Can Good Projects Succeed in Bad Villages?
Project Design, Village Governance and Infrastructure Quality in Rural China

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Abstract

This study seeks to explain the differences in infrastructure quality across China's villages. Using primary data on three main types of infrastructure projects in rural China, we find that a.) between-project within-village quality differences are small and project design has little explanatory power; b.) between-village variations are larger; and c.) there are strong correlations between the ways villages govern themselves and project quality. We conclude that it is difficult to make good projects work in bad communities and that there is something at the village level that is making some projects succeed in some villages, but not in others.

JEL classification: H41; H54; H71
Keywords: Infrastructure Quality; Village; Rural China

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In recent years, internationally, there has been a debate regarding what explains the differences in the quality of infrastructure that have been observed across regions around the world. Some scholars believe that project-specific characteristics are so important that appropriate project design can enable project to succeed in any type of villages (e.g., Isham et al., 1996; Khwaja, 2004). More recently, Olken (2007) found evidence that in Indonesia, the way an infrastructure project is monitored—a project-specific characteristic—matters in the creation of quality projects. In contrast, several village-specific factors have been forwarded in the literature as explanations for why infrastructure is of different quality across regions. For example scholars have emphasized the roles that sound governance (World Bank, 1999; Easterly, 2002), leadership (Casselli and Morelli, 2004) and policy (World Bank, 2000) may play in the success of public projects. Obviously, whether good projects can succeed in bad communities is still a debatable question.

A similar debate is ongoing in China. In fact, this debate—although not always framed in this precise way—is often centered on the question: What is the most important factor for assuring that a project that is built is high quality—having a well designed project or implementing it in a well governed village? Wang (2006) and Zhao (2005), for example, stress the importance of a.) the type of procedure that is designed for soliciting project applications; b.) the way that projects are designed; and c.) how the progress of project implementation is monitored during construction. A part of the literature also stresses the importance of keeping the ultimate user—in this case the local farm households—involved by creating ways to let them participate (another project design attribute) in the process (e.g., Guo, 2005; NDRC, 2006). In contrast, another body of literature in China stresses that precisely because so little is expended on monitoring and evaluation that project design is not important (Lin, 2007). What is important is having quality village governance, village leadership and other policies (Wu, 2006; Li, 2007). Although not stated in this way, we

believe this body of work can be interpreted as saying that infrastructure projects can only succeed when they are implemented in good villages.

While there has been considerable work debating the reasons that quality projects are found in some villages but not others (Guo, 2005; Zhao, 2005; Wang, 2006; Lin, 2007), most of these studies are anecdotes or case studies in nature. By contrast, there is almost a complete absence of empirical evidence on why the quality of infrastructure projects varies across communities. Almost certainly one of the major reasons for this paucity of empirical work is that disaggregated data on the quality of infrastructure (and its determinants) are rarely available, especially in developing countries. In fact, development economists have complained about the scarcity of disaggregated data when doing quantitative studies on the issues of public goods provision at the local level (Dethier, 1999; Bardhan, 2002). Empirical economists also have spent little time working with engineers who have long developed procedures for scoring and evaluating the quality of infrastructure projects (but who have little disciplinary interest in analyzing the determinants of quality across many different projects).

The overall goal of this paper is to measure the quality of infrastructure investments in rural China as well as to document the differences among projects and among villages in order to try to understand why the quality of infrastructure investments differs across space. We are particularly interested in analyzing the sources of the differences in the quality of projects by examining: a.) whether or not the differences are due to project-specific characteristics (or henceforth, *project design attributes*); and/or b.) whether or not the differences are due to village-specific (or henceforth, *village* or *community governance*) characteristics. If it is found that project design attributes and/or village governance are driving the differences in the quality of infrastructure in rural China, we then want to identify which of the factors (which project design attributes or which facet of community governance) are most responsible for the differences. The ultimate goal is to answer the question, “Can good infrastructure projects succeed in bad villages?”

Or, “Does community governance have to be improved before we can expect there to be a high quality infrastructure project—regardless of the initial design?”

Data

Our main empirical analysis draws information from the 2005 China Rural Governance Survey undertaken by ourselves. In this survey, 100 villages were randomly selected from 50 towns in 25 counties from 5 provinces according to a multi-stage stratification procedure. The five provinces were each randomly selected to represent five of China’s major agro-ecological zones: Jiangsu in the eastern coastal region; Sichuan in the southwest; Shaanxi in the northwest; Hebei in the central region; and Jilin in the northeast.

Although villages in China invested in a variety of infrastructure projects (Luo et al., 2006), we focus on three core infrastructure projects, roads/bridges, irrigation and drinking water. In our sample villages, these three types of projects account for more than half of total investment. Among the 100 villages, 13 do not have the three core infrastructure projects and therefore were dropped from our analysis. Among the 87 villages in the final sample, more than half have multiple core projects (Table 1).

Quality of Infrastructure Projects in Rural China

Data for Measuring Quality

We designed one block of the survey instrument to focus exclusively on the quality of investment. Two of the enumerators utilized an instrument that was designed by us in consultation with professional civil engineers to come up with a quality index for each project. Each evaluation form assessed two dimensions of each infrastructure project: an engineering dimension and a performance dimension. In attempting to describe each of these dimensions, we created a long list

of project design attributes. Specifically, there were 23 attributes used on the form for each road project, 42 attributes for each irrigation project and 37 attributes for each drinking water project.

