

Do Legal Rules Explain China's Growth?

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Introduction

- How much of China's economic growth can be explained by reforms of formal institutions?
 - Written laws and regulations as proxy for formal institutions.
 - Of the laws enacted between 1978-1990, only 37% in effect today.
- The literature on legal origins shows the importance of legal rules (La Porta et al. 2008).
- Many papers have demonstrated impacts from particular changes (e.g., tax collection, WTO reforms).
- But the *de jure* legal/regulatory requirements are often not implemented (Hallward-Driemeier and Pritchett, 2015).
 - “Crony capitalism” (Bai, Hsieh and Song, 2018).
 - China's Doing Business ranking is quite low (78 in 2017, below Indonesia, Colombia, etc.).

This Project

- This project analyzes the full corpus of China's laws since 1978, along with comprehensive regulatory documents.
 - How has content changed over time? Does it track common wisdom regarding the evolution of the Chinese economy's market orientation?
 - Can changes to legal text explain growth?
- A key challenge is how to process these texts
 - Corpus is large (over 1 million documents).
 - Legal language is hard to map directly into economic policy.
- This project uses a disciplined approach using new tools in NLP.

Preview of Findings

- Active introduction of market-oriented legal infrastructure from the mid 1980s to around 2000.
 - The 3rd plenary session of the 12th Party Congress in 1984: “commodity economy”.
 - The 16th Party Congress in 2002: “preliminary completion of the socialist market economy”.
 - Laws on the books in 2002 contain over two standard deviations more “neoliberal” language than in 1984.
 - The period also saw an over one standard deviation decline in “marxist” economic language.
- The introduction of market-based policies slowed down in the last fifteen years.
- The market orientation of policies explain just an extra 2% of provincial variation in GDP pc growth beyond province and time fixed effects.

Literature Review

- Divergence between de jure and the de facto legal environment
 - Theoretical perspectives (Acemoglu and Robinson 2008)
 - Tax evasion (Fisman and Wei 2004, Carrillo et al. 2014)
- Literature on China's policy reforms
 - Decentralization of economic policies (Blanchard and Shleifer 2001, Jin, Qian, and Weingast 2005)
 - Factional competition in the central government (Cai and Treisman 2006)
- Natural language processing in economics
 - Central banker communication (Hansen, McMahon and Prat forthcoming)
 - Product differentiation (Hoberg and Phillips 2016)
 - Quality of technological innovations (Kelly et al. 2018)

Outline

- Corpus composition
- Measuring market orientation of regulations
- Relationship between provincial regulations and growth

Corpus of Chinese Legal Rules

- We obtained the entirety of PKULaw documents from the company.
- Recent papers have used documents from PKULaw's subscription service to study specific Chinese policies.
 - Chari et al. (2018): Rural Land Contracting Law
 - Tian (2018): rollout of migration reforms
- We are not aware of any project that uses the entirety of raw PKULaw documents.
- The corpus contains
 - (Close to) the universe of formal laws and regulations made by China's central and local governments (total number: 64802).
 - A substantial number of “normative documents” (over 1.3 million).

Corpus of Chinese Legal Rules

- Formal laws include those made by the national and local People's Congresses, the State Council and its administrative agencies, and local governments.
- The “normative documents” often lay out concrete policies despite a lack of formal legal status (e.g., Provincial minimum wages are stipulated in these documents).
- 99% of documents issued by central and local Development Reform Commissions in the corpus are informal normative documents.

A Screenshot of the PKULaw Interface

Title

推进“一带一路”贸易畅通合作倡议

【发布部门】	商务部	Issuing department	【发布日期】	2017.05.14	Issuing date
【实施日期】	2017.05.14	Effective since	【时效性】	现行有效	Current effectiveness
【效力级别】	部门工作文件	Document type	【法规类别】	商贸物资综合规定，一带一路	Area category

【全文】

【法宝引证码】

CL1.4.296634

推进“一带一路”贸易畅通合作倡议

Document id

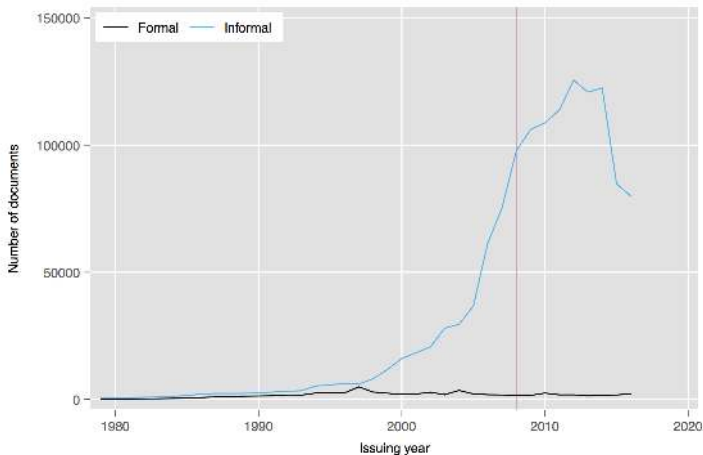
(商务部发布 2017年5月14日)

Text

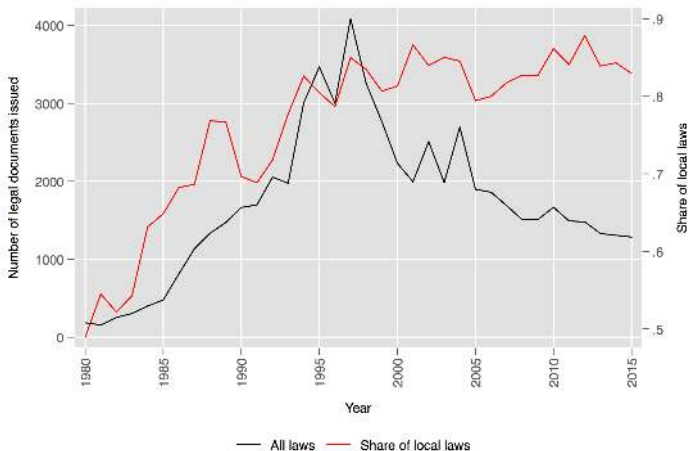
2017年5月14日，中国商务部主办的“一带一路”国际合作高峰论坛高级别会议“推进贸易畅通”平行主题会议在北京举行。来自相关国家和国际机构的代表围绕“畅通、高效、共赢、发展，深化‘一带一路’经贸合作”主题，进行了深入和富有成效的讨论，达成广泛共识。本倡议根据此次会议讨论情况制定，由相关国家和国际机构在自愿基础上参与，并对未来参与保持开放。

Coverage over Time

- Due to increased digitization and disclosure, much better coverage in recent years for informal documents.
- We deal with formal and informal regulations separately.



