

International Joint Ventures and Internal vs. External Technology Transfer: Evidence from China

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FDI, Technology Acquisition, and Development

- ▶ Attracting FDI: Key element in development strategies since late 1970s
 - ▶ Break with earlier, self-reliant policies skeptical of FDI
- ▶ Why? foreign-owned firms (MNEs) bring **advanced technology**
 - ▶ Knowledge spillovers to local employees, firms, and industries
 - ▶ Positive learning externalities
- ▶ Flip side: Because MNEs are highly productive
 - ▶ Capture market share from local firms
 - ▶ Lower profits, less indigenous innovation

The Case of China, 1998 to 2007

- ▶ Examine international joint ventures (IJVs) in broader context of FDI
 - ▶ IJVs: Business partnerships b/n firms headquartered in different countries to form a new commercial entity
- ▶ IJVs are major vehicle for FDI in ~10 countries
- ▶ Including China, the world's largest destination for FDI

Joint Ventures versus FDI

- ▶ Advantages of Int'l Joint Ventures over regular FDI?
 - ▶ FDI: Wholly foreign owned enterprise (WFOE)
- ▶ **Local Firms, Host Country:** More access to foreign know-how and capital
- ▶ **Foreign firms:** Local partnership avoids complexities of entering local market
 - ▶ Lower cultural barriers
 - ▶ Regulatory barriers

FDI and IJVs in China

- ▶ China open to FDI since 1979
 - ▶ “Law on Sino-Foreign Equity Joint Ventures”
- ▶ FDI took off after Deng's tour of the South (1992)
 - ▶ Policy reforms and the introduction of special economic zones for foreign investors

Importance of Different FDI Modes

	1997	2002	2007
Equity joint venture	19.5	15.0	15.6
% of total FDI flows	43.1	28.4	20.9
Contractual joint venture	8.9	5.1	1.4
% of total FDI flows	19.7	9.6	1.9
Wholly foreign-owned enterprise	16.2	31.7	57.3
% of total FDI flows	35.8	60.2	76.6
Sum	45.0	51.8	74.1

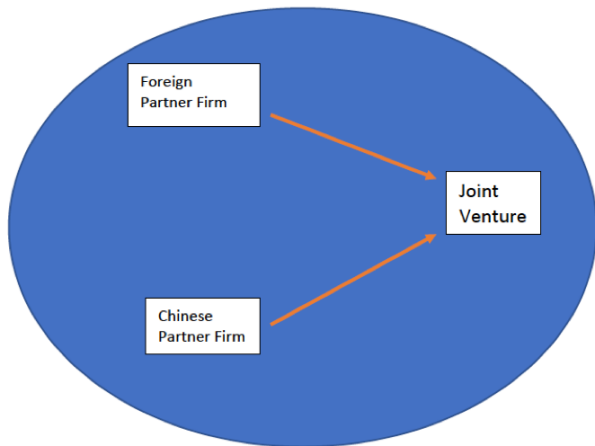
Source: China Stat. YB. Realized, current USD (billlion)

FDI and IJVs in China

- ▶ China's *Catalogue of Industries for Foreign Direct Investment*: some industries: “encouraged”, others “prohibited”
- ▶ Class of “restricted” industries:
 - ▶ Foreign firms legally required to partner with a domestic firm in a Sino-foreign joint venture
 - ▶ Example: Certain chemicals & pharmaceuticals, electronics, machinery

Joint Venture Formation

Figure: Joint Venture Formation



FDI, IPRs, and China's Entry into WTO

- ▶ Before 2002: Limited integration into world markets
 - ▶ “Shallow” integration (Nick Lardy)
- ▶ With WTO entry: stronger protection of intellectual property rights (IPRs)
 - ▶ TRIMs: “Agreement on Trade-related Investment Measures”
- ▶ FDI liberalized w/ China's entry into WTO (2002)
 - ▶ 112 of 424 four-digit CIC industries fully liberalized
 - ▶ Today: 38 economic activities are “restricted”
- ▶ Considerably lower than it was in the past, but still a point of contention

POLITICS

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Trump advisor Hassett: US firms get crushed by China's 'forced joint ventures' on top of high tariffs

- China is stealing U.S. technology through unfair requirements for market access, White House economic advisor Kevin Hassett says.
- Unlike the separate steel and aluminum tariffs, "everybody is unified" behind the punitive Chinese measures, Hassett says.
- "If we had reciprocal tariffs worldwide," he says, "there would be a massive reduction" down to the U.S. level.