The form that we used to evaluate the quality of each core infrastructure project was created to look like a score sheet. A specific number of points were assigned to each attribute. The number of points was supposed to reflect the importance of the contribution of the attribute to the project's overall quality. For example, the depth of the road surface and the material used to construct the road surface was assigned 12.5 points (accounting for more than 10 percent of a road's quality). By contrast, the "line of the road," which was measured by the enumerator based on a visual inspection of "how straight" a road looks (or how symmetric the curves are), was only assigned 4 points. If the attributes of a project all received full score, the score would add to 100.[1]

Information about how the infrastructure project performed its function was also enumerated by the evaluation team. Households were randomly selected and asked about the performance and reliability of the roads, irrigation networks and drinking water systems. For example, in the case of roads enumerators asked the villagers how many days per year that a road was not usable (due to rain or mud or some other factor). Enumerators also asked if the flow of traffic was ever impeded because the road was too narrow or the surface impassable. In the case of the drinking water systems, enumerators used litmus test paper to test for acidity and glass test tubes to check for the clarity of water. As in the case of roads, enumerators also asked about reliability (e.g., how many months per year; days per month and hours per day did the drinking water system deliver water?). Enumerators also asked farmers about their perception of the irrigation system's reliability.

Constructing the Measure

A straightforward measure of quality that we created from our data, the *raw score*, was the simple sum of the scores of each of the project attributes. Therefore, the raw score ranged from 0 to 100. In some irrigation or drinking water projects, however, the scope of work only involved a subset of the attributes of a project. In this case the project's score was standardized so it too

ranged between 0 and 100 points. The standardization was accomplished by dividing the sum of the score given by the enumerators by the total number of points available for the attributes that were relevant to the project. For example, if an irrigation project only involved replacing the pump (worth 15 points if the attribute was judged to meet the criteria for a full score), intake gates (2 points) and main head-works (8 points), the total possible points would be 25. Such a project would have nothing to do with the rest of the irrigation system (e.g., the tertiary canals, outlet gates to farmer fields and/or the drainage system—worth 75 points). Because of this partial nature, there was no way that points could be assigned for these other attributes. In such cases we standardized the score by dividing the sum of the points assigned to each of the relevant attributes by the total maximum number of points for the attributes (had they been given a full score). For example, in the case of the partial irrigation project, if the enumerator decided that the scores assigned to the 3 relevant attributes added to 20, score would be *20/25*100*, or 80 points. In the rest of the essay we call this measure the *standard raw score*.

Quality of Rural China's Infrastructure Projects

Our survey showed the quality of infrastructure projects in rural China increases slightly during the sample period. From 1998 to 2003, the standard raw scores of infrastructure projects increased from 70 to 75 (Table 2). Hence, using the standard raw score measure, our approach to measuring quality does not support the conclusions of others (Yang et al., 2005; Zhao, 2005; Huang and Xia, 2006) that claim quality was suffering during the recent period of investment expansion. Moreover, we find that the scores rise in provinces—although at different rates in different provinces when looking at the quality of infrastructure projects over time by province.

In addition to the rising quality of infrastructure over time in rural China, the data show that, in general, there are differences in the quality of infrastructure projects across our sample. In looking at different distributions of infrastructure projects, we see that while the standard raw scores of a typical infrastructure projects is 75 out of 100 points, some projects score as low as 30

points whereas others score as high as 96 points. The large variation in the quality of infrastructure projects is obvious when examining the shape of the distribution of standard raw scores (Figure 1).

Descriptive Analysis

Data for Capturing Project Design Attributes

There was a special part of the survey that covered five types of project design attributes of each village's core projects (i.e., roads, irrigation and drinking water). a.) *Scope of the project* (project age, total project expenditure, sources of the funding, size of the project in physical terms, the terrain of project site, and the partial nature of a project).[2] b.) *Initiation and application of the project* (Information collected on this dimension included who initiated the project, who applied for the project, and whether other villages were competing and applying for the same type of project when our sample village was applying).[3] c.) *Project design* (whether a project was designed by the village leadership or the village's two committees, an official from an upper level government unit, or some other entity, such as a contractor).[4] d.) *Project implementation* and monitoring (Who actually implemented a project? who actually led the implementation of a project? and who actually inspect the final infrastructure project?). e.) *Villager participation* (whether villagers participated in the non-technical or technical decisions of a project)**.** The definition, mean and standard deviation of each of the project design attribute variables are presented in Appendix Table 1.

Do Project Design Attributes Correlate with Quality?

We examine descriptive relationships between some of these variables and the quality of infrastructure projects. Interestingly, we find little evidence that project design attributes can make a project succeed. The only exception is investment size (Table 3). As projects move from the lowest quartile (when projects are ranked in terms of thousands of yuan) to the highest quartile, the standard raw score of the project ranges from 67.5 points to 84.8 points (Row 1). This pattern suggests that, at least according to these descriptive findings, one of the reasons that infrastructure

projects are of different quality may be due to the investment size.

