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Postal Address:
Institut d'Economia de Barcelona
Facultat d'Economia i Empresa
Universitat de Barcelona
C/ Tinent Coronel Valenzuela, 1-11
(08034) Barcelona, Spain
Tel.: + 34 93 403 46 46
Fax: + 34 93 403 98 32
ieb@ub.edu
http://www.ieb.ub.edu

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Ruixin Wang, Wendun Wang

ABSTRACT: A `dress-up contest' is a competition for the best public image, and fiscal decentralisation can lead to such contests between local governments. In this paper we model the dress-up contest and investigate how it a effects social welfare. We show that yardstick competition (due to fiscal decentralisation) forces local governments to allocate more resources to more visible public goods (such as cash assistance) than less visible goods (such as vendor payments) and thus starts dress-up contests. The resulting distortion of resource allocation causes a structural bias in public expenditure and further hurts social welfare. To empirically verify our theoretical model, we employ U.S. state-level data from 1992 to 2008, and we estimate the panel data model using various econometric approaches. The empirical results provide strong evidence that fiscal decentralisation can lead to distortion in public expenditure arising from dress-up contests. We also find that this distortion increases the regional poverty rate.

JEL Codes: D72, H75, H77

Keywords: Fiscal decentralization, yardstick competition, dress-up contest, functional coefficient model

Ruixin Wang
CentER, Tilburg University
PO Box 90153
5000 LE Tilburg, The Netherlands
E-mail: r.wang_4@tilburguniversity.edu

Wendun Wang
Econometrics Institute
Erasmus University Rotterdam
The Netherlands
E-mail: wangwen-dun@gmail.com

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1 Introduction

During the last three decades, fiscal decentralisation (FD) and local-government reform have been at the centre-stage of policy experiments. This has occurred not only in countries with a traditional tendency to decentralise, such as the United States, but also in a large number of developing and transition economies, such as Africa, Asia, and Latin America (The World Bank, 1999). FD, which moves the responsibility for decision-making in public expenditure from central to local governments, is widely believed to be an effective tool for improving the efficiency of public expenditure. One of the major transmission channels, well documented in the literature, is yardstick competition, through which FD regulates the behaviour of Leviathan government (Besley and Case, 1995; Belleflamme and Hindriks, 2005; Besley and Smart, 2007; Bordignon et al., 2004); see Lockwood (2005) for a recent review.

The literature focuses on the benefits of FD; in contrast we explore a negative aspect. We argue that under asymmetric information, the yardstick competition of *capability* between local governments (due to FD) turns into a competition for a *better image*, i.e. a 'dress-up contest'. This is because voters with limited information cannot observe the politicians' capability; they instead infer this capability from the public service provided. This motivates politicians to allocate more resources to the public goods that can best demonstrate their capability. The dress-up contest can lead to a structural bias in public expenditure, which may result in a distortion of social welfare.

This paper has two main contributions. First, we propose and model dress-up contests that occur between local governments and are caused by FD. From Rogoff (1990) and Mani and Mukand (2007) we borrow the visibility concept in a two-politician model. Public goods are 'invisible' if they do not provide a good indication of politicians' capability, either because they are difficult to observe or because they are determined by factors beyond the government's control. Mani and Mukand (2007) showed that a government tends to spend more on visible projects than invisible projects, since voters infer its capability from visible projects. This is referred to as the visibility effect. We extend their model by introducing yardstick competition between two politicians. Using a one-shot game, we show that yardstick competition motivates the politicians to start a dress-up contest. To win more support in an election, they allocate more resources (public expenditure and effort) to the

more visible goods, since these goods demonstrate their capability and provide a better image, given a binding fiscal budget constraint. In this sense, the yardstick competition turns into a competition for a better image, and FD can intensify this dress-up contest. Our model is related to the tax competition model (see for example Janeba and Peters (1999), Cai and Treisman (2005), and Zissimos and Wooders (2008)), but our conclusion is rather different. In the tax-competition literature, the mobility of capital motivates governments to promote public services. Using a similar framework, we show that the mobility of information may not always be positive, because it can distort the structure of public expenditure and lead to a welfare loss.