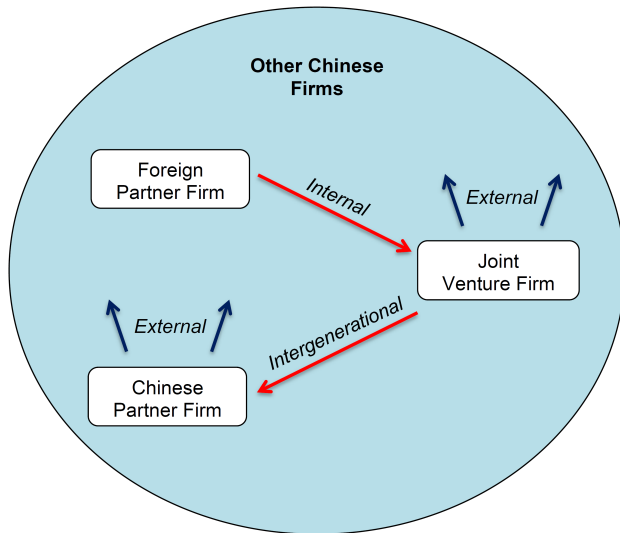
Matthew J. Belvedere | [@Matt_Belvedere](#)

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China's Policies: In Line with WTO?

- ▶ This paper: no legal analysis
- ▶ However: issue is hotly debated whether China violates WTO rules
- ▶ Branstetter (CMU): China's policies designed to force foreign multinationals to transfer tech to Chinese firms
- ▶ Lardy, Hufbauer (Peterson Institute, DC): China's policies not in violation of WTO rules

Joint Ventures, Technology Transfer, and Spillovers



Key Findings

- ▶ **IJV Selection:** Foreign investors pick Chinese partners that are: productive, large, innovative, export-oriented, government-connected
- ▶ **Effects:** Joint venture partners benefit from foreign technology
 - ▶ Not only the newly set-up joint ventures
- ▶ **Industry knowledge externalities**
 - ▶ IJVs generate positive spillovers in same industry
 - ▶ IJVs lead to positive spillovers for suppliers
 - ▶ Joint venture spillovers > FDI spillovers

Outline

1. Introduction
2. **Data sources**
3. Joint Venture Partner Selection
4. Identification of Joint Venture Effects
5. Industry Spillovers from Joint Ventures
6. Industry Spillovers from regular FDI
7. Summary and conclusions

Data: Three Main Sources

- ▶ *Above-scale Industrial Firms Panel* (1998-2007; ASIFP)
 - ▶ All Chinese enterprises with sales above 10 million RMB in mining/logging, manufacturing, and utilities
 - ▶ Firm-level data on input usage, financials, age, location, industry
- ▶ *Name List of Foreign and Domestic Joint Ventures in China*
 - ▶ Identifying information on all Chinese joint ventures
 - ▶ Includes: Chinese partner firms to foreign investors
- ▶ *China's State Intellectual Property Office patent database*
 - ▶ Patent applications of firms

Matched data on JVs, Innovation, and Performance

- ▶ Link info from *Name List* to ASIFP to identify joint ventures as well as the domestic Chinese partner firms
- ▶
- ▶ Outcome variables:
 - ▶ Productivity
 - ▶ Preferred TFP estimates: Olley-Pakes, Wooldridge methods
 - ▶ Based on gross output (c.f. van Biesebroeck, Orr, Trefler, Yu)
 - ▶ Innovation: Patenting, product innovation
 - ▶ Exporting