Data for Capturing Village Governance and Other Characteristics

The village governance part of the survey generated five types of village governance variables. a.) Village governance (whether a village leader was directly elected by villagers through ballots). b.) *Nature of village leadership* (information on two of the village's most important leaders since 1991—the "village leader" who heads the village's administrative committee) and the village party secretary who is the head of the village's Communist Party Committee (CPC), including their age, education, the job and experience that he/she held before taking office, and the village leader')**.**[5] c.) *Policy environment* (the exact date of the start of Tax for Fee reform in each village and the number of regulations through which the township government managed its villages in terms of fiscal management and administration).[6] d.) *Connections of the village with cadres outside the village* (how many villagers who were born and raised in the village were currently working as cadres in township or county government agencies outside of the village). e.) *Basic village characteristics* (the amount of land available for cultivation, the proportion of households with family businesses, the proportion of households that had at least one member in the migrant labor force, the level of debt that a village owed on a per capita basis, and the distance in kilometers from the office of the village committee to the township seat. The definitions, means and standard deviations of the village governance and other characteristics are also presented in Appendix Table 1.

Do Village Governance Variables Correlate with Quality?

Descriptive analysis shows that one of the village governance characteristics—the measure of direct elections—is correlated with the quality of infrastructure projects. When comparing the quality of infrastructure projects between villages with directly elected leaders and those with appointed leaders, we see a positive relationship (Table 4, Row 1). As projects move from villages with appointed leaders to those with directly elected leaders, the standard raw score of the project ranges from 72.9 points to 75.4 points. This rise suggests that village governance may be related

(at least a little bit) with the observed variation in the quality of infrastructure projects.

In contrast, when examining the relationship between the number of fellow villagers who were born and raised in the village but work in government agencies (at the township or county level), there is a surprising pattern to the data (Table 4, Row 14). As villages move from having no villagers to having more than five fellow villagers work in government agencies, the standard raw score actually fell from 77.5 to 70.4 points. While this was hard to explain ex ante, during interviews with village leaders, we heard that although connections might help villages get more projects from above to invest in infrastructure, it does not necessarily help villages build better quality infrastructure. When asked why, village leaders sometimes said that cultivating and fostering connections takes up so much time, resources and effort that they do not have enough time and efforts to build better projects (or that their connections do not always come through with any more than trivial funding—forcing villages to cut corners during implementation). If this is true, this suggests that when villages try to improve the quality of their infrastructure through informal connections, in the final analysis it might turn out to undermine infrastructure quality.

Multivariate Analysis: Empirical Specifications

To identify whether project design attributes can affect the quality of infrastructure projects, we take advantage of the fact that 45 out of 87 sample villages have multiple core projects to estimate an empirical specification that introduces village fixed effects:

(1) $Q_{ij} = a_0 + a_1 PDA_{ij} + \mu_i + \varepsilon_{ij}$

where Q_{ij} denotes the quality (standard raw score) of project j in village i. PDA is a vector of project design attributes, which is composed of the 18 attributes that are categorized into variables measuring project scope; project application and initiation; project design, and project implementation and monitoring, and villager participation. The terms a_0 and a_1 are parameters to be estimated and ε is the error term. The village fixed effects are denoted by μ_i, a vector of 44 village dummy variables—one for each village in our sample that has multiple core infrastructure

project delivered to their village during the study period. We include μ_i to hold constant all community level (and above) effects. The results of the parameter estimates of equation (1), in fact, should provide us with a set of convincing findings on the causal relationship between project design attributes and quality. The estimated coefficients will be reflecting the within-village variation of project quality that are due to the within-village variation of project design attributes and will not be affected by any village governance factors (in our sense of the term—that is, any other village-specific factors).

To more convincingly identify what village governance characteristics can affect the quality of infrastructure, we estimate the following empirical specification,

(2) $Q_{ij} = a_0 + a_1 PDA_{ij} + a_2 VGC_i + \varepsilon_{ij}$

where all of the variables and parameters in equation (2) are the same as those in equations (1) except that we have added a vector of village governance characteristics denoted by VGC_i and, a_2, a vector of parameters associated with VGC_i, a vector of 19 village governance variables that we defined at the previous section. The results of the parameter estimates (a_2) of equation (2) should at least provide us with a set of findings that describe the correlation between village governance characteristics and infrastructure quality.

Results: Can Projects Be Designed to Work in Any Villages?

The most striking finding after running the regressions according to our empirical strategy is that there is little effect of the project design attributes on project quality. Out of the 18 coefficients in Table 5, only one of them—total project expenditure—is statistically significant (a point which we will discuss more below). Hence, especially when we account for village fixed effects, it would appear that any effort or time spent in trying to design projects in a way that will ensure project success might well be wasted (at least so far in rural China and at least in our sample villages).

Total Expenditure and Quality

There is only one prominent exception in our analyses. The coefficient on the project total expenditure variable is positive and statistically significant in all of the models that we have run (see Row 1, Table 5). This result is also consistent with what we found in the descriptive analysis. The direct interpretation of this coefficient is that larger projects are higher quality. The problem with understanding the exact meaning of this coefficient is that we used "value" (measured in yuan) for the metric of this variable. Therefore, it is impossible to know if this variable is capturing some pure economies of scale with respect to quality or if it is simply that more funding buys higher quality. To try to distinguish between these two interpretations, we focus on the subset of villages that invested in roads since we are able to include a physical measure of roads (in kilometers—*project physical size*).[7] Using this variable (together with total project expenditure), we can seek to isolate the true "economies of scale" effect from the "price" effect.