Second, we provide strong empirical evidence for public-expenditure distortion in visible and invisible goods, and we also find that this distortion caused by FD can result in a social welfare loss. To the best of our knowledge, although the visibility effect has been theoretically established, no research has empirically verified this effect, possibly because of the difficulty of finding good empirical proxies. In this paper, we investigate the FD effect on the regional poverty rate, an important aspect of social welfare. We propose to use cash assistance to the poor as a proxy for the more visible project, and vendor payments as a proxy for the less visible project. Using U.S. state level data from 1992 to 2008, we find that FD causes a public expenditure flow from the more visible to the less visible project. This result provides evidence for the visibility effect, and also confirms our theoretical findings that FD can cause dress-up contests between local governments. To further investigate the role of yardstick competition, we propose two yardstick competition measures based on the comparability of jurisdictions and the competitiveness of local governments. We estimate a difference-in-difference model and find that a stronger yardstick competition leads to a stronger FD effect on the structure of public expenditure. This is another evidence of dress-up contests. To capture how this distortion of public expenditure affects poverty, we use a functional coefficient approach, and we estimate a pooled panel and a panel with a fixed effect. This approach allows us to capture the possible nonlinear interaction between the cash-vendor-payment (CV) ratio, welfare expenditure, and poverty. We find that the distortion of public expenditure, measured by the CV ratio, can greatly weaken the effect of welfare expenditure on poverty reduction, and this influence appears to be nonlinear. Considering the possible endogeneity of welfare expenditure, we propose using public expenditure on health and hospitals as an instrumental variable of welfare

expenditure. Our analysis shows that this instrument is valid theoretically and statistically. We thus empirically verify our theoretical findings, and provide empirical evidence for a dark side to FD.

The remainder of the paper is organized as follows. In the next section we formally model the causes and effects of dress-up contests in the presence of FD. Section 3 provides empirical evidence for dress-up contests, and Sections 4 and 5 analyse the FD effect on social welfare. Section 6 summarises and concludes.

2 The basic model

The basic model aims to illustrate how yardstick competition (dress-up contests), which is introduced by FD, can affect politicians' resource allocation to two types of public goods, more visible and less visible goods. In practice, yardstick competition can arise in two cases. First, two local politicians from the different (neighbouring) cities/towns are ambitious for one position in the higher level government. Second, each local incumbent politician competes with rivals to win his local election. If the rivals are cheap talkers, then the competition pressure comes from the neighbouring jurisdictions, and it is the performance of neighbouring politicians that help voters evaluate the capability of the local incumbent. In both cases voters compare these two incumbents from the neighbouring jurisdictions. The two cases are equivalent in modeling, and thus we only discuss the first case for simplicity. Since voters can only infer politicians' capability from public services, politicians aim to establish a better image to win votes. However, an overemphasis on image building can cause an efficiency loss in welfare expenditure, and further hurt social welfare. In this section, we first derive the equilibrium of a one-shot game, and then analyse the comparative statics, i.e. the impact of FD on this equilibrium.

2.1 Politicians

We follow Cai and Treisman (2005) and assume that politicians are partially self-interested, caring both voters' welfare and private interest. To model such partially self-interested politicians, we first discuss an ideal social planner whose aim is to appropriately distribute public resources (expenditure on public goods) to maximize the utility of the "society".

The utility function of the social planner is

$$\begin{aligned} U_P &= \sum_{j=1}^{J} \upsilon_j z_j - C_P\left(e_1, \ldots, e_J\right), \\ \text{s.t.} \quad I &= \sum_{j=1}^{J} e_j. \end{aligned} \tag{1}$$

In the utility function, z_j is the observed outcome of the public good j, e_j is the public expenditure on public good j with the budget constraint I, and $C_P(\cdot)$ is the social cost of all public expenditure with $C_P'(e) > 0$ and $C_P''(e) > 0$. The social planner cares all public goods with different weights υ_j. This is an ideal case. In practice, however, a politician cares not only the social utility (benevolent), but also his own utility (self-interested), i.e. wining the election. Assume that a politician put weight γ on the social utility, and $(1-\gamma)$ on his own utility, and he maximizes his expected payoff function