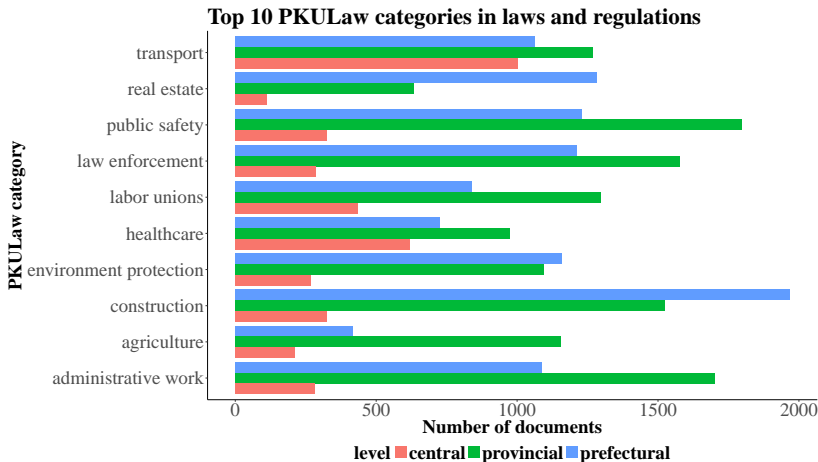
Increasing Share of Laws Issued Locally



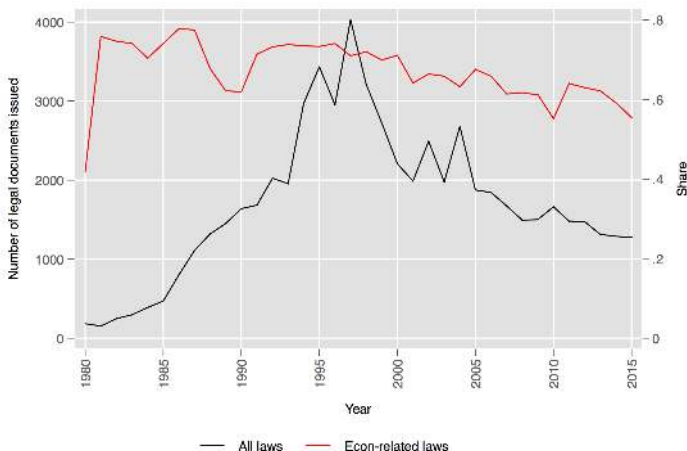
- Local laws include laws at province and prefecture levels.

Composition of the Laws

- PKULaw classifies its documents into 104 categories of policy area and 1159 subcategories.



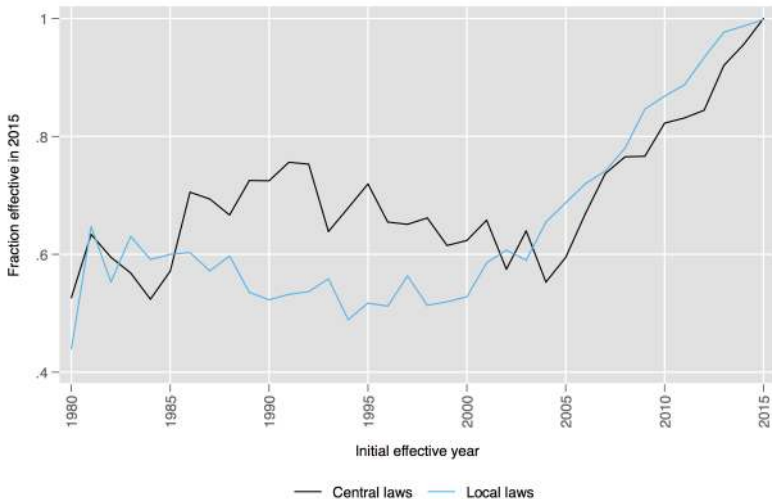
Slightly Declining Share of Laws on Economic Issues



- Economics-related laws are determined through the area categories, including transport, real estate, labor unions, construction, etc.

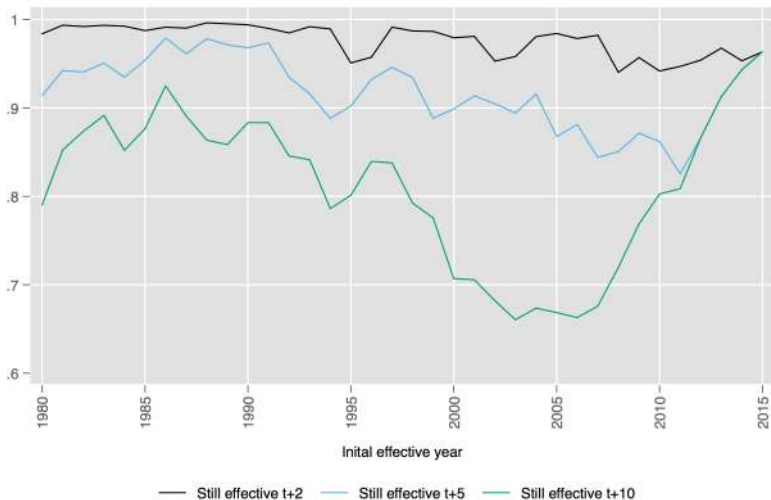
Patterns of Phasing Out

- A substantial share of laws made in the 80s and 90s, especially local laws, have been taken off the books.



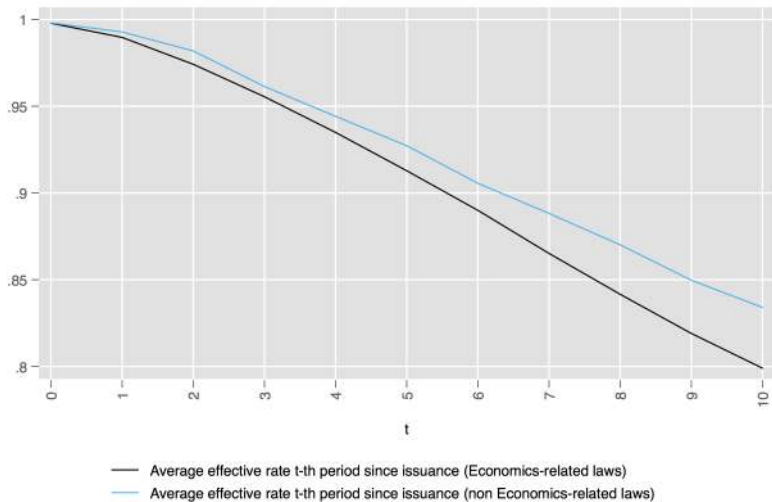
Patterns of Phasing Out

- Laws made in the 2000s are especially short-lived.

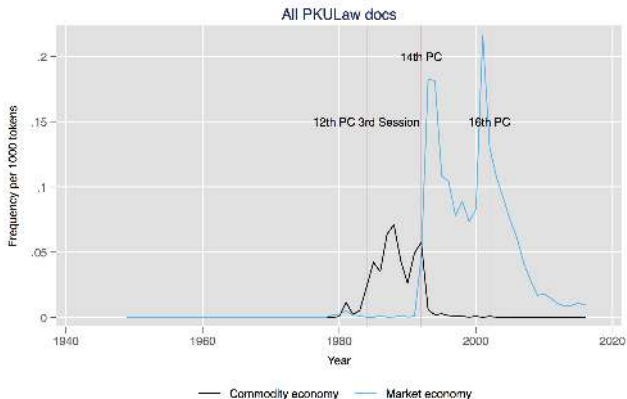


Patterns of Phasing Out

- Economics-related laws have a shorter lifespan on average.



