Appendix on data analysis in chapter 6

As indicated in the main text (p. 192), the focal issue of my data analysis is how intra-governmental resource dependence, as a key factor shaping the bargaining positions of local governments vis-à-vis higher-level authorities, affected the tendencies of local officials to bend formal and informal rules on the entry points and organizational forms of FDI. Specifically, I explore whether resource dependence had a curvilinear or bipolar effect on the likelihood of (a) central and provincial SOEs being directly exposed to FDI entrants in the same prefectures and (four-digit) industrial sectors, (b) bending of centrally imposed restrictions on the entry point and organizational form of FDI, (c) rising foreign shares in public-foreign joint ventures, and (d) growth of joint ventures with domestic private enterprises.

Empirical strategy

Investigating the impact of intra-governmental resource dependence relationships on the entry mode of FDI requires dealing with several confounding factors, including investors' preferences concerning organizational forms, attractiveness of local economic conditions to FDI, benefits of FDI perceived by local gatekeepers, and omitted variable bias. For some foreign investors, for example, the adoption of the joint venture form may be mainly driven by firm-level strategic considerations (e.g., tapping local partners' resources, connections and experiences) rather than being a response to regulatory constraints on WFOE. Mixing the joint ventures formed according to the preferences of foreign investors with the joint ventures resulting from regulatory compliance by foreign investors who otherwise would prefer WFOE blurs the causal effect of the central policy bias on the latter.

Differences in the locational characteristics, economic structure and level of development of different locales are also among the factors that affect the cost-benefit calculus of foreign investors. Inland locations, for example, pose additional transportation and communication costs than coastal locations. This problem tends to be further exacerbated by poor physical and social infrastructure in geographically unfavorable locales. Relatedly, underdevelopment of local industry and commerce constrains the capabilities of support industries and distribution systems, thus weakening the propensities of foreign investors to enter. Variations in all these regards have a direct bearing on the abilities of different local governments to attract and bargain with potential investors.

As the gatekeepers of FDI, different local governments may have different perceptions of the benefits of foreign capital as well. They may, for example, have different priorities for the policy agendas that they seek to address through FDI. While GDP growth and fiscal revenue generation may be widely shared concerns among local officials, their perceptions of the employment imperative may differ. This may be partly due to variations in population density relative to resource endowment, especially land resource endowment. But other factors may also matter. In locales with massive outmigration the pressure on local non-farm employment may be alleviated. Locales with a large workforce employed in the public sector that experienced early slowdown may face serous pressure for alternative sources of job creation. In locales that have become major destinations of both FDI and migration, a "ratchet effect" may develop – existing FDI and migrant workforce increase local government's dependence on FDI and migrant workers, thereby increasing their propensity to intensify the effort to retain and expand foreign capital (and inflow of migrants). Furthermore, concern about competition posed by foreign companies in sectors already populated by local (public) enterprises may weaken the local government's tendency to bend the rules on WFOE, as noted above.[1]

An even more formidable problem to tackle is the limitation of the information used to ascertain the causal link at issue. Other than a distinction between investors from Hong Kong, Macau and Taiwan and investors from other countries, the data I analyze do not contain more detailed information about the attributes (e.g., parent company profiles, home country characteristics, and past and current investment distributions) of foreign investors. Yet such attributes may affect the organizational patterns of FDI. For example, parent companies like Foxconn – a Taiwanese-owned conglomerate that hires over 1 million workers (mostly working in factories making Apple products) in China and accounts for 5-6% of the country's exports – tend to have extraordinarily strong

[1] The self-interest calculations that went into the decisions of local governments concerning the emphasis on the dominance of public ownership in joint ventures were similar to those concerning the implementation of the central policy restrictions on WFOE. Of particular importance was the perceived need to cede ownership and control for the inflow of additional resources and/or improvement in governance. A major contributing factor to this need was the fate of the sales expansion strategy that I have discussed in chapter 4. Where the strategy faltered early among local public enterprises, the local government would be hard pressed to find coping measures, including letting foreign investors play a more dominant role in joint ventures. Before the sweeping change in national policy on private ownership in 1997-8, however, this could carry an undertone of ideological incorrectness and thus might be deemed as a menacing element in the political performance assessment of local officials. The risk tended to be most significant in sectors with foreign entry restrictions explicitly imposed by the central government. But, again, it was possible to contain or defuse the risk where the local government was able to find enough ground of justification and reinforce it with bargaining power leveraged through very strong or weak fiscal resource positions versus higher level authorities.

bargaining power with local authorities that seek to attract FDI than small and low-tech companies from Taiwan or Hong Kong. The effect of such an unobserved factor in the data may not be randomly distributed. In multivariate analysis this can lead to systematic correlation between the explanatory variables (e.g., the proxy for intra-governmental resource dependence) and the error term that captures the non-randomly distributed residuals among different observations, which would violate the requirement of statistical independence and may result in biased estimates.