$$\begin{aligned} \max_{e_{1i},\ldots,e_{Ji}} \mathrm{E}(U_i) &= \gamma U_{P,i} + (1-\gamma) R\eta_i - C_i\left(e_{1i}, \ldots, e_{Ji}\right) \qquad i \in \{A, B\}, \\ \text{s.t.} \quad I_i &= \sum_{j=1}^{J} e_{ji}, \end{aligned} \tag{2}$$

where R is the return from winning the election, with $R = 0$ indicating failure. η_i is the probability of winning the local election for the politician i. To win the future election, each politician needs to provides evidence of his capability (such as public services) at the cost C to convince voters. Note that C also depends on the public expenditure on J public services, but C is different from C_p, representing the extra cost for the politician to provide public goods besides social cost, e.g. management expenses, time, et al. We assume that the first- and second-order derivatives of the cost function satisfy $C(e)' > 0$ and $C''(e) > 0$. The budget constraint also applies.

2.2 Voters

We assume that there are two types of voters: well-informed voters (proportion k) and ill-informed voters (proportion $1-k$). Well-informed voters have their own ideology, i.e. their political persuasions and preference on governmental behavior (for example, more emphasis on defense or economic construction), and they make voting decisions based

on the (inferred) capability of politicians and their ideology. If a politician's political persuasion is far away from a voter's ideology, then the voter is less likely to vote for this politician. Let s be the measure of a voter's ideology which uniquely identifies every voter. We assume that s is uniformly distributed between $[0, 1]$. Then the choice of voter s depends on

$$\pi_{s,i} = \frac{\Phi_i}{D_{s,i}} \qquad i \in \{A, B\}, \tag{3}$$

where Φ_i is the inferred capability of politician i, $D_{s,i}$ is the difference between the voter's ideology and politician i's political persuasions. More particularly, voter s chooses to support politician A if $\pi_{s,A} > \pi_{s,B}$ and vice versa. If we assume, without loss of generality, that politician A is the left wing, and B is the right, then $D_{s,A} = s$, and $D_{s,B} = 1 - s$. Given the inferred capabilities of the two politicians (which we shall discuss in details in the next subsection), we can compute the position of the marginal voter $\hat{s}$ that is indifference to politician A and B, that is $\pi_{s,A} = \pi_{s,B}$. This leads to an indifference marginal voter

$$\hat{s} = \frac{\Phi_A}{\Phi_A + \Phi_B} \tag{4}$$

This threshold value $\hat{s}$ also determines the share of well-informed voters supporting A and B. A simple calculation shows that well-informed voters with $s < \hat{s}$ will support A, while those with $s > \hat{s}$ will support B, i.e.

$$S_A = \hat{s} = \frac{\Phi_A}{\Phi_A + \Phi_B} \qquad S_B = 1 - \hat{s} = \frac{\Phi_B}{\Phi_A + \Phi_B}. \tag{5}$$

The ill-informed voters do not have ideology, and they make decisions randomly. We assume that politicians A and B equally share the votes of ill-informed voters. Then the probability of politician i to win election can be written as

$$\eta_i = kS_i + \frac{(1-k)}{2} \qquad i \in \{A, B\}, \tag{6}$$

and we always have $\eta_A + \eta_B = 1$.

2.3 Assessing politicians' capability

To model the dress-up contest, we consider two types of public goods: more visible goods a and less visible goods b. According to Mani and Mukand (2007), public goods are less visible if it is hard to assess governmental competence based on their observed outcome.

Politicians need to allocate their limited resources to these two types of goods, and voters can then infer their capability. Following Mani and Mukand (2007), we assume that the production function of each good is

$$z_{j,i} = \tau_i + e_{j,i} + \epsilon_{j,i} \qquad j \in \{a, b\},\ i \in \{A, B\}, \tag{7}$$

where $z_{j,i}$ is the observed outcome of the public good j provided by politician i, τ_i is politician i's capability, $e_{j,i}$ is politician i's expenditure or effort on good j, and $\epsilon_{j,i} \sim N\left(0,\, \sigma^2_{j,i}\right)$ captures the exogenous stochastic factors. Public good a being more visible than b implies that there is more noise in the outcome of b than in that of a, i.e. $\sigma^2_{a,\,i} < \sigma^2_{b,\,i}$. Mani and Mukand (2007) provided two reasons for visibility differences. First, the outcome of some goods is intrinsically harder to directly observe or measure (e.g. those with short-term results are typically more visible than those that are long term). Second, some public goods are more 'complex' in the sense that their outcome is affected by a variety of factors other than governmental competence. For example, the quantity and quality of education is not determined only by governmental input, but also by teachers, parents, and peers. For simplicity and without loss of generality, politicians are assumed to have the same values of τ and ϵ_j.