China's Ideological Shift in Two Words



- 1984: “commodity economy” became appropriate.
- 1992: “market economy” legitimized.
- 2002: “the preliminary completion of the market economy”.

Measuring Market Orientation of Regulations

- Technique: word embeddings
- Three sets of target words:
 - “Marxist” words
 - “Neoclassical economics” words
 - “Neoliberal” words
- Rise and fall of these words in the regulations

Turning Text into Data

- Transform the corpus into a document-term matrix.
 - Entry (i, j) of the matrix is the number of occurrences of term j in document i .
- Preprocessing the documents:
 - Remove non-Chinese characters.
 - Word segmentation: segment sentences into tokens with *jieba*, which has the ability to learn phrases from frequently co-occurring words.
 - Consequently, many of the tokens are meaningful phrases rather than simple words (e.g., Three Represents).
 - Remove tokens containing just one character and a standard list of stop words.

Measuring “Ideology” in the Text

- We want to gauge the extent to which China has moved towards markets from Marx.
- Measuring partisanship and media slant in the US
 - Groseclose and Milyo (2005) leverage the fact that Republicans and Democrats cite different think tanks with clear political positions to estimate media slant.
 - Gentzkow, Shapiro and Taddy (2018) measure polarization by the ease with which one can infer the party of a congressperson from speech.
 - Not immediately applicable to China.
- Relatively easy to find a handful of words that have clear ideological implications (e.g., privatization, competition).
- How do we find such words systematically with minimal subjectivity?

Data-Driven Discovery of “Ideological” Words

- Find a substantial number of words to reduce noise.
- Let data tell us what these words should be.
- Use word embeddings to achieve this.
 - Each word is represented as a vector, where words similar in meaning are close in the vector space.
 - A popular architecture of word embedding models is Continuous Bag of Words (CBOW).
 - Proposed by Mikolov et al. (2013a). A neural network that predicts words from its context (i.e., surrounding words).
 - Words that are close in the vector space appear in similar contexts (i.e., if word A and word B are close in the vector space, words surrounding A in the text also tend to be words surrounding B).

Continuous Bag of Words

- Formally, given a sequence of words (w_1, w_2, \dots, w_T)
- The objective is to maximize

$$\frac{1}{T} \sum_{t=1}^T \log p(w_t | w_{t-c}, w_{t-c+1}, \dots, w_{t+c})$$

$$p(w_t | w_{t-c}, w_{t-c+1}, \dots, w_{t+c}) = \frac{\exp(v'_{w_t} \frac{1}{2c} \sum_j v_{w_{t+j}})}{\sum_{i=1}^V \exp(v'_{w_i} \frac{1}{2c} \sum_j v_{w_{t+j}})}$$

- v_w and v'_w are two vectors describing how words are used in different contexts.
- Essentially tries to make words that appear in similar contexts have large cosine similarity.

Word Embeddings: Some Examples

Table: Most similar words to “Hong Kong”

Word	Chinese	Similarity
Macau	澳门	0.782
Hong Kong SAR	香港特别行政区	0.658
textile making	制纱	0.650
Singapore	新加坡	0.641
hot pot	豆捞	0.621
Taiwan	台湾	0.620
Macau SAR government	澳门特区政府	0.614
HK and Macau	港澳	0.612
trade promotion bureau	贸促局	0.603
The Venetian	威尼斯人	0.601

Word Embeddings: Some Examples

- Word analogy: What is to Hu Jintao Three Represents is to Jiang Zemin? $\text{vec}(\text{Three Represents}) - \text{vec}(\text{Jiang Zemin}) = ? - \text{vec}(\text{Hu Jintao})$
- “Scientific Outlook on Development” is the third most similar word among all words.

Initial Words

- We start with small sets of words with relatively clear orientations and expand the sets using word embeddings.
- “Marxist words”: we extract keywords from the text of Karl Marx’s *Capital*.
 - Technique for keyword extraction is *TextRank* (Mihalcea and Tarau 2004). Google’s PageRank algorithm for ranking websites applied to text. Find the most central words in a graph of text.
 - Two words are connected in the graph if they appear within a window of each other.
 - Importance of a word recursively determined by importance of words connected to it.
 - We take the 50 most central words from *Capital*.

Initial Words

- “Neoclassical economics words”: we take the glossary from N. Gregory Mankiw’s *Principles of Economics*.
- “Neoliberal words”: we take the ten points laid out in John Williamson’s 1989 article that later became known as the Washington Consensus.
- We then find all words within a given distance of these words in the word embeddings vector space.

An Example

- Most similar words to “privatization”:
- privatization, privatization (alternative Chinese word), demutualization, joint stock system, reorganize, transform the system, corporation system, shareholding cooperative system, restructuring, transform the mechanism and build the system, asset restructuring, property rights system, state-owned enterprise, cooperative system, corporatization, change system, mixed system, shareholding cooperation, merger, debt-for-equity, state-owned
- 私有化, 民营化, 股份化, 股份制, 改组, 改制, 公司制, 股份合作制, 重组, 转机建制, 资产重组, 产权制度, 国有企业, 合作制, 公司化, 转制, 混合制, 股份合作, 兼并, 债转股, 国有

Marxist Language

Table: Relative shares of top Marxist words in the corpus

Word	Share	Word	Share
labor force	0.250	handicraft	0.006
worker	0.238	reproduction	0.005
ownership	0.150	productivity	0.005
productive forces	0.066	working class	0.005
means of production	0.057	means of subsistence	0.003
producer	0.056	industrial capital	0.002
owner	0.054	farm owner	0.002
commodity circulation	0.019	equivalent	0.002
profit rate	0.017	capitalism	0.002
mode of production	0.016	amount of value	0.002
commodity price	0.014	usury	0.002
commodity production	0.011	bourgeoisie	0.002
credit system	0.007	money capital	0.002

Mankiw Words

Table: Relative shares of Mankiw words in the corpus

Word	Share	Word	Share
investment	0.236	incentive	0.018
market	0.205	profit	0.012
social security	0.061	agent	0.011
export	0.059	currency	0.011
cost	0.039	stock	0.010
consumption	0.039	welfare	0.010
import	0.036	equilibrium	0.009
capital	0.035	market economy	0.009
bond	0.033	diversification	0.009
property rights	0.031	equality	0.009
efficiency	0.024	principal	0.007
union	0.020	screening	0.006
labor force	0.020	reserve	0.005

Washington Consensus

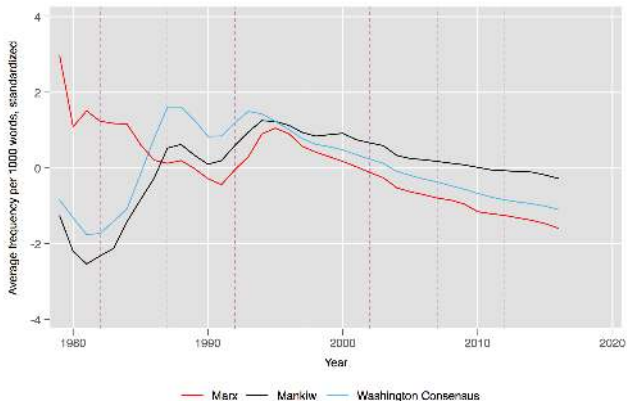
Table: Relative shares of Washington Consensus keywords in the corpus