When seeking to "decompose" the coefficient of the total project expenditure into its component parts, we find that whether we control for project physical size or not, the coefficients on the total project expenditure variable are exactly the same (Row 1, Table 6). One interpretation of this is that, holding the economies of scale constant (which do NOT affect project quality), the greater the total expenditure, the higher the quality. In simplest terms, this would imply that what we are observing is purely a price effect. If those involved in the investment project are willing to spend more money (given everything else held constant—including the size of the project), the project is higher quality. While somewhat interesting, the direct policy implications are fairly limited except to note that there is no easy way to get higher quality by project design other than allocating more funds.

So do project characteristics matter? Notwithstanding the impact of project size (which is not really a project design attribute in the strictest sense of the word), we believe it is safe to conclude—at least in our sample villages—the ways that projects are initiated, designed and implemented—*do not have a significant effect* on project quality. This means, of course, that policy makers (or those in charge of implementing quality projects) are not going to be able to rely

on project design to meet their quality goals. For the researcher, it raises another puzzle. If project design attributes are not behind the observed variation in project quality, what is? We continue to examine this question below.

Within-Village or Between-Village? Decomposing Variations in Project Quality

To seek a better understanding of why project characteristics do not seem to have a large explanatory effect on quality, in this subsection we perform a number of empirical exercises to try to identify if most of the variation in project quality is coming from within-village or between-village variations. The logic of trying to do so is related to the fact that we are not finding a lot of effect of project design attributes on project quality. If only a small share of the variation is among projects within villages, it may not be surprising that project design characteristics do not matter and may point to other sources that might be the driving forces (e.g., village governance characteristics).

The first exercise is to compare the standard deviations of project quality between and within villages in the set of 45 villages for which there are at least two projects each. Our data show that the standard deviation of average (over projects in a given village) standard raw score for these villages is 11.2, reflecting quality variation across villages. In contrast, the standard deviation of de-meaned (of the village average score) is 10.4, suggesting that if anything there is greater quality variation between than within villages. Figure 2 presents a more detailed picture of the decomposition of the variation of quality between and within villages. This illustrates that there is substantial, if not greater, variation between villages. Differences across the plotted points in the "between" variation graph represent average quality differences across villages, while in the "within variation" graph, differences for a given village reflect within village quality variation.

We also performed an alternative variation decomposition analysis. A regression of standard raw score on village fixed effects by themselves provides an R-squared of 0.51 as compared to an R-squared of 0.70 once project design attributes are included. Together these decomposition analyses indicate that some inherent attributes such as village governance is likely

to explain a significant part of the variation in quality across villages.

Do Village Governance and Other Characteristics Matter?

The results of the multivariate analysis using specification (2) demonstrate that the model which controls for both village governance characteristics and project design attributes performs relatively better than the model with only project design attributes. In fact, the goodness of fit measure, the R-Square, increases from 0.33 (Column 2, Table 5) to 0.48 (Table 7). The coefficients on most of the project design attributes are consistent with what were estimated in equation (1) where only project design attributes are controlled for (i.e., almost none of them were significant).

By far the most importing finding is, unlike in the case of project design attributes, there are some effects of village governance variables on project quality. One of the most important findings in Table 7 is that direct elections matter in explaining the observed variation in infrastructure quality. In particular, the coefficient on the directly elected dummy variable is positive and significant (Table 7, Row 1). If this is true, we can say that direct elections help improve the quality of infrastructure projects in rural China.

In addition to the direct election variable, some control variables at the village level also are significant. For example, the coefficients on the variable measuring the intensity of connections that exist between a village and the government outside the village are significant (Table 7, Row 14). In particular, projects undertaken in villages that have more connections in government agencies outside the village tend to be of lower quality. As discussed above, one possible explanation might be that village leaders that rely on connections are unable to spend enough time on the design and implementation of the projects.

Summary and Conclusions

In this paper, we have used data that we collected to create profiles of the quality of infrastructure in rural China as well as to document the differences among projects and among villages. The main question that we are interested in exploring is: “Can good infrastructure

projects succeed in bad villages?" Our short answer to this question is that good infrastructure can not succeed in bad villages, and community governance has to be improved before people can expect there to be a high quality infrastructure project. In fact, using both descriptive and multivariate analyses, we have found that few project design attributes matter in explaining the observed variation in infrastructure quality. By contrast, we found a couple of factors at the village level, particularly the way that a village selected their leader, had a strong correlation with the quality of infrastructure projects in rural China. The results of our study suggest that shifts in policies that promote elections, while slow in getting started and not universal, appear to be creating an atmosphere that is conducive for infrastructure quality. When villages elect their own leader, for some reason, there is a significant improvement that arises in the quality of infrastructure projects in the village. If the quality of infrastructure in rural China can be raised by improvements in the ways that villages choose their leaders, continuing reforms to provide local leaders with more legitimacy may lead to an even more vibrant village development environment.