Voters can observe the outcome of the public good z as well as the expenditure e. The politician's capability τ is unobserved, but voters have common knowledge of its prior distribution, $\tau_i \sim N\left(\overline{\tau},\, \sigma^2_\tau\right)$ for $i \in \{A, B\}$. Voters (with rational expectations) can use the observed outcome $z_i := \{z_{a,i}, z_{b,i}\}$ and the public expenditure $\mathbf{e_i^*} := \{e^*_{a,i}, e^*_{b,i}\}$ to update their priors of the politicians' capability, i.e. from $\overline{\tau}$ to $(z_{j,i} - e^*_{j,i})$ with associated variance $\sigma^2_{j,i}$. According to Mani and Mukand (2007), the mean posterior assessment of the politician's capability can be obtained via

$$\Phi_i = \mathrm{E}\left(\tau_i \mid \mathbf{z}_i,\, \mathbf{e}^*_i\right) = \left[\frac{h_\tau \overline{\tau} + h_a\left(z_{a,i} - e^*_{a,i}\right) + h_b\left(z_{b,i} - e^*_{b,i}\right)}{h_\tau + h_a + h_b}\right],$$

where $h_\tau = 1/\sigma^2_\tau$ and $h_j = 1/\sigma^2_j$ $(j = a, b)$ are the precision of the prior and two realizations, respectively.

2.4 Equilibrium

Given the preference of voters, politician choose their strategies on $e_{a,\,i}$ and $e_{b,\,i}$ in a one-shot game simultaneously. We first look at the strategy of politician A. The optimization

problem (2) gives the first order condition

$$\gamma\upsilon - \gamma C'_{P,\,A}\left(e_{a,\,A}\right) + (1-\gamma)\cdot Rk\cdot\left(\frac{h_a}{h_\tau + h_a + h_b}\right)\cdot\frac{\Phi_A}{\left(\Phi_A+\Phi_B\right)^2} - C'_A\left(e_{a,\,A}\right) - \lambda = 0$$

where λ is a Lagrangian multiplier. Since we have assumed the budget constraint is binding, λ must not be equal to zero, and the optimal expenditure $e^{\star}_{a,\,A} = \arg\max\left\{E\left(U_A\right)\right\}$. The case for politician B is symmetric.

2.5 Comparative statics

Based on the analysis above, we can examine how FD affects the politicians' behaviour, i.e. their public expenditure on the two types of goods, $e_{a,i}$ and $e_{b,i}$. FD can be regarded as a trigger of yardstick competition, which strengthens the information externality, and gives the voters more knowledge of the politicians' capabilities. This thus increases the proportion of well-informed voters, i.e. k, because information externality facilitates voters to detect and compare the public services, and further increases the comparability between the politicians in the neighboring jurisdictions. Therefore, we analyse the effect of FD by investigating how an increase in k affects the equilibrium.

We study the behavior of politician A. Define $F_A := \partial\widehat{\mathrm{E}}(U_A)^*/\partial e_{a,A}$, and we have

$$F_A = \gamma\upsilon - \gamma C'_{P,\,A}\left(e_{a,\,A}\right) + (1-\gamma)\,Rk\cdot\left(\frac{h_a}{h_\tau + h_a + h_b}\right)\cdot\frac{\Phi_A}{\left(\Phi_A+\Phi_B\right)^2} - C'_A\left(e_{a,\,A}\right) - \lambda.$$

Note that we always have

$$\frac{\partial F_A}{\partial k} = (1-\gamma)\,R\cdot\left(\frac{h_a}{h_\tau + h_a + h_b}\right)\cdot\frac{\Phi_A}{\left(\Phi_A+\Phi_B\right)^2} > 0,$$

and

$$\frac{\partial F_A}{\partial e_{a,\,A}} = -\gamma C''_{P,\,A}\left(e_{a,\,A}\right) - 2\,(1-\gamma)\cdot Rk\cdot\left(\frac{h_a}{h_\tau + h_a + h_b}\right)^2\cdot\frac{\Phi_A}{\left(\Phi_A+\Phi_B\right)^3} - C''_A\left(e_{a,\,A}\right) < 0.$$

