595)	0.145 (0.0349)	0.157 (0.0894)	0.0622 (0.0611)	0.140 (0.0532)	0.632 (0.107)
Imports	0.00269 (0.0419)	-0.00162 (0.0204)	-0.0575 (0.0569)	0.0419 (0.0325)	0.132 (0.0338)	-0.110 (0.0969)
Electricity consumption	0.347 (0.0772)	0.0542 (0.0681)	0.200 (0.114)	0.221 (0.0902)	0.657 (0.0745)	0.260 (0.193)
Province Effect	YES	YES	YES	YES	YES	YES
N	128	112	88	152	144	96
R^2	0.983	0.990	0.973	0.987	0.962	0.973

Note: Standard errors clustered by province in parentheses.

Table A11: C-Lasso Results

With Light		Without Light		Without Light and Tax	
(1)	(2)	(1)	(2)	(1)	(2)
Beijing	Tianjin	Beijing	Tianjin	Beijing	Tianjin
Hebei	Jilin	Inner Mongolia	Hebei	Hebei	Liaoning
Shanxi	Heilongjiang	Liaoning	Shanxi	Shanxi	Shanghai
Inner Mongolia	Jiangxi	Jilin	Heilongjiang	Inner Mongolia	Zhejiang
Liaoning	Henan	Shanghai	Zhejiang	Jilin	Shandong
Shanghai	Hunan	Jiangsu	Jiangxi	Heilongjiang	Henan
Jiangsu	Guangdong	Anhui	Shandong	Jiangsu	Hunan
Zhejiang	Guangxi	Fujian	Henan	Anhui	Guangdong
Anhui	Chongqing	Hubei	Hunan	Fujian	Chongqing
Fujian	Sichuan	Hainan	Guangdong	Jiangxi	Guizhou
Shandong	Guizhou	Qinghai	Guangxi	Hubei	Yunnan
Hubei	Shaanxi		Chongqing	Guangxi	Shaanxi
Hainan	Gansu		Sichuan	Hainan	
Yunnan	Ningxia		Guizhou	Sichuan	
Qinghai			Yunnan	Gansu	
Xinjiang			Shaanxi	Qinghai	
			Gansu	Ningxia	
			Ningxia	Xinjiang	
			Xinjiang		

Appendix VI: Estimating Returns to Capital

We use the perpetual inventory method and 1952 as the beginning year to compute capital stock K. We need FCF, the components of FCF and their price indices. We use the composition of FAI to proxy the composition of FCF, which is not available (Bai et al., 2006; Holz & Sun, 2018). FAI has three components: (1) construction and installation; (2) purchase of equipment and instruments and (3) the others. We obtain the 1981-2015 FAI composition data from the NBS website. For the 1952-1980 data, we use the composition in capital construction from in the Statistical Yearbooks of Fixed Asset Investment. The composition of capital construction is a good proxy. In the years when the composition of both FAI and capital construction is available, their differences are all smaller than 5%.

The price index for each component in FAI has become available since 1990 and is used as the prime price index to deflate FCF in Bai et al. (2006). For 1952-1989, we apply the FCF price index to deflate all the three FCF types as in Holz & Sun (2018) and normalize the 1978 price index for each type to one. Following Bai et al. (2006), we assume the real initial capital stock by each FCF type at the beginning of 1952 to be the ratio of real FCF in 1952 to the sum of the annual real FCF growth rate in 1952-1957 and the type-specific depreciation rate (Bai et al., 2006). The depreciation rate is time-invariant and is set to 8%, 24% and 15% for construction and installation, purchase of equipment and instruments and the others, respectively.

α is obtained from the four income components in the national account: compensation of employees, net taxes on production, depreciation of fixed assets, and operating surplus. We assume that net taxes on production is distributed proportionally across capital and labor. Following Holz & Sun (2018), we have

$$\alpha = \frac{\text{depreciation of fixed assets} + \text{operating surplus}}{\text{compensation of employees} + \text{depreciation of fixed assets} + \text{operating surplus}}.$$

Since income-based GDP is not available at the national level, for the official data, we simply sum up the provincial components first and then use the above equation to calculate α. For our adjusted data, we first compute provincial capital share and then use our estimated provincial GDP as weight to obtain the aggregate α.