Word	Share
taxation	0.354
trade	0.269
property rights	0.233
interest rate	0.105
deregulation	0.025
exchange rate	0.012
fiscal deficit	0.001
fiscal expenditure	0.001
privatization	0.0001

Trends: Stock of Regulations

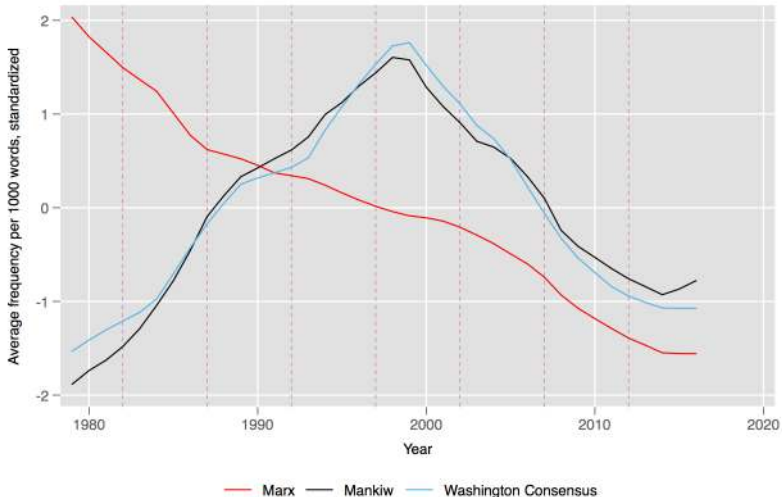
- We first look at the “stock” of laws over time, that is, laws that are currently effective in a given year.

