Does an Elected Leader Have Incentives to Provide Public Goods with Future Returns?

Youhua Shu: Department of Ideology and Political Education, Wuhan University of Technology. 430072 Hubei Province, P.R. China
Email address: shuyouhua2002@yahoo.com.cn

Shyamal Chowdhury: Agricultural and Resource Economics, Faculty of Agriculture and Environment, University of Sydney, NSW, 2006 Australia
Email: shyamal.chowdhury@sydney.edu.au

Michael Harris: Agricultural and Resource Economics, Faculty of Agriculture and Environment, University of Sydney, NSW, 2006 Australia
Email: michael.harris@sydney.edu.au

Selected paper prepared for presentation at the International Association of Agricultural Economists (IAAE) Triennial Conference, Foz do Iguacu, Brazil, 18-24 August, 2012

Abstract

This paper examines changes in the allocation of public funds between production related public goods (PRPGs) and labour augmenting public goods (LAPGs) once elected village leaders replaced an appointment system. We derive a two-period theoretical model in which the interest of appointed leaders in short economic development leads to allocate all public resources into PRPGs in the first period. In contrast, elected leaders have greater incentives to reflect the interest of electorates by allocating public resources to maximize their two-period revenues. The model predicts that elections lead to an increase in the provision level of LAPGs and a decrease in PRPGs in the first period, if the first-period allocation equilibrium of appointed leaders is away from the allocation mix in maximization of the two-period revenues. A panel dataset of 71 villages for the period of 1993-2000 is used to examine these two predictions. The results show that the elections increased the provision level of public health (LAPGs), but had no effects on irrigation facilities and paved roads (PRPGs).

1. Introduction

Economists have devoted considerable attention to the link between governance regimes and public goods (McGuire and Olson 1996. Bueno de Mesquita, Morrow et al. 2002, Deacon 2009). It is generally argued that a non-elected leader may divert resources from the broader population to privileged and powerful elites in exchange for their support. In contrast, an elected politician may have greater incentives to appeal to a wider electoral base by providing more public goods to the majority.

Particular variables representing democracy have been identified in the literature as important to support this argument. These variables include the income sources of a ruling class (McGuire and Olson 1996), the size of the elite group relative to the population (Bueno de Mesquita et al. 2002) and the size of the group controlling power relative to the population (Deacon 2009). Given the similarity of the central concepts of these variables, it is of no surprise that all studies generate the prediction that there is a lower provision level of public good under non-democracies than that under democracies.

Although there is empirical evidence to support the prediction, several cross-country studies found that democratization led to a lower provision level of some *kinds* of public goods. An important variable neglected by the literature above may explain the puzzling findings, that is, the natural characteristics of some *kinds* of public goods which play similar role to the private goods to elites in strengthening the position of non-democratic leaders. For instance, Mulligan, Gil et al. (2004) find that the public goods such as the death penalty and military spending are positively related with non-democracy. That is because those public goods limited political competition. Lott (1999) finds that a totalitarian government spends more on public education and is more likely to have a government owned television station than a democratic government, but no such effects on public health. That is because education and a government owned television station might serve the interests of a non-elected leader by controlling information and promoting the official ideology. In contrast, public health has no such desirable property for a ruler.

More sophisticated is that the type of public goods with "right" natural characteristic in serving the interest of leaders in controlling power may vastly vary across countries, due to existing heterogeneous institutional arrangements and social-economic contexts. For instance, facing the incentive constraint stemming from unequal distribution of land ownership, village leaders in India perceive roads to serve better in strengthening their position than irrigation facilities, when the extent of democratic strength increases. However, this conclusion does not apply to China simply because the land is almost equally distributed among villagers on per capita base. In this case, within-country study may provide a useful complement or even superior approach to macro-level studies for assessing the effects of democracy on a bundle of public goods provision with varying natural characteristics. However, empirical works remain very limited in this area.

China provides a good opportunity to explore the effects of one aspect of the advent of democracy in Chinese villages, having elected leaders, on two types of public goods provision. Two types of public goods can be classified according to the roles they play in the development process, based on their inherent natural characteristics. One type of public goods is able to bring economic returns immediately after construction. Hence they are treated as the "production related public goods" (PRPGs). Examples include roads and irrigation infrastructure. Another type of public goods contributes little to short-term economic growth. It is, however, crucial to sustain the future economic growth by enhancing the future labour productivity. Theses public goods are defined as "labour augmenting public goods" (LAPGs). Public health provides one example.

China initiated experimentation with elections at the village level in the mid-1980s within a non-democratic macro political institutional setting. Prior to elections, village community leaders were appointed by the township level of governments, the lowest level of local government in the political hierarchy in China. By controlling the power to appoint village community leaders, township governments passed their preferences in fostering short-term economic development down to village community leaders.

This preference is generated from the cadre responsibility system and the characteristics of the term vested in the appointment system of local leaders.

It is reasonable to postulate that the public goods preferred by appointed local leaders would be PRPGs rather than LAPGs, due to their immediate impact on production output values, thus increasing the prospects of reappointment for appointed leaders. In contrast, it is also reasonable to postulate villagers[1] may put more weights for community-provided basic public health and less weight over paved roads and irrigation infrastructure than appointed leaders. This reasoning is based on the fact that public health was under provided by each level of governments (World Bank 1997). Previous findings show that a rural household with a major health shock on average falls short of its normal income trajectory by 11.6% within 15 years after the shock and would take 19 years for a recovery (Li et al. 2006). The long-term effects of health shocks on income would be a great concern to villagers in an environment where communities were able to receive little public health service from upper governments. Villagers may have interests in increasing public health services to reduce the possibility of a latter heath shock and the negative effects of a health shock.

The introduction of elections of local politicians allows farmers to translate their interests into votes, motivating elected leaders to make the supply of the two types of public goods closer to local preferences. Departure from the hypothesized contrasting incentives of village community leaders, the enacting of the use of popular votes for positions of leadership in rural China therefore sets up potentially interesting empirical comparisons between democratic and other non-democratic in the provision level of LAPGs and PRPGs.

The empirical study contributes to identifying an efficient local-level governance mode in China. Efficient local governance is deemed crucial for the well-being of rural residents who heavily rely on public goods supplied by village communities to make their livings (Zhang et al. 2004). The incomes of the majority are mainly from agricultural production in which irrigation facilities supplied by village communities are key public inputs. Zhang and Fan (2004) found that, in China, an increase in

investment in irrigation by 1% leads to an increase in agricultural production outputs by 0.31%. Paved roads facilitate the market transaction, thus improving the productivity of inputs in production. The elasticity of paved roads to agricultural production outputs is around 0.1 and higher for non-agricultural production outputs in rural China (Zhang and Fan 2004). The benefits of formal local government interventions in prevention and control of some chronicle diseases of targeted population at the community level have outweighed the corresponding costs in China (Tian et al. 2000; Jiang et al. 2003; Pan et al. 2005).

Given the institutional reforms in the past twenty years, rural China provides researchers an opportunity to investigate the effect of the introduction of elections at the village level on the allocation of public spending (Zhang et al. 2004; Luo et al. 2007; Wang and Yao 2007; Luo et al. 2010). Wang and Yao (2007) find that the elections led to an increase in investment on public projects and a decrease in administrative costs. Luo et al (2007, 2010) find that villages with more competitive elections (meaning village leaders are directly elected) invested more in public goods than those with less competitive elections (village leaders indirectly elected). Zhang et al. (2004) find evidence to support their hypothesis that election led to a significant shift of tax burden from households to village owned enterprises.

Wang and Yao (2007) and Luo et al (2007, 2010) do not distinguish between the varying roles of public projects in local economic development and poverty reduction. Included in the public projects are the transfers to households below the poverty line and the spending in local roads, village schools, irrigation infrastructure, public health and etc. Local roads and irrigation infrastructure have earlier been classified to be PRPGs while schools and public health be LAPGs. They do not answer the question as to the effect of elections on the provision of PRPGs and LAPGs. Zhang et al. (2004) focuses on the revenue side with less attention paid to expenditures. Key gaps identified in the literature thereby lay the foundation for an empirical analysis of the effects of the election of local government politicians in rural China on LAPGs and PRPGs.