Therefore, using the implicit function theorem, we obtain the following inequality at equilibrium

$$\frac{\partial e_{a,A}}{\partial k} = -\left(\frac{\partial F_A}{\partial k}\right)/\left(\frac{\partial F_A}{\partial e_{a,A}}\right) > 0. \tag{8}$$

This shows that as k increases, politician A spends more on more visible public goods. Given the binding budget constraint, the expenditure on less visible goods thus shrinks. The analysis of politician B is similar, and we also have $\partial e_{a,B}/\partial k > 0$.

To summarise, our model shows that when k increases (more well-informed voters), politicians tend to focus more on establishing a good image. Given a binding fiscal budget constraint, more visible goods are more efficient at demonstrating capability and establishing a good image. This explains why expenditure on more visible goods increases under FD. However, an overemphasis on visible goods can lead to a structural bias in the public expenditure, and thus hurt social welfare. This implies that politicians' focus on their image may have a negative effect on social welfare. We investigate these theoretical findings empirically in the following sections.

3 Evidence for a dress-up contest

Our empirical analysis has two goals. The first is to provide evidence for the association between FD and dress-up contests. Second, we ask how dress-up contests affect poverty, an important aspect of social welfare. We address the first issue in this section, and the second in the following two sections. We use U.S. state level data, and our sample covers 48 states excluding Alaska and Hawaii with the time span from 1992 to 2008.

A key issue is how to determine the more visible and less visible public goods. It is difficult to find a strictly visible public good in the real world because the outcome of most such goods is determined by a number of factors beyond the government's control and is difficult to observe or measure. We focus on poverty, and we consider cash assistance to be relatively visible and vendor payments to be less visible. Cash assistance directly increases citizens' disposable income and reduces poverty. Hence, its outcome, i.e. poverty reduction, can be observed in the short term, and it primarily depends on the government's expenditure on this service. In contrast, vendor payments (welfare expenditure excluding cash assistance) are made to private purveyors for medical care, burials, and other commodities. The outcome of these payments depends on a large number of factors beyond the government's control, such as the performance of other institutes, and it may not be obvious in the short term. To appreciate these two measures, we need to distinguish between two concepts: visibility and visuality. Public services are visible if their outcomes are affected by less noisy factors, while they are visual if their outcomes are easily observed by voters. Some of the items of vendor payment can be visual, such as activities of soup kitchen. However, they are still less visible than cash because the outcome of these pay-

ment depends on the performance of intermediate institute, i.e. soup kitchen. Therefore, it is reasonable to regard cash assistance as more visible and vendor payments as less visible.

We provide evidence to show the existence of a dress-up contest. Since it is difficult to exactly identify all the transmission channels, we use evidence from different sources to rule out possible alternative explanations.

3.1 FD effect on public-expenditure structure

We first consider a direct test for the causal effect of FD on dress-up contests. To outline our empirical strategy, we introduce some preliminary notation. Assume that state-level politicians spend $1/v_S$ of the state expenditure on visible projects, while local-level politicians spend $1/v_L$ of the local expenditure on such projects. Since yardstick competition is more fierce in local elections than in state elections, we have $v_S > v_L \geq 1$. If we let Γ be the total (state + local) public expenditure, and let D be the degree of FD, then the total expenditure on the more visible project (cash assistance) and that on the less visible project (vendor payments) are given by

$$\text{Cash} = \frac{\Gamma}{v_S} + \Gamma \text{D}\left(\frac{1}{v_L} - \frac{1}{v_S}\right) \quad \text{and} \quad \text{Vendor} = \Gamma - \text{Cash} = \Gamma\left(1 - \frac{\text{D}}{v_L} + \frac{\text{D}-1}{v_S}\right).$$

The ratio of Cash to Vendor (hereafter the CV ratio) is

$$\text{RCV} = \frac{v_L + \text{D}(v_S - v_L)}{v_L(v_S - 1) - \text{D}(v_S - v_L)}.$$

Note that RCV is a monotonically increasing function of the degree of FD, i.e.

$$\frac{\partial \text{RCV}}{\partial \text{D}} = \frac{v_S v_L (v_S - v_L)}{\left[(v_S - 1)v_L - \text{D}(v_S - v_L)\right]^2} > 0. \tag{9}$$

Therefore, as the degree of FD increases, the total expenditure on cash and the CV ratio both increase. Inequality (9) thus allows us to empirically test the direct association between FD and dress-up contests.