Summary Statistics

Variable	Mean	Std. Dev.	Variable	Mean	Std. Dev.
Full Sample (~1.9 million obs.)			Joint Ventures (1.3% of sample)		
Age	9.25	7.67	Age	8.37	4.2
Employment	280.3	1,371.54	Employment	321.18	603.47
Foreign Share	0.02	0.1	Foreign Share	0.24	0.28
Govt. Share	0.14	0.33	Govt. Share	0.12	0.24
Export Ratio	0.12	0.3	Export Ratio	0.26	0.63
TFP (OP)	2.69	1.38	TFP (OP)	2.91	1.32
Patents	0.11	5.88	Patents	0.41	7.42
Sales (1000 RMB)	73.83	769.44	Sales (1000 RMB)	206.24	1,209.43
Joint Venture Partners (8.6% of sample)			Other Chinese Firms (90.1% of sample)		
Age	10.68	6.58	Age	9.13	7.79
Employment	594.95	2,859.34	Employment	249.67	1,136.62
Foreign Share	0.12	0.22	Foreign Share	0.01	0.07
Govt. Share	0.12	0.28	Govt. Share	0.14	0.34
Export Ratio	0.32	0.42	Export Ratio	0.1	0.27
TFP (OP)	2.77	1.36	TFP (OP)	2.68	1.38
Patents	0.37	15.64	Patents	0.08	3.76
Sales (1000 RMB)	183.21	1,409.46	Sales (1000 RMB)	61.48	666.91

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What do foreign investors look for in Chinese JV partner?

- ▶ Form a propensity-score matched sample of JV partners and control (non-IJV partner) firms in same industry-by-province

- ▶ Propensity to be chosen as IJV partner

$$PT_Select_{it} = f(\mathbf{X}'_{it}\gamma, \lambda_j, \lambda_r, \lambda_t, \varepsilon_{it})$$

- ▶ PT_Select_{it} : 1 if Chinese firm i is selected as an IJV partner in year t , 0 otherwise
- ▶ \mathbf{X}_{it} : Firm-level productivity, innovativeness, size, other characteristics
- ▶ $\lambda_j, \lambda_r, \lambda_t$: Industry, province, and year fixed effects

Logit Regression of IJV Partner Selection

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Employment	0.691 ^a (0.038)	0.719 ^a (0.037)	0.837 ^a (0.042)	0.838 ^a (0.042)	0.823 ^a (0.040)	0.805 ^a (0.040)	0.790 ^a (0.039)	0.672 ^a (0.036)	0.692 ^a (0.036)
Age		-0.159 ^a (0.039)	-0.144 ^a (0.040)	-0.139 ^a (0.040)	-0.112 ^a (0.042)	-0.115 ^a (0.042)	-0.114 ^a (0.044)	-0.077 (0.050)	-0.076 (0.051)
Foreign Share					2.886 ^a (0.615)	2.878 ^a (0.618)	2.703 ^a (0.627)	2.398 ^a (0.604)	2.328 ^a (0.600)
Govt. Share					-0.123 (0.115)	-0.144 (0.117)	-0.114 (0.119)	0.073 (0.120)	0.111 (0.119)
Subsidy						0.381 ^a (0.071)	0.399 ^a (0.071)	0.337 ^a (0.073)	0.348 ^a (0.076)
Export Ratio							0.635 ^a (0.130)	0.715 ^a (0.127)	0.722 ^a (0.126)
Net Profit								0.143 ^a (0.016)	0.103 ^a (0.020)
TFP									0.192 ^a (0.048)
Observations	11,692	11,692	11,692	11,692	11,692	11,692	11,692	11,692	11,692
Industry FE	N	N	Y	Y	Y	Y	Y	Y	Y
Province FE	N	N	Y	Y	Y	Y	Y	Y	Y
Year FE	N	N	Y	Y	Y	Y	Y	Y	Y
JV Age FE	N	N	N	Y	Y	Y	Y	Y	Y