The remainder of this paper proceeds as follows: Section 2 provides a brief description of fiscal decentralization and that of the local governance in rural China. Section 3 constructs a simple static and dynamic model that links the institutional environment with provision of PRPGs and LAPGs. Section 4 explains the data source and provides descriptive analysis. Section 5 presents the empirical model and estimation. Section 6 concludes the paper.

2. Institutional Framework and Public Goods Provision at Village Level

The motivation of local governments, including village communities, in fostering short-term economic development is a strategic reaction to political and fiscal arrangements. The central government delivered an incentive package to induce local government at each level to allocate public investment in ways intended to contribute to economic growth. Fiscally, it linked local expenditures with local revenues. Politically, it linked the career potential of appointed local leaders with local economic performance. A set of criteria was applied to assess local leaders' performance, in which economic development within their term was assigned the highest weights. Although village communities are not formally recognized as local governments in the Chinese political hierarchy, incentives to promote economic development were still passed down from township through two channels prior to elections, namely, the power to make appointments (O'Brien and Li 1999; Wang and Yao 2007) and to set salaries based on village revenues (Whiting 2001).

During the period from the mid-1980s to 1998, the appointment system at village level coexisted with an experimental electoral system. The enactment of the Organization Law for the Village Committees in 1998 formalized village autonomy. The main responsibilities of village committees did not change with the advent of elections.

There were no regulations on the duties of village communities on the provision of basic public health services during the 1990s. However, the *Regulations on Peasant Burden and Management of Labour* encouraged primary public health services at village level to be financed by public welfare funds. This is because the central

government did not replace the CMS with a new financial system after the introduction of the household responsibility system (HRS) in 1978 (World Bank 1997). Furthermore, government funds allocated to public health declined throughout the 1990s (Liu 2004). As a consequence, rural areas received little public health services from the country and township.

Public health financing schemes at village level have greatly varied across provinces over the 1990s. The World Bank (1997) reported that approximately 12% of Chinese villages in five provinces remained with the CMS in 1991. Of other villages, some provided financial assistance for farmers who could not afford to pay for health services, and some provided buildings, equipment or variable funds to collectively owned or privately owned village clinics, and some subsidized preventive services at village clinics (Meng et al. 2000). Many villagers also completely depended on personal finances for both preventive and curative services.

A survey conducted by the authors in 2008, described in section 4, also shows that investment in public health services varied widely across villages. Around 50% of sample villages (58 villages with information on village investment in public health) did not have any outlays on public health from 1993 to 2000. Of them, the ratio reached as high as 100% in Yunnan province and 80% in Guangdong provinces. Interestingly, these two provinces were the last two to introduce the electoral system into villages in their administrative areas. In the three provinces that led the introduction of elections, Liaoning, Shandong and Hubei, around one third of sample villages did not have any investment in public health. For those villages that had any spending on public health, investment (standardized to per capita monetary units based on 1978) also varied from ¥0.007 to ¥3.28. Figure 1 shows average per capita investment in public health remained relatively stable with around ¥0.20 per person throughout the sample period.

[Insert Figure 1 about here]

Similarly, there was no institutional arrangement for financing construction and maintenance of within-village roads by each level of government in the 1990s. However, the *Regulations on Peasant Burden and Management of Labour* encouraged paved roads to be financed by public welfare funds. Figure 1 reports the average of accumulated length of paved roads based on per capita basis within villages according to the survey data. The accumulated length of paved road witnesses a significant increase from 7 meters in 1993 to 20 meters in 2000.

In comparison, providing maintenance of irrigation infrastructure is one of the key duties for village communities. Public investment in irrigation is reported in Figure 1, based on the data from the National Fixed-Point Survey (NFS) conducted by the Research Center of Rural Economy, the Ministry of Agriculture, China. Irrigation investment fluctuated over the sample period. It decreased from ¥5.8 in 1993 to ¥3.8 in.1995, followed by an increase until it reached the peak of ¥7.6 in 1998. In the next two years, there was a mild decrease.

4. The model

4.1 Two Types of Public Goods: PRPGs and LAPGs

Assume that there are two types of public goods, denoted Q_1 and Q_2, financed by local taxes. Also assume the lifespan of local residents last for two periods. Denote the first period t and the second period $t+1$. Further, term the first period the short run and the two periods combined constitute the long run. The first type of public good, Q_1, is interactive with private inputs to generate revenues to a resident in two periods, and is labelled as PRPGs. The second type of public good, Q_2, contributes to production through improving labour productivity in the second period, and is referred to as LAPGs. Villager-voters are assumed to be able to receive an equal share of returns of PRPGs and LAPGs.

In this study, LAPGs are specialized to public health services. Those public health services consist of some preventive public health programs and health insurance which covers regular health check in the first period. Curative public health for illness

which affects labour productivity in the first period is not considered in the first period, since appointed leaders at each level of government are postulated to have an interest in providing such services. LAPGs in the second period include curative public health service while preventive public health is not considered. That is because there is no need for preventive public health in the last period of local residents. Q_2 provided in period one is assumed to have no effects on labour productivity in that period, but is more effective in improving labour productivity in period two than that provided in the second period. In contrast, Q_2 provided in period two is assumed to have immediate impacts on labour productivity in that period.

The assumption regarding Q_2 provided in period one can be explained by the different roles that some preventive public health programs and health insurance play in the two periods. When a person is healthy and in an environment where the risk of outbreak of epidemic is lower in the first period, some preventive public health services may have little contribution to his productivity. Examples include public health education campaigns on quitting tobacco consumption and public health services for controlling infections in the local community. However, education on quitting tobacco consumption plays an important role in strengthening a person's belief in the long term benefits of quitting smoking, such as lower possibility of lung cancer and other smoking related diseases. In the same way, controlling infection in the local community is crucial for managing the risk at a low level, thus greatly reducing the possibility of outbreak of epidemics in the second period. In other words, insufficient public health service provision in the first period increases the likelihood that a villager will have a health shock in the second period[1]. When the health shock hits villagers in the second period, more resources will then be required to fully or partially recover from that health shock than what would have been required for the provision of preventive public health services in the first period.

[1] To simplify the analysis, we do not introduce the uncertainty of a health shock or outbreak of epidemics into the model. That is because it would not affect the main results of the model. In the model in presence of uncertainty, a voter will compare the maximized expected value of outputs in two periods with the sum of maximized short term value of outputs in each period. The condition can be derived upon which more LAPGs will be provided under the electoral system than that in the appointment system. The condition is the expected marginal product of LAPGs in the second period is greater than that of PRPGs in two periods. This result, in essence, is the same as that of the model presented in this chapter.

Public health insurance schemes have the same contribution to labour productivity in the two different periods as preventive public health services. Health insurance assists a person to get earlier diagnosis and treatment of illness. If an illness is left untreated in the first period, there is greater likelihood that the illness will develop into a more severe one in the second period than if it was treated. In the second period, more resources then will be required to fully or partially recover from severe illness than would have been required to treat less severe illness in the first period.

Assume that a local community has initial physical privately owned capital K_t and effective human capital $e_t L_t$ in the first period. K_t is assumed to be exogenous to village leaders. L_t is the quantity of labourers in a community and $e_t > 0$ is the labour quality indicator in the first period. e_t is assumed to be the highest level of labour quality in the lifetime of a villager. Q_{2t} has no effects on labour quality in the first period and, therefore, does not enter into the production function in that period.

In comparison, Q_1 works as an input or an intermediate input in the production function in both periods. Let the production function in the two periods take the form of Cobb-Douglas production function.

4.2 Production Function in the First Period

Normalizing the quantity of labourers in the community L_t to be unity, the production function in the first period can be represented by

$$Y_t(A_t, Q_{1t}, K_t) = A_t Q_{1t}^{\alpha} e_t^{\beta} K_t^{1-\alpha-\beta} \tag{1}$$

where Q_{1t} is PRPGs provided in the first period. A_t is the total factor productivity in the first period.