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Figure 1: Distribution of the Quality of Infrastructure Projects, Standard Raw Score

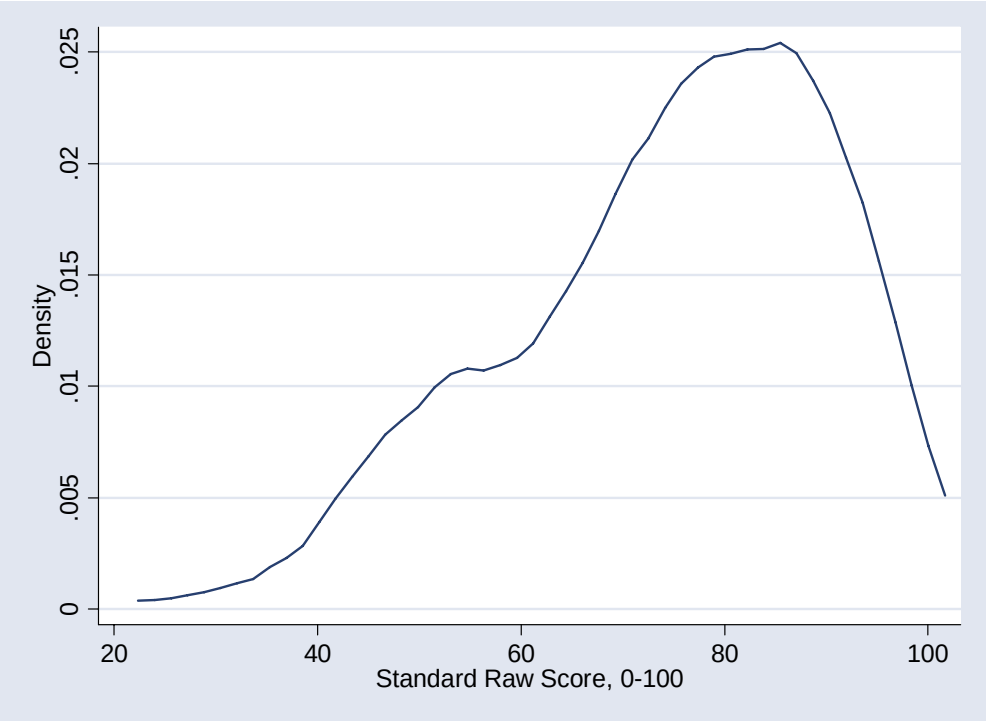

Figure 2. Between and Within Village Variation in Project Quality (Villages with MULTIPLE Core Infrastructure Projects)

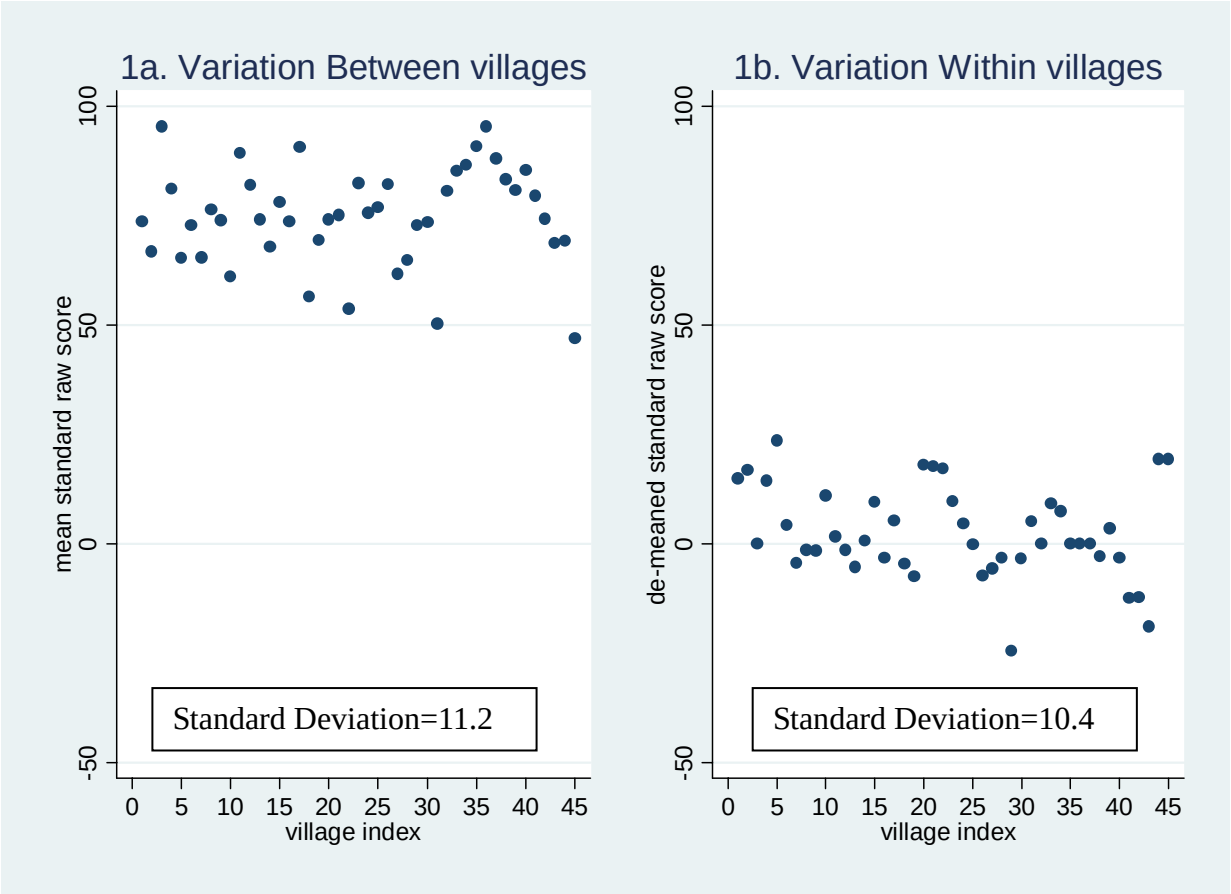

Table 1: Sample Projects and Villages

Classification	Freq.	Per cent
A. Project Type		
Roads	84	58.74
Drinking water	24	16.78
Irrigation	35	24.48
Total number of projects	**143**	**100**
B. Village type		
Villages with One core projects	42	48.28
Villages with **Two** core projects	36	41.38
Villages with **Three** core projects	7	8.05
Villages with **Four** core projects	2	2.3
Total number of villages	**87**	**100**

Table 2: Increase in the Quality of Infrastructure Over Time

Starting year of infrastructure project	1998/1999	2003/2004
All sample	70 (19.0)	75 (14.7)
Sichuan	65 (20.4)	71 (11.9)
Shaanxi	62 (19.4)	68 (13.5)

Note: standard deviation in brackets.