To test this association, we consider the reduced-form model

$$\text{RCV}_{it} = \alpha_i + \kappa_0 + \kappa_1 \text{D}_{it} + \kappa_2 \text{TWE}_{it} + \varepsilon_{it}, \tag{10}$$

where the subscript it denotes observation of the ith state ($i = 1, \ldots, N$) at year t ($t = 1, \ldots, T$), and α_i is the individual-specific effect. D represents the degree of FD, and we

measure it by

$$D := \frac{\text{Local public expenditure}}{\text{Total public expenditure}},$$

where the local expenditure includes the expenditure of the county, city, and town governments, and the total expenditure is the expenditure of the state and local governments. TWE is the total (state + local) welfare expenditure. The fixed-effect estimation results[1] are given in column (1) of Table 1. It shows that a larger degree of FD is associated with a larger CV ratio, and the correlation is strong and robust. In columns (2) and (3), we replace the contemporary FD D by its first- and second-order lagged values D_{L1} and D_{L2}, respectively, to capture the causal effect, since an FD policy may take effect after a period of time. We see that using lagged values gives a more positive and more significant estimate, confirming the causal relationship between FD and the CV ratio.

Table 1: FD effect on CV ratio

	(1)	(2)	(3)	(4)
D	0.4849			
	(2.43)			
D_{L1}		0.5018		
		(2.67)		
D_{L2}			0.4888	
			(3.06)	
D_{CT}				2.3915
				(2.77)
TWE	−0.2464	−0.2539	−0.2270	−0.2760
	(−9.78)	(−10.26)	(−10.06)	(−5.68)
CONST	0.2430	0.2484	0.2233	0.2532
	(7.83)	(8.40)	(8.58)	(6.86)

As a robustness check, we recompute the FD ratio using the expenditure from only the city and town governments (excluding the county-level governments), and we denote this ratio D_{CT}. Since yardstick competition is supposed to be more intense at the city and town level, we expect to observe a stronger association between dress-up contests and FD, i.e. a

[1] A preliminary analysis suggests the fixed-effect model is more appropriate than the random-effect model.

more significant and positive estimated coefficient κ_1. The results in column (4) indeed indicate a more significant effect, showing the robustness of this finding.

3.2 The role of yardstick competition

Yardstick competition plays a crucial role in the theoretical model, so we introduce it into our empirical analysis. Since FD distorts the structure of public expenditure through the channel of yardstick competition, we expect that the stronger the yardstick competition, the stronger the distortion. More formally, if the local-level yardstick competition is intensified, i.e. v_L is smaller, then the CV ratio increases, because

$$\frac{\partial \mathrm{RCV}}{\partial v_L} = -\frac{\mathrm{D}v_S^2}{\left[(v_S-1)v_L - \mathrm{D}(v_S - v_L)\right]^2} < 0.$$

This implies that given the same degree of FD, if the local-level yardstick competition is stronger in a particular state, then the politicians in that state have more incentive to invest in visible projects. In other words, the degree of yardstick competition can affect the impact of FD on the structure of public expenditure. This mechanism can be empirically captured by an interaction term between yardstick competition and FD. Thus, we consider the model

$$\mathrm{RCV}_{it} = \alpha_i + \kappa_0 + \kappa_1 \mathrm{D}_{it} + \kappa_2 \mathrm{COMP}_{it} + \kappa_3 \mathrm{D}_{it} \times \mathrm{COMP}_{it} + \kappa_4 \mathrm{TWE}_{it} + \varepsilon_{it}, \qquad (11)$$

where COMP is a measure of the yardstick competition. Estimating (11) allows us to identify the mechanism described in Section 2, at least to some extent.