4.3 Production Function in the Second Period

Assume that there is only one generation, that is, no population growth between the two periods. Normalizing the quantity of the labourers in the second period to be unity. In contrast, labour productivity in the second period is affected by public investment in Q_2 in both periods. Denote $e_{t+1}(Q_{2t}, Q_{2,t+1})$ as the labour quality function in period two. Labour quality is only affected by health shock. Health shock occurred in the second period is incurred by an insufficient provision level of Q_{2t}. A sufficient provision level of Q_{2t} is defined to be the level of health intervention which just effectively controls the risk of health shock beyond the critical point of outbreak. Denote the sufficient provision level of Q_{2t} by $\bar{Q}_{2t}$. When $\bar{Q}_{2t}$ is provided, no health shock occurs in the second period. Labour quality remains at e_t.

Furthermore, villagers do not have any interest in the provision level of Q_{2t} exceeding $\bar{Q}_{2t}$. That is because the quantity exceeding $\bar{Q}_{2t}$ has no influences in improving labour quality. In this paper, $\bar{Q}_{2t}$ is assumed to be a constant and is known to both villagers and leaders.

Labour quality is affected by health shock in the second period, if the provision level of public health in the first period is lower than its sufficient level. Given $Q_{2t} < \bar{Q}_{2t}$, the loss of labour quality due to health shock in the second period is assumed to be linearly negatively associated with the first-period provision level of public health services. That is, when more Q_{2t} is provided, illness would be less severe which, consequently, leads to a lower level of loss of labour quality. There is no loss of labour quality when $Q_{2t} = \bar{Q}_{2t}$. The loss of labour quality can be assumed to reduce at the rate of $1 - \frac{Q_{2t}}{\bar{Q}_{2t}}$.

In contrast, public health services in the second period provides a remedy to labour quality after health shock, when $Q_{2t} < \bar{Q}_{2t}$ is provided. Assume that there is a

sufficient investment level $Q_{2,t+1}$ which treats a sick person to a full recovery to e_t[2] if $Q_{2t} = 0$. Denote that sufficient investment level for a full recovery from health shock by $\bar{Q}_{2,t+1}$.

For the same rationale as Q_{2t}, investment over a sufficient level $\bar{Q}_{2,t+1}$ does not improve labour quality in the second period. Thus, the quantity of investment exceeding a sufficient level is not desirable for villagers. Assume that one unit of $Q_{2,t+1}$ is less effective than Q_{2t} in maintaining labour productivity in period two. This assumption implies $\bar{Q}_{2t} < \bar{Q}_{2,t+1}$.

For any $Q_{2t} < \bar{Q}_{2t}$, the loss of labour quality is assumed to decrease after treatment in the second period. That is, the more $Q_{2,t+1}$ is provided, the lower level of loss of labour quality after treatment would be. Assuming that the loss of labour quality after treatment reduces at a rate of $\frac{Q_{2,t+1}}{\bar{Q}_{2,t+1}}(1-\frac{Q_{2t}}{\bar{Q}_{2t}})$. When $Q_{2t} = \bar{Q}_{2t}$, there is no necessity to invest in public health in the second period, that is, $Q_{2,t+1} = 0$.

In sum, the loss of labour quality in the second period consists of two parts: firstly, labour productivity reduces by $(1-\frac{Q_{2t}}{\bar{Q}_{2t}})e_t$ if health shock occurs but there is no treatment; secondly, treatment in the second period reduces the loss of labour productivity by $\frac{Q_{2,t+1}}{\bar{Q}_{2,t+1}}(1-\frac{Q_{2t}}{\bar{Q}_{2t}})e_t$. The loss of labour quality, therefore, can be represented as a function of investment in public health in two periods. Denote this function by $I(Q_{2t}, Q_{2,t+1})$:

[2] This assumption may not reflect two scenarios. In the first scenario, a person with some diseases can not be treated with infinite treatment and therefore, totally lost their labour productivity. In the second scenario, a person with some diseases can be partially recovered with infinite treatment. As a consequence, the marginal product of Q_{2t} would be greater in these two scenarios than the scenario created in the study. This implies taking these two scenarios into the model would strengthen the conclusion.

(2) $$I(Q_{2t}, Q_{2t+1}) = (1 - \frac{Q_{2t}}{\bar{Q}_{2t}})e_t - \frac{Q_{2,t+1}}{\bar{Q}_{2,t+1}}(1 - \frac{Q_{2t}}{\bar{Q}_{2t}})e_t = (1 - \frac{Q_{2t}}{\bar{Q}_{2t}})(1 - \frac{Q_{2,t+1}}{\bar{Q}_{2,t+1}})e_t$$

Therefore, the second-period effective human capital affected by investment in two periods can be obtained by subtracting the loss of human capital in the second period from effective human capital in the first period. This can be represented as follows[3]:

(3) $$e_{t+1}(Q_{2t}, Q_{2t+1}) = e_t - (1 - \frac{Q_{2t}}{\bar{Q}_{2t}})(1 - \frac{Q_{2,t+1}}{\bar{Q}_{2,t+1}})e_t$$

Denote $a = \frac{1}{\bar{Q}_{2t}}$, $b = \frac{1}{\bar{Q}_{2,t+1}}$ and $a > b$. Equation (3) can be rewritten as follows:

(4) $$e_{t+1}(Q_{2t}, Q_{2t+1}) = e_t - (1 - aQ_{2t})(1 - bQ_{2,t+1})e_t$$

The stock of Q_1 in both periods will enter into the production function in the second period. It can be represented simply as the aggregate level of Q_1:

(5) $$TQ_1 = Q_{1t} + Q_{1,t+1}$$

Villagers are assumed to be able to adjust their investment in privately owned capital in two periods to pursue maximized outputs, given effective human capital and Q_1. Assume the additive rule also applies to the privately owned physical capital. That is:

(6) $$TK = K_t + K_{t+1}$$

[3] The depreciation rate of Q_1, Q_2 and privately owned capital is ignored, or equivalently the depreciation rate is taken to be zero

Denote the total factor productivity in the second period by A_{t+1}. The production function in the second period is therefore given by:

$$Y_{t+1}\{A_{t+1},(Q_{1t}+Q_{1,t+1}),(K_t+K_{t+1}),[e_t-(1-aQ_{2t})(1-bQ_{2,t+1})e_t] \tag{0.7}$$

$$= A_{t+1}(Q_{1t}+Q_{1,t+1})^{\alpha}[e_t-(1-aQ_{2t})(1-bQ_{2,t+1})e_t]^{\beta}TK^{1-\alpha-\beta}$$

Assume in both governance regimes there are two candidates to compete for the office position. In the appointment system, two candidates offer their policy platforms to their upper governments. In contrast, candidates would offer the policy platform to local voters in the electoral system. Leaders hold office only for a single period under both governance regimes. However, they can be re-elected or reappointed for the second period if they continue to offer the best policy platform for their respective selectorate at the end of the first period. Also assume that in both systems local leaders are credibly able to allocate public funds between the two types of public goods within their tenures according to their policy platform. Further assume that local governments run a balanced budget. Candidates possess the information regarding the stock of the human capital and the physical capital within their communities in each period in both governance regimes. Upper governments and local resident-voters clearly understand the effects of policy platforms on their well-being.

For simplicity, let the utility function of both leaders and villager-voters linearly depend on the production outputs[4]. Also assume that local governments have initial endowments M_0 at the beginning of the first period. Normalize the price of the outputs and of the public inputs in two periods to be unity.

[4] Any other utility that a farmer derives from consumption of LAPGs, for instance, the happiness associated with pain relief after treatments is ignored. Ignoring the utility derived from consumption of public health does not materially affect the results. Rather, it would strengthen the conclusion.

4.4 Allocation of Q_1 and Q_2 in the First Period

4.4.1 Under the Appointment System

The tax revenues at the end of the first period are assumed to be the only factor determining the appointment prospect of a candidate at the initial point of the first period. Since only Q_{1t} can generate tax revenues in the first period, candidates would offer their policy platform that allocating all the initial endowments M_0 to Q_1 to maximize the tax revenues in the first period. By offering the policy platform of $Q_{1t}^{a*} = M_0$, $Q_{2t}^{a*} = 0$, a candidate is appointed and allocates the entire budget M_0 to Q_1.