Table 3: Cross Tabulations between Project Design Attributes and Standard Raw Score

Project scope (1)	Lowest quarter	Mid-low quarter	Mid-high quarter	Highest quarter
1. Total project expenditure	67.5	70.4	76.2	84.8
2. Project age	77.6	70.6	76.0	72.7
Project scope (2)			No	Yes
3. Village funded only			76.7	72.5
4. Above funded only			74.5	75.5
Project initiation and Application			No	Yes
5. Government initiation			73.0	79.9
6. Committees application			76.9	72.5
7. Government application			72.4	83.0
8. Competitive application			73.1	76.1
Project design			No	Yes
9. Committees design			76.5	71.9
10. Government design			72.9	77.4
Project implementation and Monitoring			No	Yes
11. Committee leading implementation			79.2	71.5
12. Villager implementation			77.2	65.8
13. Government implementation			70.0	79.0
14. Top-down monitoring			72.4	80.1
Farmer participation	0	0~1/3	1/3~3/4	>3/4
15. Household participation	73.7	74.5	76.1	74.9
16. Household labor contribution	76.8	74.8	72.2	66.5

Source: Authors' survey.

Table 4: Cross Tabulations between Village Governance Characteristics and Standard Raw Score

Village governance	**No**	**Yes**		
1. Direct election	72.9	75.4		
Village leadership	**<31 years**	**30-40 years**	**40-45**	**>45**
2. Leader age	79.4	75.4	72.6	74.0
3. Secretary age	73.5	76.1	71.0	75.7
	<7	**7-9**	**10-12**	**>12**
4. Leader education	78.2	73.9	73.1	83.5
5. Secretary education	73.5	74.4	75.7	69.0
	No	**Yes**		
6. Leader job	78.0	69.7		
7. Secretary job	77.1	68.8		
8. Leader experience	75.5	74.1		
9. Secretary experience	74.3	74.6		
10. Party member	75.1	74.4		
Policy environment	**No**	**Yes**		
11. Before tax for fee	75.4	72.2		
	<1	**1**		
12. Administrative regulation index	73.1	76.8		
13. Fiscal regulation index	70.7	76.6		
	0	**1-2**	**3-5**	**>5**
14. Connection	77.5	75.1	75.4	70.4
Other characteristics	**Lowest quarter**	**Mid-Low quarter**	**Mid-High quarter**	**Highest quarter**
15. Per capita land	70.6	75.1	77.2	75.7
16. Business households	70.3	73.0	77.4	77.9
17. Migrant households	74.7	72.4	76.6	74.5
	0	**0-30**	**30-100**	**>100**
18. Per capita debt	74.5	72.0	71.0	80.0
	0	**0-0.25**	**>0.25**	
19. Minority people	71.0	74.4	85.7	
	<2	**2-4**	**4-6**	**>6**
20. Remoteness	76.6	78.8	70.9	73.4

Source: Authors' survey.

Table 5: The Impact of Project Design Attributes on Project Quality

VARIABLES	(1) Village FE: Projects from multiple-project villages only	(2) OLS: All projects
Project scope		
1. Total project expenditure	0.02*	0.01***
	(2.02)	(2.68)
2. Project age	0.08	0.01
	(0.71)	(0.28)
3. Easy terrain	-3.01	6.83**
	(0.40)	(2.26)
4. Partial project	7.26	6.06
	(0.62)	(0.86)
5. Village funded only	-1.03	-0.55
	(0.19)	(0.18)
6. Above funded only	1.81	3.30
	(0.21)	(0.73)
Initiation and application		
7. Government initiation	-9.64	-3.07
	(1.36)	(0.78)
8. Committee application	-3.39	-0.88
	(0.45)	(0.27)
9. Government application	6.51	4.09
	(0.74)	(0.86)
10. Competitive application	2.20	-2.41
	(0.37)	(0.88)
Project design		
11. Committee design	1.88	2.32
	(0.21)	(0.66)
12. Government design	4.52	2.50
	(0.59)	(0.71)
Implementation/monitoring		
13. Village leading implementation	-4.09	-3.34
	(0.60)	(1.05)
14. Villager implementation	4.01	-6.20*
	(0.46)	(1.70)
15. Government implementation	3.98	1.82
	(0.50)	(0.58)
16. Top-down monitoring	-5.37	0.63
	(0.67)	(0.19)
Villager participation		
17. Participation in size decision	-0.71	-5.38*
	(0.12)	(1.93)
18. Participation in technical decision	5.32	4.31
	(0.74)	(1.35)
Village Fixed Effects	YES	NO
Project type dummies	YES	YES
Observations	101	143
R-squared	0.70	0.33

Note: *** p<0.01, ** p<0.05, * p<0.1; t-statistics in parentheses.