a: $p < 0.01$, b: $p < 0.05$, c: $p < 0.10$; robust s.e. clustered at industry

IJV Partner Selection - Summary

- ▶ Foreign investors pick Chinese domestic partners that are
 - ▶ larger
 - ▶ more established
 - ▶ more innovative, higher productivity
 - ▶ have government connections
- ▶ Such partners are most able to contribute to the success of the joint venture
- ▶ Results are both **plausible** and **rarely taken into account** when assessing JV performance and spillovers

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Joint Ventures and WTO Entry

- ▶ Exploit liberalization of FDI regime w/ China's WTO entry
- ▶ Identification: **increase** in market access to China for foreign firms
 - ▶ Difference-in-difference approach w/ firm fixed effects
- ▶ Captures
 - ▶ **Deregulation** of FDI, strengthening of IPRs
 - ▶ More **credible commitment** to open trade & FDI regime
 - ▶ May incentivize foreign firms to transfer tech closer to frontier

Partner Firm Performance and WTO

$$y_{it} = \alpha + \beta_1 PT_{it} + \beta_2 [PT_{it} \times WTO_t] + \mathbf{X}'_{it}\gamma + \mu_i + \lambda_t + \varepsilon_{it}$$

- ▶ PT_{it} : equal to 1 if i partner to IJV in t , 0 otherwise
 - ▶ WTO_t : equal to 1 if year ≥ 2002 , 0 otherwise
 - ▶ \mathbf{X}_{it} : Firm employm't, age, gov't connections, foreign ownership
- ▶ Identification: β_1 is difference to matched non-partners pre-WTO
 - ▶ β_2 is Δ in partner firm outcome in WTO era
 - ▶ Within-firm variation b/o μ_i

Intergenerational Tech Transfer

	(1) TFP (OP)	(2) TFP (W)	(3) Patents	(4) Export Ratio
Partner	0.093 ^a (0.027)	0.088 ^a (0.029)	-0.012 (0.018)	0.088 ^c (0.005)
Partner × WTO	-0.045 ^b (0.021)	-0.045 ^b (0.022)	0.067 ^a (0.011)	-0.003 (0.004)
Observations	53,901	53,362	43,088	53,901
Firm FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y

Includes emp, age, gov't connections, for. share, subsidies

a: $p < 0.01$, b: $p < 0.05$, c: $p < 0.10$

Joint Venture Performance and WTO entry

$$y_{it} = \alpha + \beta_1 JV_i + \beta_2 [JV_i \times WTO_t] + \mathbf{X}'_{it}\gamma + \lambda_j + \lambda_r + \lambda_t + \varepsilon_{it}$$

- ▶ JV_i : Firm i formed as joint venture
 - ▶ WTO_t : equal to 1 \geq year 2002, 0 otherwise
 - ▶ \mathbf{X}_{it} : Firm employment, age, government connections, foreign ownership
- ▶ Identification: β_1 is difference to matched non-partners pre-WTO
 - ▶ β_2 is JV performance difference in WTO era
 - ▶ Evidence consistent w/ internal tech transfer

Joint Ventures and Firm Performance

	(1) TFP (OP)	(2) TFP (W)	(3) Patents
JV	0.560 ^a (0.023)	0.559 ^a (0.024)	0.005 (0.004)
JV × WTO	-0.172 ^a (0.033)	-0.179 ^a (0.034)	0.019 ^a (0.007)
Employment	0.908 ^a (0.007)	0.938 ^a (0.007)	0.034 ^a (0.002)
Observations	970,913	970,861	851,995
Industry FE	Y	Y	Y
Province FE	Y	Y	Y
Year FE	Y	Y	Y

a: $p < 0.01$, b: $p < 0.05$, c: $p < 0.10$

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Joint Ventures and Spillovers to Other Chinese Firms