4.1. 2 Under the Electoral System

Under the electoral system, the objective of a candidate is to maximize votes. A villager-voter, as a rational agent, would demand a bundle of public goods to maximize his lifetime income, rather than the short term income. Without considering other attributes of candidates unrelated to the interests of villager-voters, the following necessary condition must be satisfied so that a voter would vote for a candidate: his lifetime income generated from a candidate's policy platform is maximized.

Assume that all villager-voters have identical production functions exhibiting constant returns to scales. Denote the discount rate as r. The total value of outputs over the lifetime of all voters can be represented by $Y = Y_t + \frac{Y_{t+1}}{1+r}$. When $Q_{2t} \le \bar{Q}_{2t}$ and $Q_{2,t+1} \le \bar{Q}_{2,t+1}$, the discounted value of production outputs in the two periods can be written as follows:

$$(8)\quad \sum_{i=t}^{t+1} Y_i = A_t Q_{1t}^{\ \alpha} K_t^{1-\alpha-\beta} + \frac{A_{t+1}(Q_{1t} + Q_{1,t+1})^{\alpha}[e_t - (1 - aQ_{2t})(1 - bQ_{2,t+1})e_t]^{\beta} TK^{1-\alpha-\beta}}{1+r}$$

By using backward induction, candidates are able to derivate a locality's demands on the two types of public goods in the first period, given all the parameters and the form of production function are known. This can be done in two steps: the first step is to derive the relationship between the optimal provision bundle in period two for maximization of the outputs in that period and any arbitrary provision bundle in period one, as well as the resultant tax revenues (budget) at the end of the first period. The second step is to derive a locality's demands on LAPGs and PRPGs in the first period either directly by following the assumption or by inserting such relationship into the function (8) to derive the local demands for the two types of public goods in the first period.

By any arbitrary provision level of Q_{1t} and Q_{2t}, the value of outputs at the end of the first period would be $Y_t(A_t, Q_{1t}, K_t)$. Denote τ the tax rate. The budgets of local governments are thus $\tau Y_t(Q_{1t})$. Maximization of the value of outputs in this period is obviously of interest to villager-voters because it is their last period of life. This can be represented by:

$$(9) \qquad \underset{Q_{1,t+1}, Q_{2,t+1}}{Max} \frac{A_{t+1}(Q_{1t} + Q_{1,t+1})^{\alpha}[e_t - (1 - aQ_{2t})(1 - bQ_{2,t+1})e_t]^{\beta} TK^{1-\alpha-\beta}}{1 + r}$$

Subject to the resources constraint function:

$$(10) \qquad Q_{1,t+1} + Q_{2,t+1} = \tau Y_t(Q_{1t})$$

and the constraint that the provision level of $Q_{2,t+1}$ is no more than the sufficient level of $\bar{Q}_{2,t+1}$:

$$(11) \qquad Q_{2,t+1} \leq \bar{Q}_{2,t+1}$$

Constructing the Lagrange function and solving the first order conditions based on the derivatives with respect to Q_{1t+1}, Q_{2t+1} and Lagrange multipliers λs yields:

$$\frac{\alpha}{Q_{1t}+Q_{1,t+1}}Y_{t+!}=\lambda_0$$

$$\frac{\beta b(1-aQ_{2t})}{aQ_{2t}+bQ_{2,t+1}-aQ_{2t}bQ_{2,t+1}}Y_{t+!}=\lambda_0+\lambda_1 \tag{12}$$

$$\lambda_1 \geq 0, \quad \lambda_1(Q_{2,t+1}-\overline{Q}_{2,t+1})=0, \quad Q_{2,t+1}\leq \overline{Q}_{2,t+1}$$

Solving (12) yields the following solutions:

Case one: $\lambda_1 > 0$

There is a corner solution in this case: $Q_{2,t+1}^{v*}=\overline{Q}_{2,t+1}$ and $Q_{1,t+1}^{v*}=\tau Y_t(Q_{1t})-Q_{2,t+1}^{v*}$. This arises because the second-period marginal product of period two investment in LAPGs is greater than the second-period marginal product of period two investment in PRPGs at this point, given any arbitrary provision level of LAPGs and PRPGs in the first period. In this case, the effective human capital in the reality is not sufficient to make the marginal products of human capital equals that of PRPGs. Such insufficiency is not incurred by public investment. Instead, it is incurred by the quantity of the labourers in the second period in our model.

The provision level of LAPGs in the first period would be straightforward, that is, $Q_{2t}^{v*}=0$ and $Q_{1t}^{v*}=M_0$. The reason is that if $Q_{2,t+1}^{v*}=\overline{Q}_{2,t+1}$ is the solution in maximization of the second period revenues, there would be no necessity to provide positive LAPGs in the first period. It leads to no differences in policy outcomes of the two types of public goods between the two governance regimes in the first period.

Case two: $\lambda_1 = 0$

There are two possible solutions:

Solution 1: $Q_{2,t+1}^{v*} = \bar{Q}_{2,t+1}$ and $Q_{1,t+1}^{v*} = \tau Y_t(Q_{1t}) - Q_{2,t+1}^{v*}$

This is also a corner solution: $Q_{2,t+1}^{v*} = \bar{Q}_{2,t+1}$ and $Q_{1,t+1}^{v*} = \tau Y_t(Q_{1t}) - Q_{2,t+1}^{v*}$. In this case, the second-period marginal product of period two investment in LAPGs is equivalent to that in PRPGs at this point, given any arbitrary provision level of LAPGs and PRPGs in the first period. The provision level of LAPGs in the first period would also be straightforward, that is, $Q_{2t}^{v*} = 0$ and $Q_{1t}^{v*} = M_0$, for the same reason as that in case one. It leads to no differences in policy outcomes of the two types of public goods between the two governance regimes in the first period.

Solution 2: $Q_{2,t+1}^{v*} < \bar{Q}_{2,t+1}$ and $Q_{1,t+1}^{v*} = \tau Y_t(Q_{1t}) - Q_{2,t+1}^{v*}$

where

$$(13) \qquad Q_{1,t+1}^{v*} = \frac{\alpha\tau}{\alpha+\beta} Y_t(Q_{1t}) - \frac{\beta}{\alpha+\beta} Q_{1t} + \frac{\alpha}{b(\alpha+\beta)(1-aQ_{2t})} - \frac{\alpha}{b(\alpha+\beta)}$$

$$(14) \qquad Q_{2,t+1}^{v*} = \frac{\beta\tau}{\alpha+\beta} Y_t(Q_{1t}) + \frac{\beta}{\alpha+\beta} Q_{1t} - \frac{\alpha}{b(\alpha+\beta)(1-aQ_{2t})} + \frac{\alpha}{b(\alpha+\beta)}$$

Next, a locality's demands on LAPGs and PRPGs in the first period under this solution can be derived by following the procedures below:

Knowing how the optimal $(Q_{1,t+1}^{v*}, Q_{2,t+1}^{v*})$ varies with Q_{1t} and Q_{2t}, local leaders would insert $\{Q_{1,t+1}^{v*}[Q_{1t}, Y_t(A_t, Q_{1t}, K_t), Q_{2t}], Q_{2,t+1}^{v*}[Q_{1t}, Y_t(A_t, Q_{1t}, K_t), Q_{2t}]\}$, as presented in equations (13) and (14), into (8) to derive the optimal Q_{1t} and Q_{2t} to maximize the

aggregate discounted output value over the two periods, subject to the initial endowments M_0 , non-negativity condition $Q_{2t} \geq 0$ and the constraint that the provision level of Q_{2t} is no greater than its sufficient level $\overline{Q}_{2t}$.