My basic strategy to deal with the above problems is to exclude obviously confounding cases from the sample, to control for observable variations among foreign investors and among local governments, and to use instrumental variables and panel data analysis to contain omitted variable bias. To determine the cases for exclusion from the sample of data analysis I use the 1987, 1995 and 1995 versions of the "Catalogue of Foreign-invested Industries" issued by the central government. I include only foreign-invested firms in "restricted" sectors, in sectors where joint venture was the organizational form stipulated by government guidelines, and in "prohibited" sectors. This criterion excludes FDI firms operating in sectors not facing explicit government restrictions on organizational forms, where the distinction between joint venture and wholly foreign-owned enterprise basically reflects investors' preferences in firm-level strategic considerations. There remains the possibility, however, that some of the joint ventures present in the sectors subject to government restrictions were still those that actually preferred JV to WFOE. Such coincidence between investors' preference and government policy inflates the number of cases in the JV category and thus likely leads to an underestimation of the effect(s) of the explanatory variable(s). Nevertheless, if the resultant estimates are still strong and statistically significant despite this remaining bias, it is plausible to infer that the evidence for the hypothesized causal link is robust.

To address the potential problem of omitted variable bias in pooled regression, I construct two instrumental variables by using GIS mapping to derive information on two dimensions of the spatial features of each locale and then interacting them with time trend. The first spatial feature is geographic proximity to the nearest coastal harbor.[2] Locales closer to coastal harbors tend to have more opportunities than inland locales to benefit from internationalization and thereby broaden their revenue bases (Zweig 2002). The second spatial feature is the ruggedness of the local terrain of each

[2] The list of coastal harbors, totaling 53 and with origins dating back to pre-1949 times, is from *Materials of the Third National Census of Harbors* compiled and published by the Ministry of Transportation in 2008. I identify the locations of the harbors on the map of China, use GIS software to calculate the distance of the central point of each prefecture to each coastal harbor and select the shortest distance as the measurement.

prefecture.[3] It poses varying degrees of difficulty for the development of local industry and commerce, which are the main sources of government revenue. As discussed in chapter 3, the initial economic gaps associated with these conditions after the start of economic reforms had a direct impact on the terms of the fiscal contracts – especially those concerning fiscal uploads and downloads – between different prefectures and their supervising provincial authorities before 1994 (Jia Kang and Zhao Quanhou 2008). These terms in turn served as the benchmarks for determining the fixed remittance and subsidies for local governments during and after the 1994 restructuring. An interaction term between time trend and each of the two spatial features just noted thus captures the changing fiscal implications of the initial level of economic development for each prefecture.[4] What it reveals is how time trend mediates the treatment effects of the two geographic factors on the main explanatory variables (i.e., ratio of fiscal uploads to downloads and its squared term) constructed with fiscal data. I include the interaction terms as instrumental variables. They may be closely correlated with the explanatory variables but not the dependent variable (same sector presence or organizational form of FDI); and the only possible channel for them to influence the dependent variable is through the explanatory variables.

It should be noted that both the distance to coastal harbors and the ruggedness of local terrain may well be factors that foreign investors consider in their choice making on investment locations and/or between JV and WFOE. But what looms large in their consideration is likely to be the concrete costs and benefits associated with these factors, rather than how the temporal patterns of variation across different locales affect intra-governmental fiscal relations, which are what the interaction terms are intended to capture. If and when such patterns do have any influence on the location or organizational form of FDI, they are likely channeled through the regulatory actions of local gatekeepers. I therefore include both variables as controls in the first and second stages of the IV regression analysis.

---

[3] Here ruggedness is measured by the percentage of the area with slopes being above 15% of the surface space in a prefecture. The geographical data, originally produced by NASA from spacecraft digital imaging of the Earth, are downloaded from the website of the United States Geological Survey (USGS) (http://www.cgiar-csi.org/data/elevation/item/45-srtm-90m-digital-elevation-database-v41, accessed on March 11 2012). Following the method deployed by Saiz (2010), I use the data on elevation, derived from the USGS Digital Elevation Model (DEM) at 90 square-meter cell grids, to generate slope maps for mainland China. GIS software is then used to calculate the exact share of the area corresponding to the land with slopes being above 15% of the surface space within each prefecture.