- ▶ JV **externalities** to firms in **same** industry (“horizontal”)?

$$JV_{jt}^H = \frac{\sum_{i=1}^{N_{jt}} JV_i \times Sales_{it}}{\sum_{i=1}^{N_{jt}} Sales_{it}}$$

$$P_JV_{jt}^H = \frac{\sum_{i=1}^{N_{jt}} PT_{it} \times Sales_{it}}{\sum_{i=1}^{N_{jt}} Sales_{it}}$$

- ▶ JV^H Share of industry j 's sales in year t conducted by JVs
 - ▶ Chance for externalities \uparrow when JVs are rel. common
 - ▶ **Negative** externalities: Market share rivalry
 - ▶ **Positive** externalities: Technological learning
 - ▶ Analogous def for partner firms: P_JV^H

Joint Ventures and Industry Spillovers

- Spillovers from (1) joint ventures and from (2) partner firms:

$$y_{it} = \beta_2 JV_{it}^H + \beta_3 \left[JV_{it}^H \times WTO_t \right] + \mathbf{X}_{it}'\gamma + \lambda_i + \lambda_t + \varepsilon_{it}$$

$$y_{it} = \beta_2 P_JV_{it}^H + \beta_3 \left[P_JV_{it}^H \times WTO_t \right] + \mathbf{X}_{it}'\gamma + \lambda_i + \lambda_t + \varepsilon_{it}$$

- β_3 : change in other firms' performance in WTO era

Horizontal Spillovers from Joint Ventures

	(1) TFP (OP)	(2) TFP (W)	(3) Patents	(4) New Pr. Ratio	(5) Export Ratio
JV^H	1.075 ^a (0.262)	1.075 ^a (0.285)	-0.334 ^a (0.062)	0.061 ^c (0.032)	0.011 ^b (0.005)
JV^H × WTO	0.708^a (0.271)	0.839^a (0.296)	0.426^a (0.066)	-0.083^b (0.042)	0.086 (0.081)
Observations	956,812	919,103	804,977	956,812	956,812
Firm Fixed Effects	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y

a: $p < 0.01$, b: $p < 0.05$, c: $p < 0.10$; includes Employment, Age, Foreign Share, Govt. Share, Subsidy; robust s.e. clustered by industry × year.

Horizontal Spillovers from Joint Venture Partners

	(1) TFP (OP)	(2) TFP (W)	(3) Patents	(4) New Pr. Ratio	(5) Export Ratio
P_JV^H	0.366 ^b (0.147)	0.345 ^b (0.157)	-0.123 ^a (0.030)	0.009 (0.012)	0.042 (0.060)
P_JV^H × WTO	0.422^b (0.171)	0.449^b (0.180)	0.095^a (0.026)	-0.023^b (0.011)	-0.118 (0.087)
Observations	956,812	919,103	804,977	956,812	956,812
Firm Fixed Effects	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y

a: $p < 0.01$, b: $p < 0.05$, c: $p < 0.10$; includes Employment, Age, Foreign Share, Govt. Share, Subsidy; robust s.e. clustered by industry × year.

Joint Venture Spillovers: Quantification

► Productivity spillovers

- Joint ventures account for **4.5% of increase in TFP**

$$\frac{\left[(1.075 + 0.782) \times J\bar{V}_{post}^H - (1.075 \times J\bar{V}_{pre}^H) \right]}{(\bar{TFP}_{post} - \bar{TFP}_{pre})} = 0.045$$

- Analogously, JV partners account for **10% of increase in TFP**

► Patenting Spillovers

- Joint ventures account for **11% of increase in patenting**

$$\frac{\left[(0.366 + 0.442) \times J\bar{V}_{post}^H - (0.366 \times J\bar{V}_{pre}^H) \right]}{(\bar{Pat}_{post} - \bar{Pat}_{pre})} = 0.110$$