(15)

$$\underset{Q_{1t},Q_{2t}}{Max}: \sum_{t=1}^{2} Y_t = A_t Q_{1t}^{\alpha} K_t^{1-\alpha-\beta} + \frac{A_{t+1}(Q_{1t} + Q_{1,t+1}^{v*})^{\alpha}[e_t - (1 - aQ_{2t})(1 - bQ_{2,t+1}^{v*})e_t]^{\beta}(TK)^{1-\alpha-\beta}}{1+r}$$

$$s.t \quad Q_{1t} + Q_{2t} = M_0$$

(16) $$Q_{2t} \geq 0$$

$$Q_{2t} \leq \overline{Q}_{2t}$$

Constructing the Lagrange function and solving the first order conditions based on the derivatives with respect to Q_{1t} , Q_{2t} and Lagrange multipliers μs yields

$$\frac{\alpha}{Q_{1t}} Y_t + \{\frac{\alpha b(\tau \frac{\partial Y_t}{\partial Q_{1t}} + 1)(1 - aQ_{2t})}{[b(1 - aQ_{2t})\tau Y_t(Q_{1t}) + b(1 - aQ_{2t})Q_{1t} + aQ_{2t}]}$$

(17) $$+ \frac{\beta^2 b(\tau \frac{\partial Y_t}{\partial Q_{1t}} + 1)(1 - aQ_{2t})}{\beta b(1 - aQ_{2t})\tau Y_t(Q_{1t}) + \beta b(1 - aQ_{2t})Q_{1t} + (\beta - \alpha)aQ_{2t}}\} \frac{Y_{t+1}}{1+r}$$

$$= \mu_1$$

$$\{\frac{\frac{\alpha a}{(1-aQ_{2t})}}{[b(1-aQ_{2t})\tau Y_t(Q_{1t})+b(1-aQ_{2t})Q_{1t}+aQ_{2t}]}$$

$$+\frac{\beta^2 a\{1-b\tau Y_t(Q_{1t})-bQ_{1t}\}}{\beta b(1-aQ_{2t})\tau Y_t(Q_{1t})+\beta b(1-aQ_{2t})Q_{1t}+(\beta-\alpha)aQ_{2t}}\}\frac{Y_{t+1}}{1+r} \quad (18)$$

$$=\mu_1-\mu_2+\mu_3$$

$$\mu_2 Q_{2t}=0,\quad \mu_2\geq 0,\quad Q_{2t}\geq 0,\quad Q_{1t}+Q_{2t}-M_0=0$$

$$\mu_3(Q_{2t}-\bar{Q}_{2t})=0,\quad \mu_3\geq 0,\quad Q_{2t}\leq \bar{Q}_{2t} \quad (19)$$

Solving equation (17), (18) and (19) yields the following solutions[5]:

Case one: $\mu_2>0$, $\mu_3=0$

There is a corner solution in this case: $Q_{2t}^{v*}=0$ and $Q_{1t}^{v*}=M_0$. That is because the discounted second-period marginal product of period one investment in LAPGs is less than the aggregate of the discounted marginal products in the two periods of period one investment in PRPGs at the point:

$$Q_1^{v*}=\{M_0, Q_{1,t+1}^{v*}[M_0, Y_t(A_t, M_0, K_t)]\}$$

$$Q_2^{v*}=\{0, Q_{2,t+1}^{v*}[M_0, Y_t(A_t, M_0, K_t)]\} \quad (20)$$

[5] Since the nominator in equation (18) shows that $Q_{2t}^{v*}\neq\bar{Q}_{2t}$, there is no need to consider the case $\mu_3>0$. Noteworthy, here, is that $Q_{2t}^{v*}\neq\bar{Q}_{2t}$ may not be consistent with the reality where local government may provide a sufficient level of public health in the first period. This result arises because of the way that this study defines the response of the effective human capital to the provision level of public health in the two periods. Since the focus of the study is on the differences in the provision level of LAPGs and PRPGs between the two governance regimes, $Q_{2t}^{v*}\neq\bar{Q}_{2t}$ would not affect the results.

In this case, provision of positive Q_{2t} brings less long term revenues. It leads to no differences in policy outcomes of the two types of public goods between the two governance regimes in the first period.

Case two: $\mu_2 = 0$, $\mu_3 = 0$

There are two possible solutions: $Q_{2t}^{v*} = 0$, $Q_{1t}^{v*} = M_0$ and $Q_{2t}^{v*} > 0$, $Q_{1t}^{v*} < M_0$

Solution 1: $Q_{2t}^{v*} = 0$, $Q_{1t}^{v*} = M_0$

This is also a corner solution. In this case, the aggregate of the discounted marginal products in the two periods of period one investment in PRPGs equal the discounted second-period marginal product of period one investment in LAPGs if all public resources are allocated to PRPGs in the first period. That is to say, the solution $Q_{2t}^{v*} = 0$, $Q_{1t}^{v*} = M_0$ satisfies the condition for maximization of the long term revenues of local resident-voters. Therefore, no local preferences for Q_{2t} make candidates propose to allocate all funds to Q_{1t}.

Solution 2: $Q_{2t}^{v*} > 0$, $Q_{1t}^{v*} < M_0$

This arises because the aggregate of the discounted marginal products in the two periods of period one investment in PRPGs are less than the discounted second-period marginal product of period one investment in LAPGs if all public resources are allocated to PRPGs. The consequence of $Q_{2t}^{a*} = 0$, as an appointed leader would do, is that the long term revenues are not maximized.

Summarizing the analysis above delivers the Proposition 4.1:

Proposition 4.1:

1. The allocation equilibrium of elected leaders is at the point upon which the two-period income of villager-voters would be maximized. This allocation equilibrium makes

the aggregate of the discounted marginal products in the two periods of period one investment in PRPGs is equal to the discounted second-period marginal product of period one investment in LAPG.

2. Elections in the first period lead to a higher provision level of Q_{2t} and a lower provision level of Q_{1t} than those in the appointment system if:

the allocation of equilibrium of appointed leaders in the first period results in the aggregate of the discounted marginal products in the two periods of period one investment in PRPGs being less than the discounted second-period marginal product of period one investment in LAPG.

5. Data and descriptive analysis

The data for this study come from two major sources: one of these is the NFS conducted by the Research Center of Rural Economy, the Ministry of Agriculture, China, and a primary survey that the authors conducted. The details about the NFS data can found in Wang and Yao (2007). The NFS started in 1984 and covers more than 300 villages and over 20,000 households in 30 provinces. The sub-sample from the NFS dataset used in this study provides information for 73 villages in six provinces for the period between 1993 and 2000, excluding 1994. The 73 villages include all the villages in the six provinces in the NFS dataset. The provinces are representative of China in terms of both the geography and the level of economic development. The most developed provinces include Liaoning (North), Shandong (East) and Guangdong (South). Two provinces, namely Yunnan (South) and Gansu (West), are the least developed. Hubei (Central) falls between the above two. The village-level data contains information regarding public finances by different sources

and outlays and village characteristics.

For data on elections in each of the 73 villages that was not available in the NFS and other secondary sources, the authors conducted a matching retrospective survey in 2008. Two villages could not be identified since the population and land areas in the successive years changed unusually without any outside shock. Of the 71 villages, 58 village heads or accountants provided information concerning the starting year and frequency of the elections from 1986 to 2000, as well as the investment in public health and paved roads during the period 1993-2000. The remaining 13 villages did not provide such information.

It is postulated that village accountants and village heads do not have incentive to report the unreliable data on investment in public health. The outlays on public health seem to be an insensitive topic to leaders since provision of public health services benefits a community rather than leaders themselves. Secondly, villages usually have accounting records for their public finance. Regarding paved intra-village roads, they are measured by accumulated length of roads by a year, rather than monetary units. The length of paved roads is observable and thus leaders or accountants do not have incentive to report unreliable data. The information on investment in irrigation for the 73 villages is available from the NFS sub-sample dataset.

The information from the two data sources has been matched. Therefore, the sample used in this study includes 71 villages for the period 1993-2000, with several missing values in some years. The missing values in the NFS occurred mainly because some villages were added to the panel and some villages were dropped in some years. The information regarding why this occurred is not available to us.

5.1 Two Types of Public Goods

The public goods considered here include intra-village paved local roads, irrigation facilities and public health services. All the public goods considered here were self financed by villages. Construction or maintenance of those small-scale public goods

can be completed within the tenure of a leader. The data regarding the net yearly investment in the irrigation infrastructure are drawn from the NFS. The net length of the paved roads in each year and the net yearly investment in public health are acquired from the matching survey. Irrigation and public health are standardized to per capita monetary units (based on 1978). The net paved local roads are standardized to net per capita metres owned in a village.