[4] Here the time trend is defined as the number of years from the 1994 fiscal restructuring. It carries the value of -2 for 1992, -1 for 1993, 0 for 1994, 1 for 1995, 2 for 1996, and so on.

Data

The main data sources used in the data analysis consist of annual industrial surveys (1993-1999) conducted by the National Bureau of Statistics (the industrial census data are used for 1995, when no annual industrial survey was conducted). The scope of coverage and the list of variables in these surveys can be found in the summary table posted at this site. Additional data include prefectural socioeconomic statistics from provincial statistical yearbooks (1993-1999), prefectural fiscal statistics from *Statistical Materials for Prefecture, Cities, and Counties* (1993-1999), statistics from the *China City Statistical Yearbook* (1990-1999), and import and export data from *China Customs Yearbook* (1993-1999).

Variables

The threat posed by FDI to the interests of higher level authorities is the entry of FDI firm(s) in the same prefecture and 4-digit industrial sector as existing industrial SOEs owned by provincial or central governments.[5] For firm-level data this is derived as a binary variable. For prefectural data this is constructed as the share of such cases accounted for by a prefecture in the provincial total.

To proxy local rule being on the entry points and organizational form of FDI, I make use of the information about the varying degrees of restrictiveness of central government FDI guidelines (i.e., 1987, 1995 and 1995 versions of the "Catalogue of Foreign-invested Industries") regarding JVs and WFOEs in different sectors. The variable constructed with this information contains six categories: JVs in sectors with JV stipulation, JVs in "restricted" sectors, WFOEs in "restricted" sectors, JVs in "prohibited" sectors, WFOEs in sectors with JV stipulation, and WFOEs in "prohibited" sectors.[6] The first category faced the least degree of restriction. It is treated as the reference category in categorical data analysis.

[5] In view of limited data availability for cities and counties, I use prefecture as the basic analytic unit for local economic conditions and government authority. This choice is also justifiable in that prefectures are sub-provincial governance centers and the cities and counties within each prefecture tend to face a more similar policy environment and therefore demonstrate less variability in FDI regulation than those from other prefectures.

[6] I identify JVs and WFOEs by using the registration type reported by each firm in the data sets. As mentioned in the preceding section my analysis does not make the further distinction between equity joint ventures and contractual joint ventures.

The response variable in the analysis on the possible link between weakening strength of the local public sector and rising foreign ownership in newly formed joint ventures with public enterprises is constructed by calculating the percentage of foreign ownership in equity capital. It has two renditions. One treats the variable as continuous, and the other treats the variable as a binary variable by categorizing foreign-owned equity shares into those above the 50% level and those at or below that level. The latter allows for a comparison of absolute dominance with lesser degrees of dominance by foreign owners.[7]

For the analysis of the growth of joint ventures with domestic private enterprises, the relative magnitude of foreign-private joint ventures in all joint ventures at the prefectural level. I use the shares of these JVs in total sales, workforce, and assets as the proxy measures.

I proxy the main explanatory variable – i.e., intra-governmental resource dependence – by dividing prefecture-level fiscal subsidy-contribution ratio with the pertinent provincial average, both lagged for one year. As argued in the main text, a high ratio indicates s a high degree of fiscal dependence on higher-level authorities, whereas a low ratio reflects the opposite.

To account for variations in firm- and industry-related characteristics, I include a few control variables. Given that investors from Hong Kong, Macau and Taiwan tend to have closer cultural distance with mainland China than investors from other economies, I construct a binary variable denoting whether the investor(s) of a sample firm came from these economies dominated by ethnic Chinese. Another control variable is capital intensity, proxied with the ratio of total fixed assets to the number of employees. Greater capital intensity may involve more use of proprietary assets, which is considered in the FDI entry mode literature as a major factor affecting the choice between JV and WFOE. To control for firm size and firm age, I use total sales and year of establishment as proxies. To account for potential peer influence and organizational learning as emphasized by some studies in the literature, I calculate the sales share of joint ventures in each industrial sector. For firm age, fixed industry effect and fixed time effects, I use year of establishment, sectoral dummies based on two-digit industry classification and year dummies as proxies respectively.

To control for variations in local economic conditions at the prefectural level, I include several control variables. They are: local GDP, GDP per capita, percentage of the

[7] A controlling stake does not necessarily involve more than 50% of ownership. But data on relative dominance based on the holding of controlling stake is unavailable.

primary (farming) sector in local GDP, FDI per capita, distance to the coast, percentage of the local workforce with primary and junior high school education, and average nonfarm wage. In addition, provincial and prefectural dummies are used to proxy fixed regional effects.