Yardstick competition is a difficult concept to measure, and to the best of our knowledge there is no satisfactory measure in the literature. We propose two measures based on the comparability of jurisdictions and the competitiveness of local governments. First, we consider the comparability of jurisdictions. This is motivated by the argument of Bodenstein and Ursprung (2005) that yardstick competition 'emerges when the performance of governments in various jurisdictions becomes sufficiently comparable so that the voters can alleviate the agency problem by making meaningful comparisons between jurisdictions'; see also Besley and Case (1995). In the U.S., most congressional districts consist of several local governments that have similar political and economic situations, such as similar political interests and voters' preferences. Hence, we expect that the yardstick competition

between local governments *within* a congressional district is stronger than that *outside* the district. This implies that the congressional district demarcates the political boundaries of the yardstick competition. If a given district contains more local governments, then the yardstick competition in this district is more intense because each local government has more comparable rivals. Given this motivation, we propose to measure the yardstick competition by

$$\text{COMP}_r := \frac{\text{Number of local governments}}{\text{Number of congressional districts}}.$$

This ratio is unaffected if we control for a state's land size or population since we divide both the numerator and denominator by the land size or population.

Next, we consider measuring the yardstick competition by the competitiveness of the local elections, which is computed based on the percentage of votes won by the leading party. We denote this measure as COMP_c. The average level of competitiveness is a reasonable measure of the yardstick competition within the state. The competitiveness is higher if the leading party wins a smaller share of the votes, suggesting that the competing parties are well matched or none of the candidates has strong support. In both cases, the yardstick competition can be intense. Due to the lack of county-level data, we use congressional-district data. In the two-party system of the U.S., congressional elections are expected to be highly correlated with local (county, city, or town) elections, and thus the average competitiveness of these elections can be a proxy for the yardstick competition at the local level.

To see how the FD effect varies at different levels of competitiveness, we first rank all the states according to their average competitiveness (averaged over time). Then, we estimate the FD effect using two samples, made up of the most competitive and the least competitive states. Columns (1)–(4) of Table 2 present the results. It is clear that the FD effect on the CV ratio is much stronger and more significant in the more competitive states. Next, we examine the interaction effect of competitiveness more formally by estimating the panel data model (11). The results are given in columns (5)–(8) of Table 2. We see that the interaction terms are strongly positive when using COMP_r and strongly negative when using COMP_c in the models with contemporary and lagged FD. This again confirms that a stronger yardstick competition leads to a stronger FD effect on the CV ratio. The significance of the level terms D and COMP depends on the measurement of the

yardstick competition. COMP is significant but D is not when we measure the competition by COMP_r; and D is significant but COMP is not when we measure the competition by COMP_c. In the difference-in-difference model, the coefficients of the level terms capture only an 'initial' effect. The different significance levels suggest that COMP_r and COMP_c measure the yardstick competition from different perspectives. Since the size of the interaction term in columns (5) and (6) is much larger than that in columns (7) and (8), and is also larger than the size of its level terms, we find that the results from the two measures are generally consistent: a larger degree of FD and more intense yardstick competition are associated with a higher CV ratio.

To summarise, the above analysis shows that a high degree of FD is associated with an expenditure flow from the more visible product (cash assistance) to the less visible product (vendor payments), and the association is even stronger in regions with more intense yardstick competition. This is because to achieve a better image and win more votes, politicians tend to allocate more resources to the more visible project. This dress-up contest is intensified by FD through the channel of yardstick competition. These empirical results thus provide support for our theoretical findings.

4 FD effect on poverty

We have seen, from both theoretical and empirical perspectives, that fiscal FD can cause a dress-up contest which forces governments to allocate more expenditure to the more visible public goods. In the following two sections, we investigate how this distortion of public expenditure influences social welfare. We focus on the effect of FD on the poverty rate, an important aspect of social welfare, and empirically identify the transmission mechanisms. For this purpose, we introduce three additional variables: poverty (p), unemployment rate (UNEM), and Gini index (GINI). Poverty is defined by the share of people with an income lower than the standard income, and this standard differs across states. A more detailed description of the variables and their sources is given in the Appendix.