Table 1 presents the descriptive statistics of all the three public goods in the villages with elections and without. Compared with the villages without elections, the villages with at least one round of elections had a lower net yearly investment in paved local roads, but a higher net yearly investment in irrigation and public health, on average.

[Insert Table 1 about here]

5.2 Election

Provinces seem to be the major decision makers in the timing of the elections. Of 58 villages with information regarding starting year of the elections during the sample period, 42 villages (over 70% of sample villages) had introduced elections by the year 1993. All of these 42 villages are located in four provinces, namely, Liaoning, Shandong, Hubei and Gansu. Only one village in Liaoning first held an election in 1998 and one in Gansu in 1997. No election was held in the remaining14 villages located in Guangdong and Yunnan until the enactment of the Organization Law for Village Community in 199812. However, it is unknown why some provinces went ahead with the introduction of elections while others were left behind. Guangdong is one of the richest provinces in China but was the last one to introduce elections, only one year ahead of Yunnan province, one of the poorest provinces. In contrast, Shandong and Liaoning, the richest provinces, were the first ones to introduce elections. Gansu, one of the poorest provinces, introduced elections at almost the same time as Shandong and Liaoning. It seems that the introduction of elections had little to do with the level of economic development, at least at the provincial level. Figure 2 presents the cumulative number and percentage of villages that introduced

elections over the period from 1986 to 2000.

6. Empirical Estimation

The proceeding discussion has shown that the introduction of elections depends more on the decision of provincial government. Therefore, it appears to be appropriate to use an estimation model which simultaneously controls for village random effects and provincial fixed effects o estimate the effects of the elections. The provincial fixed effect serves to control for unobservable provincial characteristics that may simultaneously determine both the investment behaviour and the introduction of elections in the villages within a province. This is particularly important for obtaining unbiased estimates of the effects of election as the introduction of elections might be correlated with unobserved provincial characteristics. Examples of unobserved province characteristics include the personal relationship between provincial leaders and the Ministry of Civil Affairs, the fondness of provincial leaders for democracy and leaders' efforts and capacity. Village random effects is to control for the remaining unobservable random village effects by assuming they are uncorrelated with election dummies and other explanatory variables. For public good j, the specification for the empirical estimation takes the following form:

$$(21) \quad Y_{it}^{j} = \lambda_0^j + \lambda_1^j e_{it} + P_{it}\lambda_2^j + Q_{it}^j \lambda_3^j + \sum_{n=1}^{5} \beta_n^j D_n + \upsilon_i^j + \nu_{it}^j$$

Y_{it}^{j} is the yearly net investment in the public good j on per capita basis at village i in year t, when j represents public health or irrigation facilities. It is the net length of per capita paved local roads at village i in year t, when j represents the paved local roads. e_{it}, P_{it} and Q_{it}^{j} are observable variables, explained below. D is a province dummy. One province, namely, Gansu, serves as a base, against which provincial differential effects are measured. D equals one when village i is in the province n, and is otherwise zero. β_n^j is the coefficient for the province n. $\lambda^j s$ are coefficients for the corresponding independent variables. υ_i^j is the village random effects and ν_{it}^j the idiosyncratic error term.

e_{it} is the dummy variable for an election at village i in year t, the primary explanatory variable. It takes the value one when the village i in year t has introduced at least one round of elections, and equals zero if it has not held any. According to the model, the sign of its coefficient λ_1 is predicted to be negative for public investment in irrigation facilities and the length of paved local roads. In comparison, the sign for public health is predicted to be positive.

P_{it} is a vector of control variables. These include per capita village tax (fees) revenues available to a village, per capita income, total number of households, the length of time after the introduction of elections and a dummy variable for the presence of VOEs. The first three are in logarithms. Per capita village tax revenues control the size of the village finances. Evidence shows that a larger Chinese village public finances are more likely to increase the extent of competition in elections (Oi and Rozelle 2000). Per capita net income accounts for the level of village economic development. Demands for public goods are more likely to increase as incomes increase. The total number of households represents the village size. Its sign depends on whether increases in administrative costs outweigh decreases in unit costs of public good provision as the village size increases, as postulated by Zhang (2004). The length of time after the introduction of elections in a village is used to capture the effects of a period of time on LAPGs and PRPGs. Although appointed leaders may overinvest in PRPGs at the expense of LAPGs, a period of time itself may correct that overinvestment in PRPGs and underprovision of LAPGs. The effects of elections on the two types of public goods may be exaggerated since election dummy variables may pick up that effect of time, if the time effects are not accounted for. A dummy variable for VOEs takes the value one if there is at least one VOE, zero otherwise. The accounting profits and fees from VOEs were regulated to provide public goods. Therefore, villages with at least one VOE are more likely to provide more public goods, in comparison with those without.

Q_{it}^{j} is a vector which includes variables to capture local preferences for each public good. There are two possible proxies for local preference for paved roads: distances from a village to main roads and whether villages are in the city outskirts. Demands for intra-village roads in a village with longer distances to main roads may be higher than that in a village with short distances. Villages closer to cities are more likely to have better access to paved roads, therefore, their preferences for roads would be lower than the remote villages. For irrigation facilities, two ratios imply the extent to which villages depend on agriculture: the ratio of the incomes from agriculture in the previous year and the ratio of the agricultural arable land to the total land. Demand for irrigation facilities is more likely to increase as the extent of dependence on agriculture goes up. Infant mortality rate is a relatively good indicator for local interests in public health services. One of the main duties of village-owned health stations is to provide basic reproductive services. Consequently, a higher rate of infant mortality can be interpreted as insufficient public heath facilities and doctors, indicateing higher local preferences for public health. Village random estimation results are reported in Column (1), (3) and (5) in Table 2.

[Insert Table 2 about here]

There are two concerns of the linear estimation of the effects of elections. Firstly, it is observed that 44% of the observations of public investment in irrigation, 64% of observation of public health and around 88% of observations of local paved roads in the sample take the value zero. This indicates some sample villages did not invest in some or all of the three public goods in some years. This is possibly because allocating no funds (a corner solution) to some or all the public goods is an optimal solution to maximize the benefits of village leaders. Secondly, random effects estimation may produce negative predicted values of investment in irrigation and in paved local roads since the signs of election dummy variables in these two public goods are predicted to be negative. The existence of zero public investment in the three public goods, therefore, reveals a possible nonlinear relationship between public investment and the independent variables. In order to capture such nonlinear relationship, random effects Tobit models are applied to estimate the effects of

elections on public goods provision. Village random effects Tobit model takes the following form:

$$
\begin{aligned}
& Y_{it}^{j} = \max(0, X_{it}^{j}\delta^{j} + \zeta_{i}^{j} + \varsigma_{it}^{j}) \\
\textbf{(22)} \qquad & \qquad\qquad t = 1993,1995....,2000\,,\ i = 1,2.....,71 \\
& \varsigma_{it}^{j} \mid X_{i}^{j}, \zeta_{i}^{j} \sim Normal(0, \sigma_{\varsigma}^{j2})
\end{aligned}
$$

where $X_{it}^{j} = (1, e_{it}, P_{it}, Q_{it}^{j}, \sum_{n=1}^{5} D_{n})$. The superscripts, subscript and variables in X_{it}^{j} and Y_{it}^{j} are defined the same as those in equation (21). δ^{j} are coefficients for the explanatory variables. ζ_{i} is the village random effect. ς_{it} is idiosyncratic error term and assumed to be normally distributed conditional on X_{i} and ζ_{i} . X_{i} contains X_{it} for all t. Here, X_{it} is treated as exogenous conditional on the random effects ζ_{i} . The estimated coefficients of the independent variables are reported in the column (2), (4) and (6) in Table 2.