Figure: Stock of formal laws, similarity cutoff 0.4



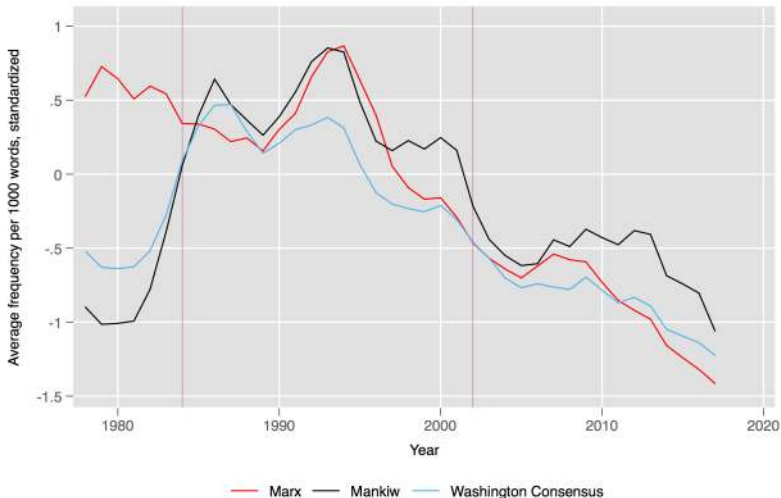
Trends: Stock of Regulations

Figure: Stock of informal laws, similarity cutoff 0.4



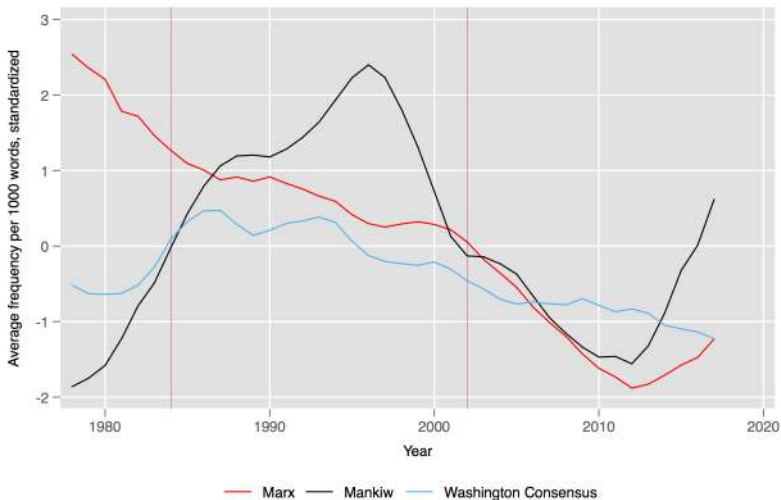
Trends: New Regulations

Figure: New formal laws issued, similarity cutoff 0.4, 5-year moving averages



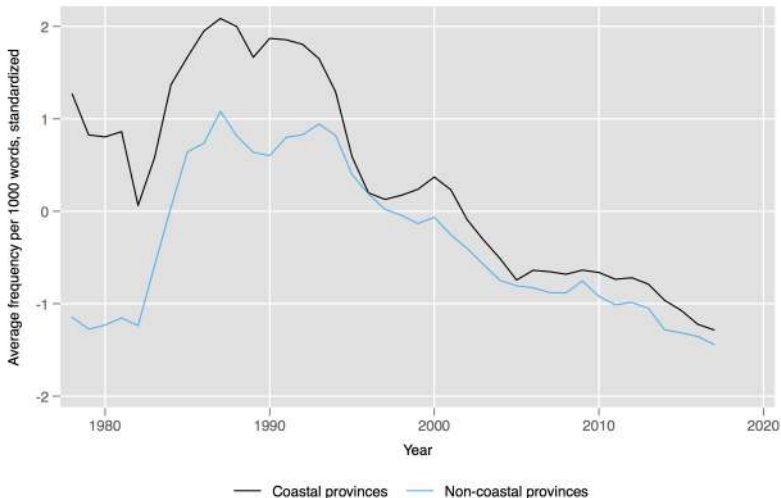
Trends: New Regulations

Figure: New informal laws issued, similarity cutoff 0.4, 5-year moving averages



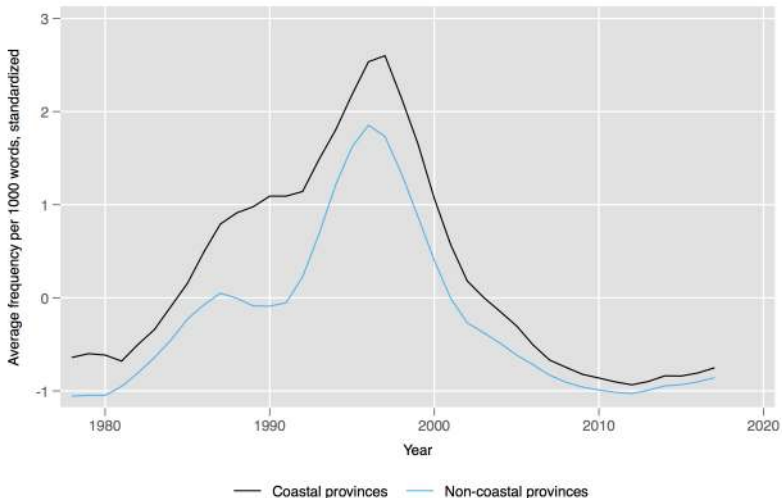
Trends: Coastal vs. Non-Coastal

Figure: Washington Consensus in new formal laws issued



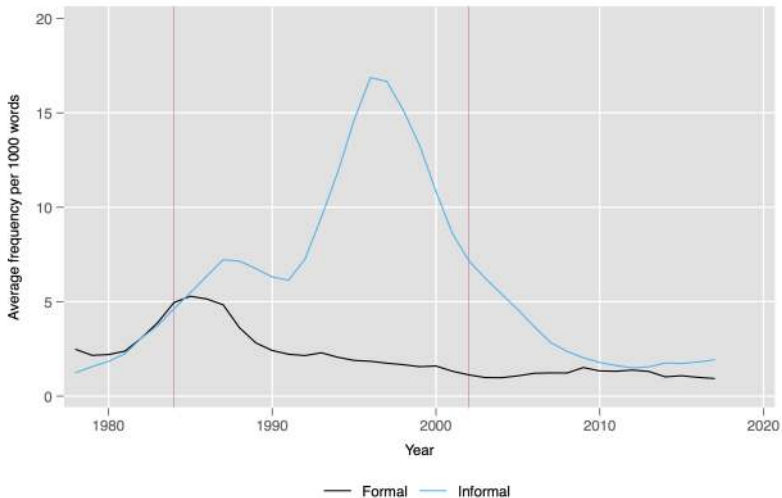
Trends: Coastal vs. Non-Coastal

Figure: Washington Consensus in new informal laws issued



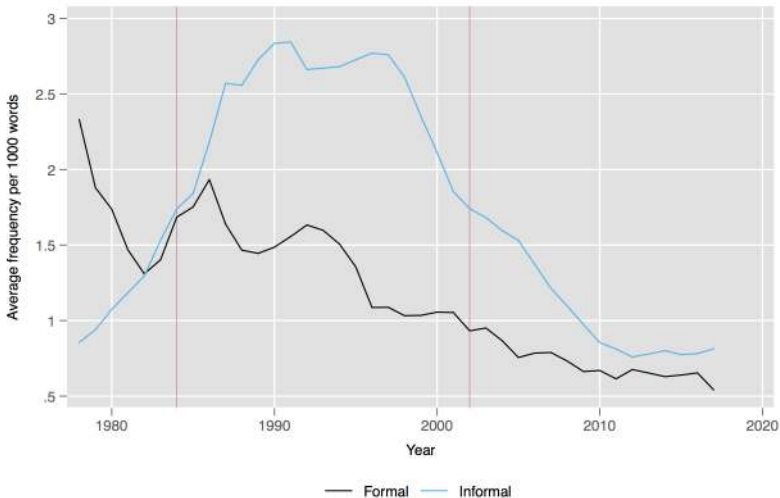
Trends: Washington Consensus Components

Figure: Taxation in new regulations issued



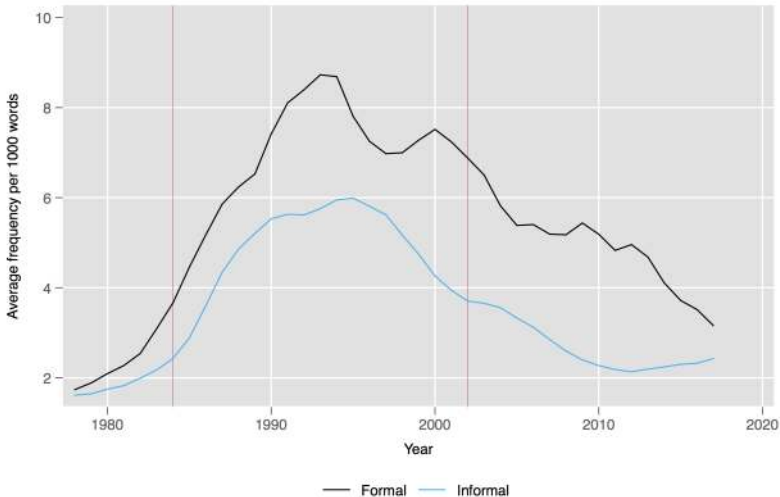
Trends: Washington Consensus Components

Figure: Trade in new regulations issued



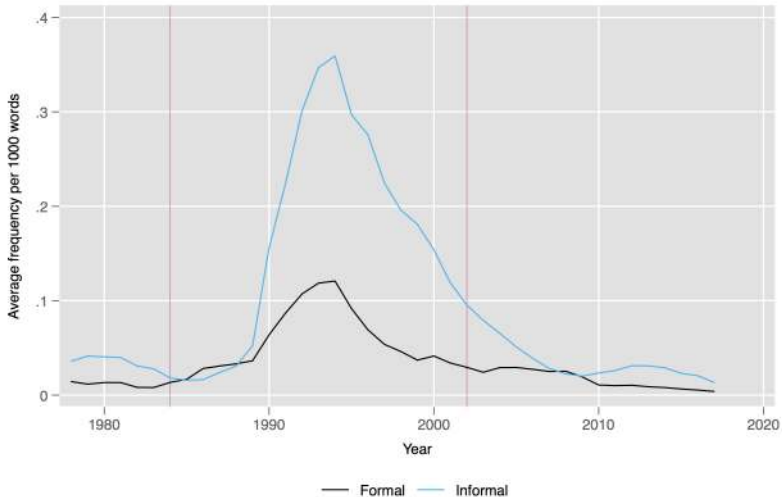
Trends: Washington Consensus Components

Figure: Property rights in new regulations issued



Trends: Washington Consensus Components

Figure: Privatization in new regulations issued



Regression Evidence

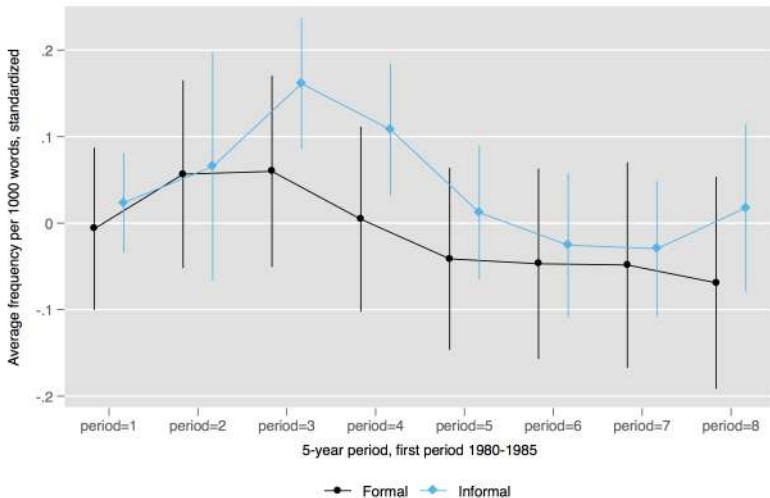
- Are these trends simply driven by compositional changes in the regulations?
- We examine whether the trends are present across policy areas.

$$Z(\text{WC}_{ipc}) = \alpha_{\text{prov}(i)} + \lambda_c + \beta_p + \epsilon_{ipt}$$

- $Z(\text{WC})$ is the z-score of Washington Consensus word share in a document.
- α is province fixed effect.
- λ is subcategory fixed effect. These are very fine-grained (1159 subcategories, e.g., land use of foreign enterprises).
- β is 5-year period fixed effect, corresponding to the 5-year plan time frames.
- Standard errors clustered at (rough) category level.