To control for factors affecting local (prefectural) governments' perceptions of the benefits of FDI, I include per capita arable land, the sales share of SOEs in each local industrial sector, the ratio of net outmigration to local workforce, FDI per capita, ratio of budgetary spending to budgetary revenue, percentage of counties with budget deficit, and 3-year moving average of the sales growth rate of local public enterprises. As measures to control for possibly varying weights assigned to the issue of import substitution in local FDI policy making (Huang 2002), I also calculate the ratios of imports and exports to the total sales in each local industrial sector. I lag all the time-varying variables, including the controls, by one year so as to block the temporal channel of reverse causality.

Statistical analysis

With the above variables defined, I perform two types of regression analysis on the presence of FDI firms in locations and sectors already populated by central and provincial SOES, and on the entry points and organizational forms of FDI. The first one is a pooled IV regression that examines entry mode. Only new entrants are included in the annual samples. One subset of the analysis makes use of firm-level data for the dependent variable and for some of the control variables, whereas another subset of the analysis uses aggregate data at the prefectural level for variables on both sides of the equation.[8] The second analysis expands the scope of investigation from entry mode to the overall distribution patterns of FDI firms and those of JVs and WFOEs. It is a panel data regression that uses the system GMM method to examine variations at the prefectural level. Both new entrants and existing FDI firms are included. For both types of analysis on entry mode, I specify the dependent variable as an ordinal variable, with the categories of regulatory restrictiveness ranked from low to high.[9]

---

[8] There is a trade-off between these analyses. The mixed-level analysis uses more information on variations and tends to produce less biased estimation than the analysis using aggregate data, but the latter tends to be statistically more efficient than the former.

[9] As robustness checks, I re-specify the dependent variable as a binary variable (with the three/six categories compressed into with/without competition and JV/WFOE respectively) and as a nominal variable (with the three/six categories treated as discrete). The results are similar to those from the analyses presented here.

I use an ordered probit model to estimate the effects of the explanatory variables on the proxy for entry mode of FDI firms in the industrial sector. The basic model is defined as follows:

$$y^* = \mathbf{x}' \beta + \varepsilon , \qquad (6.1)$$

where y^* is the latent variable of interest (level of FDI threat or organizational forms of FDI with varying degrees of regulatory restrictions), $\mathbf{x}$ is a vector of independent variables, and β is a vector of regression coefficients to be estimated, and ε is the error term (assumed to be normally distributed, with zero mean and unit variance). Although y^* is unobserved, it is related to the observed variable y (coded 1, 2, 3 in the analysis of direct exposure to FDI and 1, 2, 3, 4, 5, 6 in the analysis of violation of explicit central rules) through a series of ordered thresholds μ_n (n = 1, … 3 or 6), where $\mu_{n-1} \leqslant y^* < \mu_n$. The μ's are estimated jointly with the parameter vector β in the following probability model:

$$\text{Prob}\ (y = n) = \Phi(\mu_n - \mathbf{x}' \beta) - \Phi(\mu_{n-1} - \mathbf{x}' \beta), \qquad n = 1, \ldots 3 \text{ or } 6 \qquad (6.2)$$

The pooled regression with instrumental variables is then estimated with a two-step generalized Heckman model using Stata codes written by Chiburis and Lokshin (2007). Key results from second-stage regressions are presented in Tables A6.1-A6.2.

For the system GMM regressions, I use a dynamic regression model to analyze the panel datasets mentioned above and derive system GMM estimates for the effects of the main dependent variable(s). The basic dynamic panel model estimated in the regression analyses in this chapter is as follows:

$$g_{it} = \alpha g_{it-1} + \mathbf{y}'_{it-1} \gamma + \mathbf{x}'_{it-1} \beta + \delta_i + \mu_t + u_{it} , \qquad (6.3)$$

where g_{it} is the FDI-related response variable of in locale i, αg_{it-1} is lagged dependent variable, y'_{it-1} is a vector of lagged explanatory variables, x'_{it-1} is a vector of lagged control variables, δ_i and μ_t denote sets of locale dummies and time effects respectively, and u_{it} is the error term.

The system GMM regression method is also used for the analysis of foreign shares in joint ventures with public enterprises and the analysis of the relative significance of joint ventures with private enterprises among all joint ventures. In addition I also use conditional logit regression for a further firm-level analysis of whether foreign shares exceeded 50% of the equity capital in joint ventures with public enterprises. The key

results of these analyses are reported in Tables A6.3-A.6.6.