Column (1) and (2) in Tabel 2 report estimates of the effects of elections on investment in public health in both random effects and random Tobit estimations. In both estimations, the coefficients of the election dummy variable are positive and statistically significant. In random effects estimation, per capita public investment in health in villages with elections is ¥ 0.05 lower than those without. In Tobit estimation, the estimated marginal effects of elections in Tobit estimation have similar size as those in random effects. The expected health investment in villages with elections is still higher than those without by ¥0.05, conditional on positive public health investment. When the estimation accounts for all the villages those have invested in public health and those have not, elections increase the expected health investment by ¥0.06, comparing to the appointment system. The estimates are significantly different from zero by Wald Chi Square test in random effects Tobit estimation but they are insignificantly different from zero in village random effects. This suggests Tobit estimation is preferable to random effects estimation. The estimated results in public health are consistent with the prediction of the model

The negative sign of per capita income shows that more developed villages have less investment in public health services, as reported in the second row in Column (1) and (2). This may be due to the inequitable allocation of governmental expenditures on public health. Fiscal decentralization limited the central governments' (provinces') ability to redistribute funds from richer to poorer areas of the provinces (counties). The rural areas in wealthier provinces (counties) were able to receive more services from the higher level government than those in the poorer provinces (counties). The higher provision level of public health by the higher level government thus induced local demand on community provided public health. The coefficient for the VOEs dummy variable is positive and significant, showing that the villages with VOEs invested more on public health than those without VOEs. The accounting profits and fees from VOEs appear to provide an alternative revenue source to finance public health expenditure. The net provision level of public health in Hubei is significantly higher than that in Gansu province.

The coefficients for the election dummy variable in the two PRPGs are insignificant and negative in both estimations, as reported in the last four columns in Table 2. These are inconsistent with our model prediction. The results give arise to two questions. Firstly, from which PRPGs that elected leaders transferred public funds to public health, while investment in paved local roads and irrigation infrastructure remaining constant. The second question is that why villagers rank those PRPGs inferior to paved local roads and irrigation infrastructure, with public health being ranked on the top.

A possible explanation is that the returns of those PRPGs are redistributed unevenly among groups. That is, groups accounting for the majority may receive a lower share of the returns from those PRPGs than groups accouting for a small set of local residents but with higher bargin power with village communities. In comparison, the returns of paved local roads and irrigation infrastructure are reasonably assumed to be redistributed among groups. Thus, even if the allocation of public funds between paved local roads, irrigation and those public goods by appointed leaders has maximized the first period production output values, the short term benefits of the

majority have not been maximized, not mentioning the long term benefits. In other words, the majority may have an interest in transferring public investment from those public goods to paved local roads and irrigation, if they do not consider the long term benefits. Furthermore, when long term benefits are taken into their consideration, villagers may want their elected leaders to transfer public investment from those public goods to public health and to retain public investment in paved local roads and irrigation constant. This postulation has been supported by the empirical evidence in another paper of the authors, which shows that elections had reduced public investment in village owned enterprises where the majority of residents received less share of the returns of public investment in VOEs than VOEs labours did.

Among the control variables in the specifications of irrigation infrastructure, village tax revenues are positively associated with irrigation facilities, as expected. Public investment in irrigation infrastructure decreases with the extent to which a village depends on agriculture. Irrigation infrastructure provision appears to be unresponsive to local preferences. A possible explanation is that there may have been better or more irrigation infrastructure in villages with a higher extent of dependence on agriculture than villages with a relative lower extent of dependence. The P values for Wald Chi Square test in both estimations suggest the estimates are significantly different from zero.

Regarding the control variables in the specifications of paved local roads, the evidence suggests that the net provision level of paved local roads in Yunnan is significantly higher than that in Gansu province. The P values for Wald Chi Square test in both estimations suggest the estimates are significantly different from zero.

7. Conclusion and Policy Implications

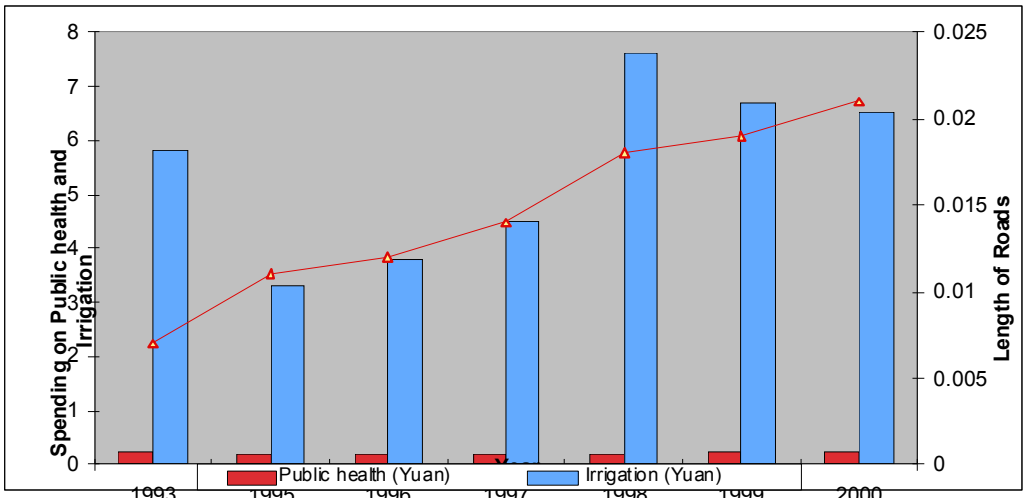
This paper has presented theoretical analyses and empirical assessments of the effects of elections in rural China on the allocation of public funds between LAPGs and PRPGs. By differentiating between the incentives of village leaders in the allocation of public resources under the appointment system and under the electoral system, the

model has delivered two theoretical predictions. Firstly, elections lead to increases in LAPGs. Secondly, elections lead to decreases in PRPGs.

Underpinned by theory, the data from the NFS and the survey in 71 villages over the period 1993-2000 was analysed to test the effects of elections on three public goods: paved local roads, irrigation facilities and public health. Paved local roads and irrigation facilities represent PRPGs while public health represents LAPG. The evidence supports the view that elections led to an increase in public health. In contrast, elections had no effects on paved local roads and irrigation facilities. The possible reasons for the results on PRPGs have been further analyzed.

The analysis suggests that a possible approach to increase the interests of appointed leaders at the formal local government in LAPGs. This approach is to increase the weightings on performance points in LAPGs and correspondingly to reduce those in economic performance within a short period. Such incentive structure would affect the behaviour of appointed leaders at the formal local government, because providing a higher level of LAPGs increases their prospects of being re-appointed in the next term, comparing with no or low weightings in LAPGs.

Figure 1 Public Investment in the Three Public Goods



Data source: Author's calculation based on her survey data in 2008 and the data from NFS, Research Center of Rural Economy in China

Table 1 Net Yearly Investment in Three Public Goods on Per Capita Basis in Sample Villages

		Observations	Mean	Standard deviation	Minimum	Maximum
No election	Paved local road (m)	77	0.33	0.85	0	8.09
	Investment in irrigation infrastructure (¥)	76	2.96	5.25	0	30.51
	Investment in public health (¥)	76	0.13	0.41	0	1.96
Election	Paved local road (m)	327	0.18	0.82	0	12.13
	Investment in irrigation infrastructure (¥)	333	5.04	14.05	0	198.22
	Investment in public health (¥)	333	0.23	0.51	0	3.28

Figure 2 Number and Accumulative Percentage of Sample Villages with Introduction of Elections