Table 6: The Impact of Project Design Attributes on Project Quality, Road Projects Only

	Physical size controlled	Physical size not controlled
VARIABLES	(1)	(2)
Project scope		
1. Total project expenditure	0.01*	0.01*
	(1.87)	(1.82)
1a. Physical size, kilometer		-0.04
		(0.07)
2. Project age	-0.01	-0.01
	(0.14)	(0.15)
3. Easy terrain	7.11*	7.11*
	(1.83)	(1.81)
4. Village funded only	-0.69	-0.69
	(0.20)	(0.20)
5. Above funded only	7.17	7.15
	(1.32)	(1.30)
Initiation and application		
6. Government initiation	-1.96	-1.95
	(0.44)	(0.44)
7. Committee application	1.78	1.81
	(0.45)	(0.45)
8. Government application	5.16	5.13
	(0.96)	(0.95)
9. Competitive application	-2.72	-2.72
	(0.83)	(0.82)
Project design		
10. Committee design	5.15	5.04
	(1.08)	(0.99)
11. Government design	6.30	6.21
	(1.43)	(1.34)
Implementation/monitoring		
12. Village leading implementation	-2.76	-2.71
	(0.65)	(0.62)
13. Villager implementation	-8.60*	-8.52*
	(1.86)	(1.78)
14. Government implementation	2.53	2.51
	(0.64)	(0.63)
15. Top-down monitoring	4.51	4.52
	(1.20)	(1.19)
Villager participation		
16. Participation in size decision	-2.61	-2.59
	(0.84)	(0.82)
17. Participation in technical decision	0.09	0.02
	(0.02)	(0.00)
Observations	84	84
R-squared	0.49	0.49

Note: *** p<0.01, ** p<0.05, * p<0.1; t-statistics in parentheses.

Table 7: Impacts of Village Governance on Quality

VARIABLES	**Project Design Attributes**	VARIABLES	**Village Governance**
Village governance		***Project scope***	
1. Direct election	5.94*	20. Total project expenditure	0.02***
	(1.79)		(3.16)
Village leadership		21. Project age	0.05
2. Leader age	-0.20		(0.61)
	(1.13)	22. Easy terrain	2.91
3. Leader education	-0.81		(0.81)
	(1.33)	23. Partial project	10.15
4. Leader job	-5.10		(1.35)
	(1.63)	24. Village funded only	0.73
5. Leader experience	-1.83		(0.22)
	(0.63)	25. Above funded only	5.09
6. Leader CPC member	1.98		(1.04)
	(0.58)	***Initiation and application***	
7. Secretary age	0.00	26. Government initiation	-3.82
	(0.02)		(0.95)
8. Secretary education	0.24	27. Committee application	-3.32
	(0.38)		(0.88)
9. Secretary job	-3.69	28. Government application	8.03
	(1.11)		(1.49)
10. Secretary experience	-1.22	29. Competitive application	-1.70
	(0.32)		(0.60)
Policy environment		***Project design***	
11. Before Tax for Fee	-1.71	30. Committee design	-2.26
	(0.38)		(0.59)
12. Administrative regulation index	8.07	31. Government design	0.96
	(1.55)		(0.25)
13. Fiscal regulation index	12.29	***Implementation/monitoring***	
	(1.28)	32. Village leading implementation	-0.77
Contact			(0.23)
14. Connection	-0.72*	33. Villager implementation	-1.82
	(1.67)		(0.47)
Other village characteristics in 1997		34. Government implementation	1.67
15. Per capita land	1.45		(0.49)
	(1.66)	35. Top-down monitoring	0.14
16. Business households	10.71		(0.04)
	(0.63)	***Villager participation***	
17. Migrant households	-3.95	36. Participation in size decision	-2.49
	(0.80)		(0.83)
18. Per capita debt	-0.00	37. Participation in technical decision	2.69
	(1.50)		(0.82)
19. Remoteness	-0.35	Project type dummies	YES
	(0.85)		
Observations	143		
R-squared	0.48		

Note: *** p<0.01, ** p<0.05, * p<0.1; t-statistics in parentheses.