Vertical Spillovers: Inter-industry Effects

- ▶ **Backward** joint venture spillovers to firm i in industry j :

$$JV_{jt}^B = \sum_{k=1}^K \alpha_{kj} JV_{kt}^H,$$

α_{kj} : share of output of industry j sold as input to industry k

- ▶ Hypothesis: supplying firms receive feedback from JVs about performance standards, leading-edge procedures

- ▶ **Forward** joint venture spillovers to firm i industry j :

$$JV_{jt}^F = \sum_{k=1}^K \theta_{jk} JV_{kt}^H,$$

θ_{jk} : share of intermediate inputs of industry j bought from k

- ▶ Hypothesis: technology embodied in intermediate inputs

Vertical and Horizontal Joint Venture Spillovers

	TFP		Patents	
Backward	-0.537 ^c (0.262)	-0.526 ^c (0.304)	0.019 (0.060)	-0.076 ^c (0.041)
Backward x WTO	1.700 ^a (0.370)	1.632^a (0.390)	0.240 ^a (0.073)	0.050 (0.067)
Forward	-0.872 (0.808)	-1.353 ^c (0.799)	-0.823 ^a (0.164)	-0.394 ^a (0.124)
Forward x WTO	-0.387 (0.770)	-1.576 ^c (0.824)	0.404 ^b (0.156)	-0.260 ^c (0.151)
Horizontal		1.240 ^a (0.265)		-0.320 ^a (0.064)
Horizontal x WTO		0.378 (0.293)		0.462^a (0.080)

a: $p < 0.01$, b: $p < 0.05$, c: $p < 0.10$; n (TFP) = 956,812, n (Patents) = 804,976

Summary: Horizontal vs Vertical Joint Venture Spillovers

- ▶ Significant evidence for increase in JV spillovers through
 - ▶ **Backward** spillovers (selling to JVs)
 - ▶ **Horizontal** spillovers (intra-industry)
 - ▶ Strongest impact on productivity: backward spillovers
 - ▶ Strongest impact on patenting: horizontal spillovers
- ▶ Less evidence for forward JV spillovers

Vertical and Horizontal JV Partner Spillovers

	TFP		Patents	
Backward	-0.047 (0.262)	-0.099 ^b (0.045)	0.018 ^c (0.009)	-0.002 (0.009)
Backward x WTO	0.321 ^a (0.072)	0.254^a (0.072)	0.042 ^a (0.014)	0.026^a (0.013)
Forward	-0.271 (0.337)	-0.094 (0.326)	-0.098 ^c (0.051)	-0.087 ^c (0.053)
Forward x WTO	0.814 ^b (0.372)	0.557 (0.364)	0.140 ^a (0.048)	0.122^a (0.050)
Horizontal		0.320 ^b (0.144)		-0.124 ^a (0.029)
Horizontal x WTO		0.417^b (0.173)		0.081^b (0.032)

a: $p < 0.01$, b: $p < 0.05$, c: $p < 0.10$; n (TFP) = 956,812, n (Patents) = 804,976

Summary on JV Partner Spillovers

- ▶ Significant evidence for **JV partner firm spillovers** on
 - ▶ productivity
 - ▶ patenting
- ▶ Patent spillovers smaller
 - ▶ Consistent with patent races
- ▶ Evidence for **forward spillovers**
 - ▶ JV partner firms are larger, produce more inputs than JVs

Joint Venture Spillovers and Other Changes w/ WTO

	Baseline	Add'l Interactions
Backward	-0.526 ^c	-0.530 ^c
Backward x WTO	1.632 ^a	1.098 ^b
Forward	-1.353 ^c	-1.486 ^c
Forward x WTO	-1.576 ^c	-0.944
Horizontal	1.240 ^a	1.260 ^b
Horizontal x WTO	0.378	0.563 ^c
<hr/>		
Employees x WTO		0.069 ^b
Age x WTO		-0.031 ^b
Foreign Share x WTO		-0.162 ^b
Govt' Share x WTO		-0.251 ^b
Subsidy x WTO		0.032

a: $p < 0.01$, b: $p < 0.05$, c: $p < 0.10$; n = 956,812

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Horizontal Spillovers from other FDI