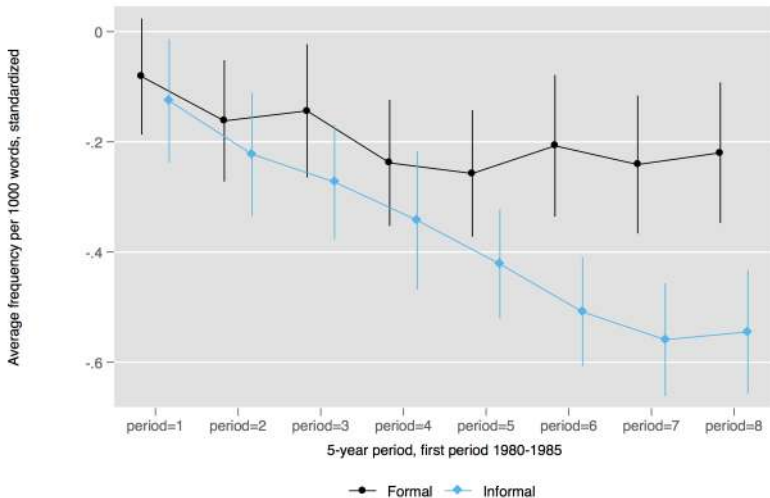
Trends: Regression Evidence

Figure: Washington consensus regressions



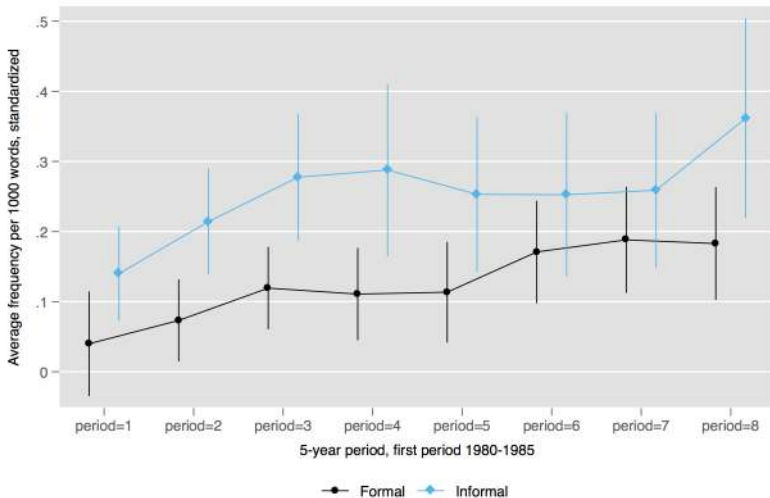
Trends: Regression Evidence

Figure: Marxist language regressions



Trends: Regression Evidence

Figure: Mankiw words regressions



Do Formal Institutions Matter?

- Now we turn to the question of whether variation in written regulations explains variation in economic performance.
 - Explanatory power of the three sets of words above and beyond province and period fixed effects for GDP per capita growth and FDI-to-GDP ratio.
 - A richer representation of the text through document clustering and variable selection.

Do Formal Institutions Matter?

- We estimate

$$y_{ip} = \alpha_i + \lambda_p + \beta \text{word share}_{ip} + \gamma' X_{ip} + \epsilon_{ip}$$

- α is province fixed effect. λ is 5-year period fixed effect.
- word share_{ip} is the average frequency share of one of the three sets of words in the “stock” of regulations that are effective throughout the period in the province.
- Controls include log number of regulations and log average length of regulations.

Do Written Regulations Explain Growth?

Table: Regulatory ideology explains little variation in growth

	DV: provincial GDP per capita growth over 5-year period					
	(1)	(2)	(3)	(4)	(5)	(6)
log Marx, formal			0.007 (0.028)			0.014 (0.062)
log Marx, informal			0.041 (0.042)			0.083 (0.051)
log Mankiw, formal				0.025 (0.055)		0.073 (0.088)
log Mankiw, informal				-0.019 (0.059)		-0.114 (0.072)
log WC, formal					0.017 (0.029)	-0.023 (0.037)
log WC, informal					0.028 (0.022)	0.054** (0.025)
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
Period FE	No	Yes	Yes	Yes	Yes	Yes
Observations	217	217	211	211	206	206
R-Squared	0.042	0.784	0.792	0.790	0.796	0.803
Adjusted R-Squared	-0.113	0.741	0.740	0.738	0.744	0.746

Do Written Regulations Explain FDI?

Table: Regulatory ideology explains some variation in FDI

	DV: mean FDI-to-GDP ratio over 5-year period					
	(1)	(2)	(3)	(4)	(5)	(6)
log Marx, formal			-0.000 (0.001)			-0.002 (0.002)
log Marx, informal			-0.002** (0.001)			-0.001 (0.001)
log Mankiw, formal				-0.001 (0.001)		0.002 (0.004)
log Mankiw, informal				0.000 (0.001)		-0.000 (0.001)
log WC, formal					-0.002** (0.001)	-0.001 (0.001)
log WC, informal					0.001** (0.001)	0.001* (0.001)
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
Period FE	No	Yes	Yes	Yes	Yes	Yes
Observations	202	202	197	197	192	192
R-Squared	0.535	0.660	0.700	0.689	0.710	0.717
Adjusted R-Squared	0.457	0.588	0.621	0.607	0.631	0.630

Does Any Regulation Predict Growth?

- If the market orientation of policies alone does not explain much growth or FDI, can a richer representation of regulations explain growth?
- We answer this question by resorting to a variable selection technique (LASSO).
- Challenge is how to represent the policies: each document is issued just once for a certain province in a certain year.
- To obtain repeated observations, we use DBSCAN (Ester et al. 1996), a widely-used clustering algorithm, to group similar documents into a cluster.
- We calculate the cosine similarity between each pair of documents, and then cluster on the basis of these similarities.

Titles of a Typical Cluster

- Reply of the National Development and Reform Commission on the Feasibility Study Report of the New Chongqing Wushan Civil Airport Project
- Reply of the National Development and Reform Commission on the Feasibility Study Report on the Construction of Xinjiang Shache Civil Airport Project
- Reply of the National Development and Reform Commission on the Feasibility Study Report on the Construction of the Newly-built Ruoqiang Civil Airport Project in Xinjiang
- Reply of the National Development and Reform Commission on the Feasibility Study Report on the Construction of the Sanjiang Civil Airport Project in Heilongjiang Province
- ...