The interpretations of these results for the thematic issue discussed in chapter 6 are presented in the main text (pp. 190-191).

Table A6.1 Regression of effect of fiscal interdependence on FDI threat to central and provincial SOEs

	Pooled IV regression		
	Firm data	Prefectural data	
		(I)	(II)
(1) Baseline model			
Linear effect	0.772	0.959	
	[0.649]	[0.716]	
Controls (not shown)			
Observations	7,694	1,718	
Pseudo R^2	.248	.331	
(2) Polynomial model with extra controls			
Linear effect	1.288**	0.864*	0.972
	[.551]	[.476}	[.821]
Curvilinear effect	-1.167***	-0.992**	-1.007**
	[0.266]	[.401]	[.623]
Interaction between quadratic term and local joint venture partner			-1.682***
			[.316]
Controls (not shown)			
Observations	7,694	1,718	1,718
Pseudo R^2	.299	.364	.355

Note: * p < 0.10; ** p < 0.05; *** p < 0.01; standard errors are in parentheses.

Table A6.2 Regression of effect of fiscal interdependence on organizational forms of industrial FDI

	Pooled IV regression	
	Firm data	Prefectural data
(1) Baseline model		
Linear effect	0.655	0.821
	[0.596]	[0.765]
Controls (not shown)		
Observations	7,694	1,718
Pseudo R^2	.201	.266
(2) Polynomial model with extra controls		
Linear effect	0.966**	0.777*
	[.578]	[.437]
Curvilinear effect	-0.981***	-0.992**
	[0.216]	[.501]
Controls (not shown)		
Observations	7,694	1,718
Pseudo R^2	.234	.322

Note: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$; standard errors are in parentheses.

Table A6.3 Regression of effect of fiscal interdependence on FDI threat to central and provincial SOEs

	System GMM regression	
	Baseline model	Polynomial model with extra controls
Linear effect	0.111*	0.521***
	[0.067]	[0.102]
Curvilinear effect		-0.692***
		[.174]
Controls (not shown)		
Observations	1,536	1,536
AR1	.000	.000
AR2	.378	.283
Hansen J	.177	.204

Note: * p < 0.10; ** p < 0.05; *** p < 0.01; standard errors are in parentheses.

Table A6.4 Regression of effect of fiscal interdependence on organizational forms of industrial FDI

	System GMM regression	
	Baseline model	Polynomial model with extra controls
Linear effect	0.127*	0.458***
	[0.071]	[0.096]
Curvilinear effect		-0.577***
		[.136]
Controls (not shown)		
Observations	1,536	1,536
AR1	.000	.000
AR2	.438	.222
Hansen J	.205	.192

Note: * p < 0.10; ** p < 0.05; *** p < 0.01; standard errors are in parentheses.

Table A6.5 Regression of factors affecting foreign ownership in JVs with local public enterprises

	Industrial sectors with restrictions	
	System GMM	Conditional logit
(1) Strength of local public sector		
Rate of return	-0.492**	-0.522***
	[.301]	[.107]
Debt-equity ratio	0.694**	0.728**
	[.352]	[.327]
(2) Fiscal bargaining power		
Linear effect	0.887	0.566*
	[.695]	[.294]
Curvilinear effect	-0.767*	-0.812*
	[.411]	[.491]
Controls (not shown)		
Observations	1,696	3,915
AR1	.000	
AR2	.179	
Hansen J	.167	
Pseudo R^2		.203

Note: * p < 0.10; ** p < 0.05; *** p < 0.01; standard errors are in parentheses.

Table A6.6 Regression of factors affecting the relative significance of foreign-private industrial JVs

	Workforce	Sales	Asserts
(1) Strength of local public sector			
Rate of return	-0.167	-0.274*	-0.522
	[.169]	[.142]	[.402]
Debt-equity ratio	0.222***	0.469**	0.228*
	[.056]	[.228]	[.111]
(2) Fiscal bargaining power			
Linear effect	0.332	0.387*	0.266
	[.275]	[.198]	[.194]
Curvilinear effect	-0.211*	-0.171*	-0.112**
	[.110]	[0.094]	[.047]
Controls (not shown)			
Observations	1,536	1,536	1,536
AR1	.000	.000	.000
AR2	.267	.279	.332
Hansen J	.556	.267	.109

Note: * p < 0.10; ** p < 0.05; *** p < 0.01; standard errors are in parentheses.