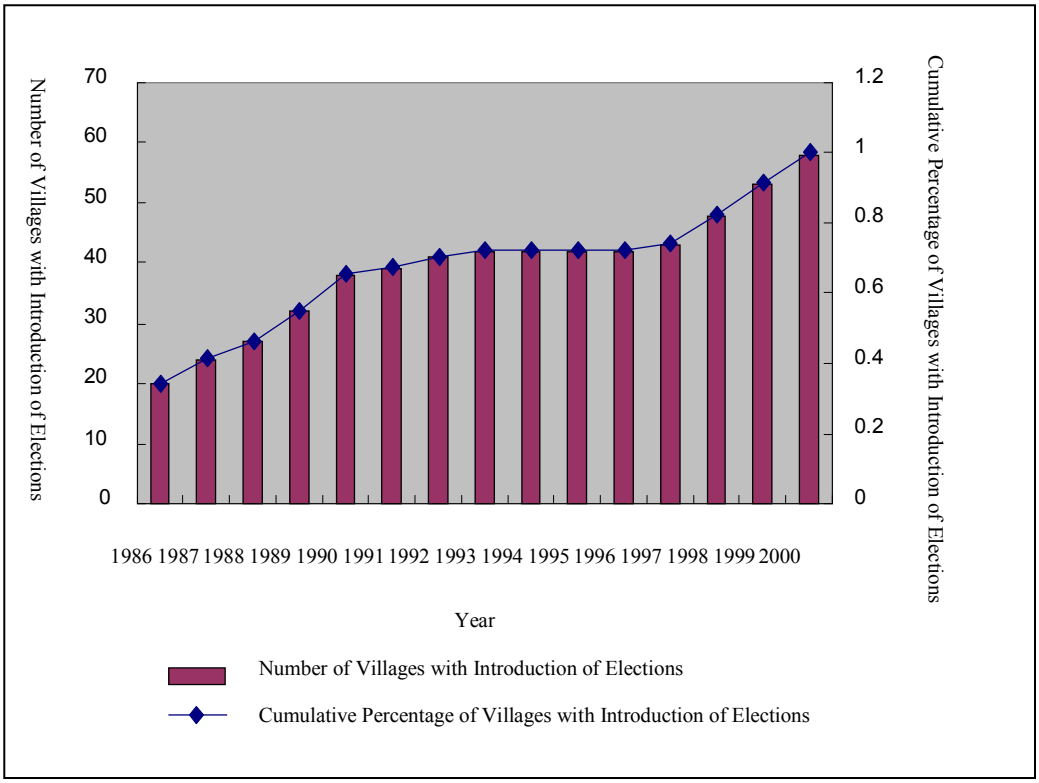


Table 2 Effects of of Election on Three Public Goods

Variables	**Public Health (¥)**		**Road (m)**		**Irrigation (¥)**	
Number of observations	408		399		394	
	Random effects (1)	Tobit (2)	Random effects (3)	Tobit (4)	Random effects (5)	Tobit (6)
Dummy variable for election	0.05* (0.03)	0.18**(0.09)	-0.12 (0.11)	-0.85 (1.15)	-0.51 (1.27)	-0.04 (0.434)
Ln (per capita income)	-0.003* (0.002)	-0.01*(0.005)	0.01 (0.008)	0.06 (0.10)	0.09 (0.10)	-0.0006 (0.04)
Ln (total households)	-0.13 (0.18)	-0.15 (0.16)	-0.12* (0.07)	-0.66 (0.71)	-2.49* (1.40)	-0.03 (0.02)
Ln(village tax revenues)	0.02 (0.01)	0.03 (0.03)	0.0007 (0.03)	0.36 (0.28)	3.00***(0.47)	0.07***(0.01)
Length of time after the introduction of elections	-0.003 (0.006)	-0.02* (0.008)	0.02 (0.01)	0.12 (0.13)	-0.09 (0.26)	-0.002 (0.004)
Dummy variable for VOEs	0.04* (0.03)	0.16***(0.06)	-0.05 (011)	-0.48 (0.69)	-0.75 (1.04)	-0.01 (0.02)
Ratio of income from agriculture to total income					-7.01** (2.26)	-0.11*(0.06)
Ratio of arable land to total land					-9.25*** (3.20)	-0.07 (0.08)
Distance from villages to main roads			-0.01 (0.02)	-0.14 (0.18)		
Dummy variable for a village being city outskirt			0.04 (0.08)	0.94 (0.94)		
Rate of infant mortality	-0.07 (0.0.9)	-0.10 (0.28)				
Liaoning province	0.25 (0.21)	0.59*((0.32)	0.40** (0.17)	1.83 (1.39)	-3.51** (2.08)	-0.05 (0.05)
Hubei province	0.28* (0.16)	0.66** (0.31)	0.002 (0.11)	-2.14 (1.66)	-4.57***(1.51)	0.03 (0.04)
Shandong province	0.20** (0.10)	0.42 (0.29)	0.02 (0.09)	-0.17 (1.34)	-3.17**(1.72)	0.04 (0.04)
Guangdong province	0.41 (0.33)	0.35(0.33)	0.12 (0.14)	1.90 (1.57)	-6.68**(2.84)	-0.06 (0.06)
Yunnan province	0.09 (0.18)	-3.60 (140.37)	0.58***(0.17)	3.73**(1.72)	-3.13 (2.67)	-0.01 (0.07)
R square (within, between, overall)	0.04 0.04 0.04		0.005 0.37 0.06		0.01 0.61 0.12	
P Value (Wald Chi Square)	0.27	0.01	0.007	0.08	0	0

The symbol *, **and *** indicate, respectively, statistical significance at the 10%, 5% and 1% levels. Figures in the parentheses in the fixed effect model are robust standard error

References:

Bueno de Mesquita B., Morrow J. D., Siverson R. and Smith A. (2002). Political Institutions, Policy Choice and the Survival of Leaders. British Journal of Political Science. 32(4): 559-590.

Deacon R. (2009). Public Good Provision under Dictatorship and Democracy. Public Choice. 139(1): 241-262.

Jiang D. Y., Liu A. Z., Tan H. Z., Luo B., Zhao M. Y., Lin Y. X., Zhou C. R., Li T. and Chen H. M. (2003). Health-Economics Study of Hepatitis B Vaccination in Adults. (in Chinese). Chinese Journal of Vaccines and Immunization. 9(3): 157-160.

Li G., Xu L. C. and Yao Y. (2006) Health Shocks, Village Elections, and Long-Term Income: Evidence From Rural China. National Bureau of Economic Research Working Paper 12686 http://www.nber.org/papers/w12686.

Liu Y. L. (2004). China's Public Health-Care System: Facing the Challenges. Bulletin of the World Health Organization. 82(7): 532-538.

Luo R., Zhang L., Huang J. and Rozelle S. (2007). Elections, Fiscal Reform and Public Goods Provision in Rural China. Journal of Comparative Economics. 35(3): 583-611.

Luo R., Zhang L., Huang J. and Rozelle S. (2010). Village Elections, Public Goods Investments and Pork Barrel Politics, Chinese-style. Journal of Development Studies. 46(4): 662 - 684.

McGuire M. C. and Olson M., Jr. (1996). The Economics of Autocracy and Majority Rule: The Invisible Hand and the Use of Force. Journal of Economic Literature. 34(1): 72-96.

Meng Q., Liu X. and Shi J. (2000). Comparing the Services and Quality of Private and Public Clinics in Rural China. Health Policy Planning. 15(4): 349-356.

O'Brien K. J. and Li L. J. (1999). Selective Policy Implementation in Rural China. Comparative Politics. 31(2): 167-186.

Oi J. C. and Rozelle S. (2000). Elections and Power: The Locus of Decision-Making in Chinese Villages. The China Quarterly. 162(Special Issue): 513-539.

Pan S., He Q. C., Zhou B. S. and Yuan Y. (2005). Evaluation on the Program of Gastric Cancer Screening in Zhuanghe, Liaoning Province (in Chinese). Chinese Journal of Epidemiology. 26(10): 757-760.

Tian H. G., Guo Z. Y., Song G. D., Wei Q., Zheng G. W., Yu S. B., Dong Y. M. and Zhang Y. J. (2000). Cost-Effectiveness Analysis on Tianjin Non-Communicable Diseases Prevention and Control Project Conducted from 1991-1997 (in Chinese). Chinal Journal of Preventive Control Chronical Non-Communicable Diseases. 8(5): 196-197, 221.

Wang S. and Yao Y. (2007). Grassroots Democracy and Local Governance: Evidence from Rural China. World Development. 35(10): 1635-1649.

Whiting S. (2001). Power and Wealth in Rural China-The Political Economy of Institutional Change. Cambridge University Press. Washington.

World Bank (1997). China 2010 Issues and Options for China: Financing Health Care. Washington, D.C. World Bank.

Zhang X. B. and Fan S. G. (2004). Public Investment and Regional Inequality in Rural China. Agricultural Economics. 30(2): 89-100.

Zhang X. B., Fan S. G., Zhang L. X. and Huang J. K. (2004). Local Governance and Public Goods Provision in Rural China. Journal of Public Economics. 88(12): 2857-2871.