Variable Selection

- We estimate the following relationship with LASSO.

$$y_{ip} = \gamma_i + \lambda_p + \sum_{c \in \mathcal{C}} \beta_c f_{ipc} + \epsilon_{ip}$$

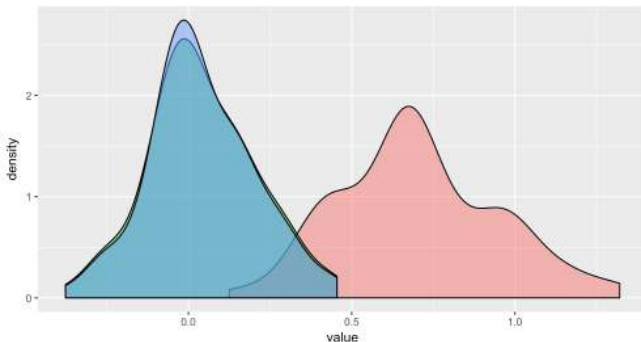
- γ_i and λ_p are province and period fixed effects. \mathcal{C} is the set of “stock” policy clusters that are effective throughout period p in province i .
- We force the fixed effects to be in the equation by setting their penalties at 0.
- Select the LASSO penalty that minimizes out-of-sample MSE in a cross-validation.
- Evaluate the predictive power of regulations out of sample (i.e., in a test set), as in-sample R^2 is rendered less meaningful by potential overfitting.

Does Any Regulation Predict Growth?

Predicting 5-year provincial GDP per capita growth using policy clusters

All prediction residuals are obtained from a 50% test set.

label ■ Raw ■ Residual net of province and period FEs ■ Residual net of province, period FEs and policy clusters

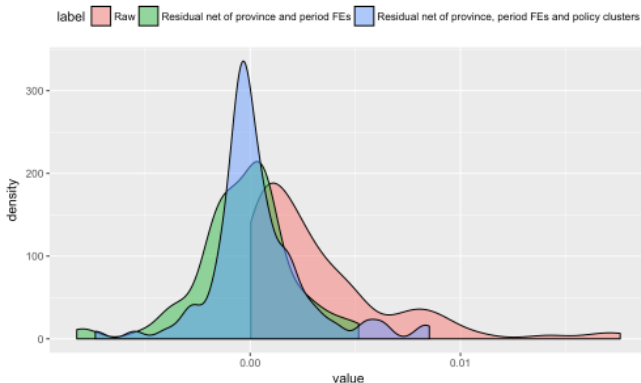


- Province and period fixed effects reduce the variance in GDP per capita growth by 53.7%.
- Policy clusters further reduce variance by just 2.33%.

Does Any Regulation Predict FDI?

Predicting FDI-GDP ratio using policy clusters

All prediction residuals are obtained from a 50% test set.



- Province and period fixed effects reduce the variance in FDI-to-GDP ratio by 56.7%.
- Adding policy clusters increases variance by 2.78% due to overfitting.

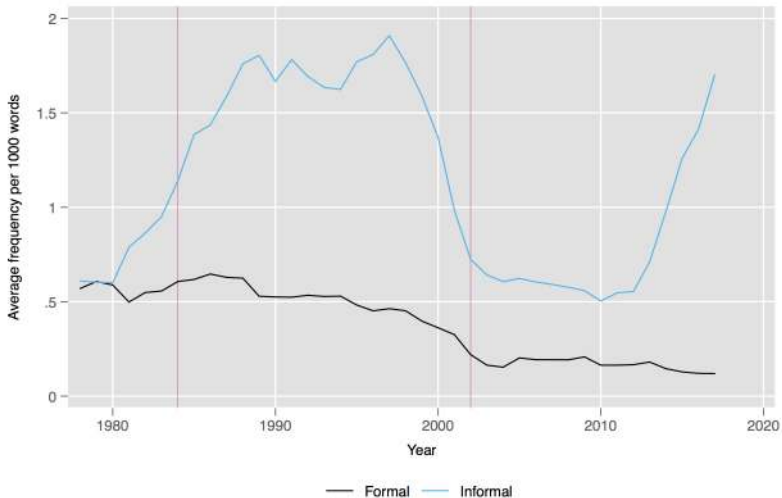
Conclusion

- Active introduction of pro-market institutions from the mid 1980s to around 2000, which slowed down after 2000.
- However, the market orientation of regulations only explains a small fraction of the provincial variation in growth and FDI.
- A richer representation of the documents also exhibits small predictive power.
- This suggests the importance of studying the informal arrangements between market participants and government officials in more detail, along the lines of Hallward-Driemeier and Pritchett (2015) and Bai, Hsieh and Song (2018).