	(1) TFP (OP)	(2) TFP (W)	(3) Patents	(4) New Pr. Ratio	(5) Export Ratio
FDI^H	0.675 ^a (0.224)	0.724 ^a (0.243)	0.052 (0.043)	0.060 ^a (0.018)	0.087 (0.058)
$FDI^H \times WTO$	-0.685 ^a (0.183)	-0.710 ^a (0.194)	0.121 ^a (0.035)	-0.049 ^b (0.021)	-0.088 ^c (0.052)
Observations	956,812	919,103	804,977	956,812	956,812
Firm Fixed Effects	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y

a: $p < 0.01$, b: $p < 0.05$, c: $p < 0.10$; includes Employment, Age, Foreign Share, Govt. Share, Subsidy; robust s.e. clustered by industry \times year.

- Defined as industry importance of firms: (1) not joint ventures, (2) foreign ownership share > 0.5

Vertical and Horizontal FDI Spillovers

	TFP		Patents	
Backward	0.137 (0.186)	0.377 ^a (0.182)	0.136 ^a (0.036)	0.101 ^a (0.030)
Backward x WTO	0.903 ^a (0.183)	0.879^a (0.187)	0.113 ^a (0.036)	0.107^a (0.034)
Forward	1.479 ^b (0.672)	0.241 (0.581)	-0.014 (0.115)	0.021 (0.099)
Forward x WTO	-0.977 ^c (0.572)	-0.677 (0.579)	0.231 ^b (0.035)	-0.076 (0.094)
Horizontal		0.672 ^a (0.200)		0.062 (0.038)
Horizontal x WTO		-0.812^a (0.178)		0.092^a (0.033)

a: $p < 0.01$, b: $p < 0.05$, c: $p < 0.10$; n (TFP) = 956,812, n (Patents) = 804,976

Horizontal vs Vertical FDI Spillovers

- ▶ Increase in Horizontal Patent Spillovers with WTO entry
 - ▶ No increase, rather, Horizontal FDI causes a decrease in other firms TFP
- ▶ FDI has positive impact on both patenting and TFP through backward spillovers
- ▶ No positive FDI spillovers through forward linkages

Regular FDI Spillovers - Summary

	TFP		Patenting	
	JV	FDI	JV	FDI
Backward		+		+
Forward		0		0
Horizontal		0		+

Discussion - FDI Spillovers

- ▶ Vertical spillovers
 - ▶ Positive backward FDI spillovers in line with Javorcik (2004)
 - ▶ Lack of evidence for positive forward FDI spillovers: as in literature
- ▶ Horizontal spillovers
 - ▶ Productivity effects
 - ▶ Declining upon WTO entry: as in Lu, Tao, and Zhen (2017)
 - ▶ Patenting spillovers positive and increasing w/ WTO entry
 - ▶ Reason: productivity reflects more strongly market share rivalry

JV and regular FDI Spilloves Compared

	TFP		Patenting	
	JV	FDI	JV	FDI
Backward	+	+	+	+
Forward	0	0	0	0
Horizontal	+	0	+	+

Relative size of JV versus FDI Spillovers

- ▶ Productivity gains
 - ▶ Accounted for by intra-industry (horizontal) JV spillovers
 - ▶ Intra-industry FDI spillovers play no role
 - ▶ Accounted for by inter-industry (backward) spillovers: FDI 23%, JV 19%
- ▶ Increase in patenting: accounted for by both FDI and JV
 - ▶ FDI more important for backward linkages: 9%, vs 5% for JV
 - ▶ JV more important for intra-industry effects: 11%, vs 7% for FDI