Appendix Table 1: Summary Statistics of Variables

Variable	Variable definition	Mean (SD)
Project quality		
Standard raw score	Standard raw score (0-100)	74.6 (15.4)
Project score		
Total project expenditure	Investment size, 1,000 yuan	199 (275)
Project age	Project age in month	23.7 (24.1)
Easy terrain	Project is located on an easy terrain? 1=yes	0.69 (0.47)
Partial project	Project is partial? 1=yes	0.38 (0.49)
Village funded only	Project funded by village only? 1=yes	0.5 (0.50)
Above funded only	Project funded by above only? 1=yes	0.11 (0.32)
Project initiation and application		
Government initiation	Project initiated by upper-level government? 1=yes	0.23 (0.42)
Committees application	Project applied by village committees? 1=yes	0.53 (0.50)
Government application	Project applied by upper-level government? 1=yes	0.21 (0.41)
Competitive application	Other villages also applying for this type of project? 1=yes	0.5 (0.5)
Project design		
Village committees design	Project designed by the village committees? 1=yes	0.41 (0.49)
Government design	Project designed by upper-level government? 1=yes	0.37 (0.48)
Project implementation and monitoring		
Committee leading implementation	Village committees in charge of project implementation? 1=yes	0.6 (0.49)
Villager implementation	Project implemented by villagers? 1=yes	0.23 (0.42)
Government implementation	Project implemented by government agencies? 1=yes	0.51 (0.5)
Top-down monitoring	Upper-level government monitored the project? 1=yes	0.29 (0.45)
Villager participation		
Participation in size decision	Villagers were consulted about the size of the project? 1=yes	0.63 (0.48)
Participation in technical decision	Villagers were consulted about the technical aspects of the project? 1=yes	0.2 (0.4)
Project type dummies		
Road project	Road project? 1=yes	0.59 (0.49)
Drinking water project	Drinking water project? 1=yes	0.17 (0.38)
Village governance		
Direct election	Village leader directly elected by villagers? 1=yes	0.66 (0.47)
Village leadership		
Leader age	Age of village leader when taking office, year	42.2 (7.9)
Leader education	Education of village leader, year	9.32 (2.66)
Leader job	Village leader a full-time farmer before taking office? 1=yes	0.41 (0.49)
Leader experience	Village leader a cadre at the village level before taking office? 1=yes	0.64 (0.48)
Leader CPC member	Village leader a member of Communist Party of China? 1=yes	0.76 (0.43)
Secretary age	Age of party secretary when taking office, year	41.3 (7.7)
Secretary education	Education of party secretary, year	9.78 (2.27)
Secretary job	Party secretary a full-time farmer before taking office? 1=yes	0.31 (0.46)
Secretary experience	Party secretary a cadre at the village level before taking office? 1=yes	0.83 (0.38)

Appendix Table 1 Continued

Variable	Variable definition	Mean (SD)
Policy environment		
Before tax for fee	Project started before tax for fee reform? 1=yes	0.27 (0.44)
Administrative regulation index	Fraction of regulation policies that township sets on the village, 0-1	0.67 (0.3)
Fiscal regulation index	Fraction of fiscal management policies that township sets on the village, 0-1	0.9 (0.15)
Contact		
Connection	Number of fellow villagers who were born and raised up in the village and now working at government agencies	3.29 (3.35)
Other characteristics in 1997		
Per capita land	Per capita land, mu/person	2 (1.69)
Business households	Fraction of households owning family business	0.04 (0.10)
Migrant households	Fraction of households that have at least one member as migrant worker outside of the village	0.30 (0.29)
Per capita debt	Per capita debt, yuan/person	179.1 (719.5)
Remoteness	Distance from village committee to township seat, km	4.64 (3.66)

Endnotes

[1] English translations of the forms for roads, irrigation and drinking water projects are available from the authors upon request.

[2] Based on this information about the funding sources of project, we created two dummy variables: one dummy variable indicating whether a project was solely funded by village (*village funded only*, 1=yes, 0=no); the other indicating whether a project was solely funded by above (*above funded only*, 1=yes, 0=no). The survey was carried out in April, 2005. So project age was measured by the number of months lapsed from the completion of a project until April 2005. In other words, as of April 2005, how old was a project in months?

[3] With this information we created a dummy variable indicating whether a project was initiated by an official from some upper level of government (*government initiation*, 1=yes, 0=no). Three project application variables were created out of questions asked as a part of this sub-block. These are a dummy variable indicating whether a project was applied for by a village's leadership or "two committees" (*committee application*, 1=yes, 0=no); a dummy variable indicating whether a project was applied for by an official from some upper-level government unit (*government application*, 1=yes, 0=no); and a dummy variable indicating whether other villages were competing for and applying for the same type of projects at the time when our sample village was applying for the project (*competitive application*, 1=yes, 0=no).

[4] These answers allowed us to create two dummy variables, one indicating whether a project was designed by the village leadership (*committee design*) and another variable indicating whether a project was designed by an official from an upper level government unit (*government design*).

[5] By comparing the exact dates of entry and exist of village leaders again the exact start and completion date of infrastructure projects in the same village, we were able to match village leader information with projects information to find out who were in office when a project was being constructed in the village.

[6] We created our two measures of administrative regulation and fiscal oversight with information from a block in the survey instrument that asked the village leader about whether or not his/her village was subject to certain regulations/policy directives instigated from above. The three administrative regulations included: a.) whether or not townships assigned township cadres to be permanently stationed in the village (or at least visit them on a regular basis); b.) whether or not townships had village leaders on the payroll of the township; and c.) whether or not there were formal restrictions on the amount of corvee labor that villages could levy on villagers. The index ran from 0 to 0.33 to 0.67 to 1.00, depending on the number of the regulations that villages faced (i.e., the number of policies that are implemented in their villages divided by three). The three financial oversight policies were: a.) whether or not townships managed the village's accounting books; whether or not townships demanded that village accountants attended accounting training courses; and whether or not townships required villages to publicly post their village income and expenditures (and asset/debt) statements on a regular basis.

[7] The strategy here is to run a new model including project physical size in addition to total project expenditure. In doing so, we believe the coefficient on the project size variable will hold constant the economies of scale effect, leaving the "price" effect embodied in the total project expenditure variable's coefficient. Although we do not show the results, we also ran one additional model, replacing both project total expenditure and project physical size with a variable constructed as the ratio of the two (project total expenditure/project physical size), which we can call project unit cost. When doing so, we find that the coefficient is significant, giving additional support to our finding that what we are really looking at is not economies of size, but really just a price effect—if more is allocated to a project, ceteris paribus, the quality rises marginally.