Appendix

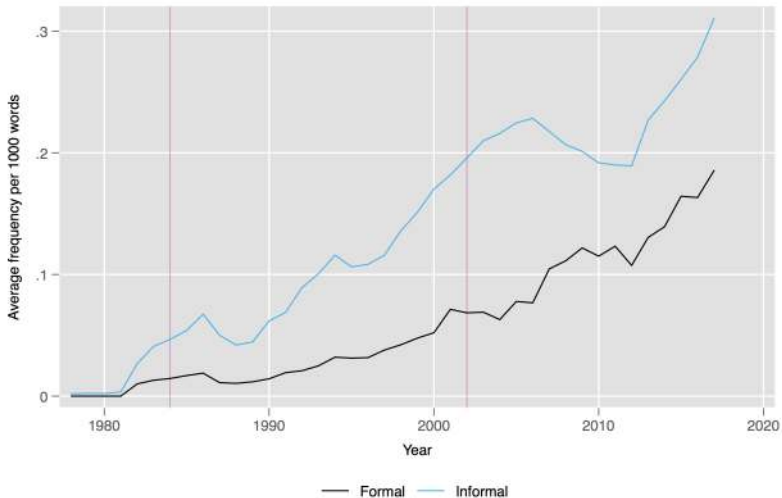
Trends: Washington Consensus Components

Figure: Interest rate in new regulations issued



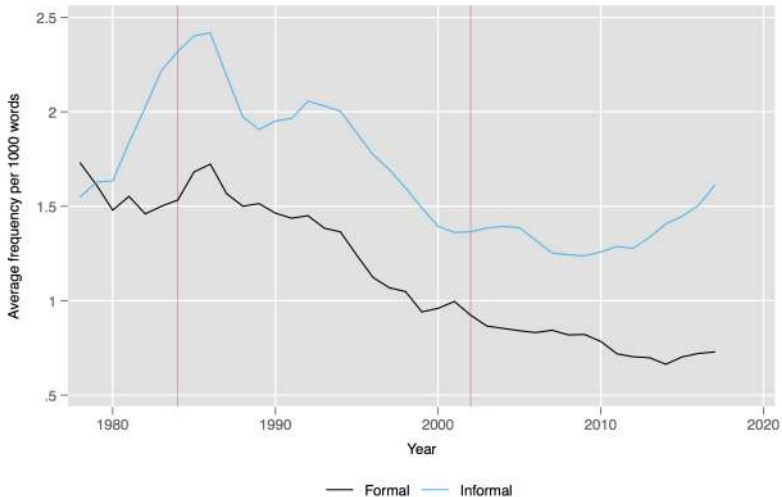
Trends: Washington Consensus Components

Figure: Deregulation



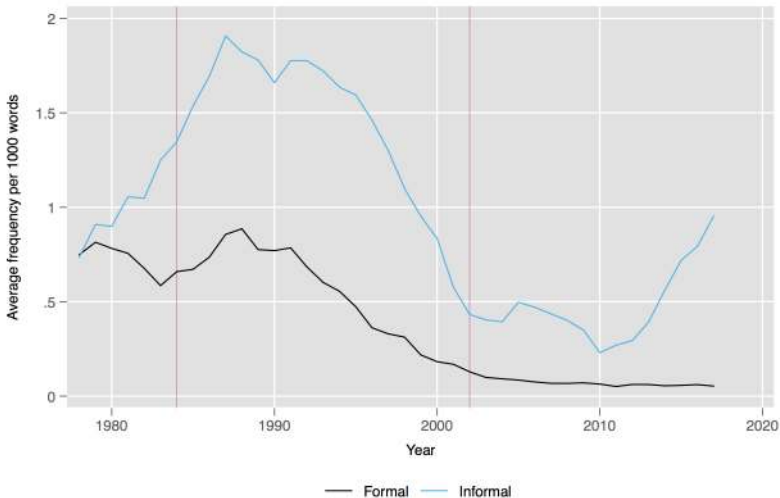
Trends: Washington Consensus Components

Figure: FDI in new regulations issued



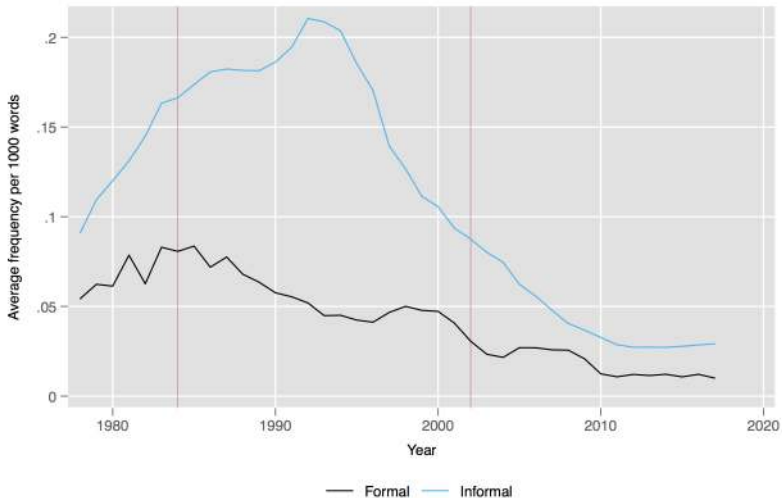
Trends: Washington Consensus Components

Figure: Exchange rate in new regulations issued



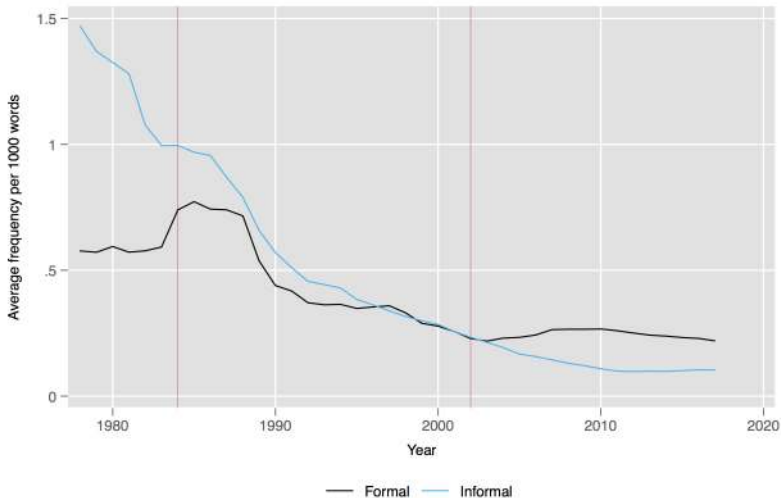
Trends: Washington Consensus Components

Figure: Fiscal deficit in new regulations issued



Trends: Washington Consensus Components

Figure: Fiscal expenditure in new regulations issued



Do Written Regulations Explain Growth?

Table: Robustness check using similarity cutoff 0.5

	DV: provincial GDP per capita growth over 5-year period					
	(1)	(2)	(3)	(4)	(5)	(6)
log Marx, formal			0.039 (0.028)			-0.002 (0.054)
log Marx, informal			0.018 (0.020)			0.053** (0.025)
log Mankiw, formal				0.045* (0.023)		0.025 (0.039)
log Mankiw, informal				-0.037 (0.035)		0.029 (0.044)
log WC, formal					0.034 (0.022)	0.015 (0.020)
log WC, informal					0.008 (0.022)	-0.014 (0.028)
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
Period FE	No	Yes	Yes	Yes	Yes	Yes
Observations	217	217	208	209	196	196
R-Squared	0.042	0.784	0.796	0.794	0.817	0.823

Do Written Regulations Explain Growth?

Table: Robustness check using similarity cutoff 0.3

	DV: provincial GDP per capita growth over 5-year period					
	(1)	(2)	(3)	(4)	(5)	(6)
log Marx, formal			0.013 (0.047)			-0.058 (0.069)
log Marx, informal			-0.001 (0.051)			-0.036 (0.080)
log Mankiw, formal				0.017 (0.097)		0.013 (0.148)
log Mankiw, informal				0.020 (0.078)		-0.001 (0.121)
log WC, formal					0.036 (0.038)	0.064 (0.045)
log WC, informal					0.003 (0.031)	0.014 (0.034)
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
Period FE	No	Yes	Yes	Yes	Yes	Yes
Observations	217	217	211	211	211	211
R-Squared	0.042	0.784	0.790	0.790	0.792	0.793

Do Written Regulations Explain FDI?

Table: Robustness check using similarity cutoff 0.5

	DV: mean FDI-to-GDP ratio over 5-year period					
	(1)	(2)	(3)	(4)	(5)	(6)
log Marx, formal			-0.000 (0.001)			-0.001 (0.002)
log Marx, informal			-0.001* (0.001)			-0.001 (0.001)
log Mankiw, formal				0.001** (0.001)		0.001 (0.001)
log Mankiw, informal				-0.000 (0.001)		0.000 (0.001)
log WC, formal					-0.000 (0.001)	-0.000 (0.001)
log WC, informal					0.000 (0.000)	0.000 (0.001)
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
Period FE	No	Yes	Yes	Yes	Yes	Yes
Observations	202	202	194	195	185	185
R-Squared	0.535	0.660	0.709	0.695	0.710	0.716

Do Written Regulations Explain FDI?

Table: Robustness check using similarity cutoff 0.3

	DV: mean FDI-to-GDP ratio over 5-year period					
	(1)	(2)	(3)	(4)	(5)	(6)
log Marx, formal			0.001 (0.001)			0.001 (0.002)
log Marx, informal			-0.002* (0.001)			-0.003 (0.002)
log Mankiw, formal				0.001 (0.002)		0.004 (0.006)
log Mankiw, informal				-0.001 (0.002)		0.001 (0.003)
log WC, formal					-0.000 (0.001)	-0.002 (0.001)
log WC, informal					0.000 (0.001)	0.001 (0.001)
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
Period FE	No	Yes	Yes	Yes	Yes	Yes
Observations	202	202	197	197	197	197
R-Squared	0.535	0.660	0.695	0.690	0.690	0.702