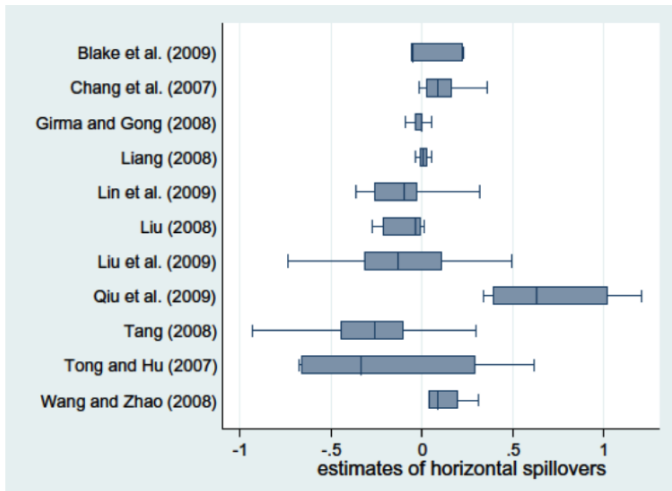
Summary and Conclusions

- ▶ IJVs comprise a major channel for FDI, especially in China
- ▶ Foreign investors **select** as partners: profitable, large, productive firms, w/ govt connections
- ▶ **Intergenerational** tech transfer: Chinese firms chosen as JV partner see performance increase
- ▶ **Industry spillovers** from joint venture firms are **large**
 - ▶ Horizontal: JVs account for 5% of industry TFP increase
 - ▶ 10% of increase in patenting
 - ▶ Also substantial gains from backward linkages (selling to JVs)
- ▶ JV spillovers **larger than regular FDI** b/o less market share rivalry

Open Questions

- ▶ Did China “force” US companies into joint ventures?
- ▶ Was there “theft” of US American intellectual property?
 - ▶ Is it enhancing national US welfare to impose new tariffs on China w/ this argument?
- ▶ Did China benefit from its FDI policy requiring joint venture partners?
 - ▶ Did foreign investors benefit?
 - ▶ Why did China change its FDI policies, moving away from requiring joint ventures?

Inward FDI spillover estimates: China



Source: Irsova/Havranek 2013

Recent FDI Spillover Estimates for China

Y. Lu et al. / *Journal of International Economics* 107 (2017) 75–90

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Table 6
Agglomeration versus competition effects.

Dependent variable: log firm TFP	Horizontal vs. vertical FDI	Local vs. non-local FDI	Developed vs. developing FDI	TFP growth ($t, t + 1$)
	(1)	(2)	(3)	(4)
FDI sector (horizontal FDI)	–3.919*** (0.051)			1.213*** (0.148)
Backward FDI	0.541*** (0.040)			
Forward FDI	3.855*** (0.078)			
FDI sector (local)		6.644*** (1.642)		
FDI sector (non-local)		–6.329*** (0.933)		
FDI sector (developed)			–7.318*** (0.454)	
FDI sector (developing)			–2.802*** (0.157)	
Firm fixed effects	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y
FDI determinants × year dummies	Y	Y	Y	Y
Tariff reductions × year dummies	Y	Y	Y	Y
SOE privatization × year dummies	Y	Y	Y	Y
Time-varying firm controls	Y	Y	Y	Y
Observations	1,368,957	1,347,189	1,368,957	1,119,151

Technology Stealing – NSA Statement

National security experts say Chinese hackers have consistently stolen trade secrets from U.S. defense contractors. This prompted former National Security Agency head Keith Alexander to describe Beijing's practices as "the greatest transfer of wealth in history." He states:^[10]

Chinese spies have gone after private defense contractors and subcontractors, national laboratories, public research universities, think tanks and the American government itself. Chinese agents have gone after the United States' most significant weapons, such as the F-35 Lightning, the Aegis Combat System and the Patriot missile system; illegally exported unmanned underwater vehicles and thermal-imaging cameras; and stolen documents related to the B-52 bomber, the Delta IV rocket, the F-15 fighter and even the Space Shuttle. President Trump's action on Monday acknowledges the broad scope of the challenge.^[10]

B 52 Bomber – Developed in 1946