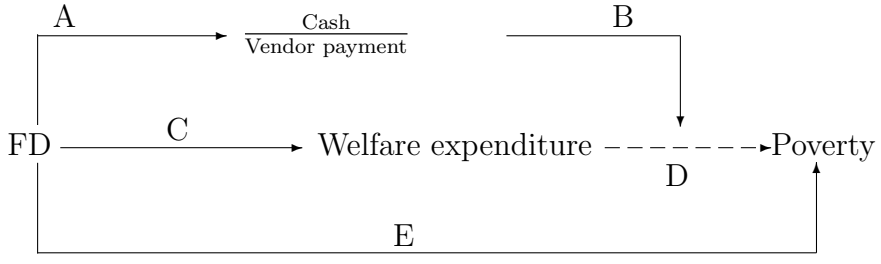
We focus on three channels from FD to poverty, which are summarised in Figure 1. First, according to the two-politician model in Section 2, FD can affect poverty through the dress-

Table 2: Interaction between FD, yardstick competition, and CV ratio

	15 most competitive		15 least competitive		Entire sample			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
D	0.7432	0.5789	−0.0900	0.4929	0.0599		0.8393	
	(4.91)	(2.52)	(−0.40)	(1.55)	(0.39)		(2.92)	
D_{L1}						0.1178		0.9182
						(0.79)		(3.60)
TWE	−0.2923	−0.2769	−0.2804	−0.2195	−0.2636	−0.2668	−0.2457	−0.2536
	(−8.00)	(−4.94)	(−8.76)	(−6.50)	(−11.90)	(−12.39)	(−10.24)	(−10.64)
$COMP_r$	√		√		−2.4494	−2.7143		
					(−3.56)	(−4.01)		
$COMP_c$		√		√			−0.0004	−0.0004
							(−0.66)	(−0.56)
D×$COMP_r$					6.9800			
					(3.91)			
D×$COMP_c$							−0.0067	
							(−2.24)	
$D_{L1} \times COMP_r$						6.3943		
						(4.05)		
$D_{L1} \times COMP_c$								−0.0081
								(−3.05)
CONST	0.2590	0.2591	0.3086	0.2328	0.3266	0.3335	0.2661	0.2722
	(8.07)	(3.68)	(8.62)	(8.74)	(11.50)	(12.54)	(5.93)	(5.90)

Note: Columns (1) and (2) use the 15 most competitive states, based on $COMP_r$ and $COMP_c$, respectively; columns (3) and (4) use the 15 least competitive states, based on $COMP_r$ and $COMP_c$, respectively; columns (5) and (6) use the entire sample of 48 states.

Figure 1: Transmission channels from FD to poverty



up contest, i.e. an expenditure flow from less visible goods to more visible goods (effects A and B). Second, FD can indirectly affect poverty by affecting the welfare expenditure (effects C and D). On the one hand, FD may increase the welfare expenditure due to higher administrative costs; on the other hand, it is likely that welfare expenditure shrinks after FD because the mobility of the poor motivates governments to spend less on welfare to reduce the fiscal burden. It is not clear which effect dominates, and we investigate this in our empirical study. Finally, in addition to the indirect effects, FD can have an impact on poverty through channels other than welfare expenditure and dress-up contests. We consider other connections between FD and poverty as effect E. We observe that the CV ratio influences poverty not directly but indirectly, by changing the structure of welfare expenditure. Hence, the arrow line of effect B does not point at poverty but at effect D. We use a dashed line for channel D since there is potential reverse causality between welfare expenditure and poverty, which we will investigate using instrumental variables.

4.1 Standard panel data

To provide empirical evidence for the transmission channels described in Figure 1, we first identify each effect A–E separately. First, we examine the transmission channel from FD to welfare expenditure, and then to poverty, namely effects C and D. To show the mediation of the welfare expenditure, we estimate the following models:

$$\begin{aligned} \mathrm{TWE}_{it} &= \alpha_i + \theta_0 + \theta_1 \mathrm{D}_{it} + e_{it}, && (12) \\ p_{it} &= \alpha_i + \beta_0 + \beta_1 \mathrm{D}_{it} + \beta_2 \mathrm{TWE}_{it} + \beta_3 \mathrm{UNEM}_{it} + \beta_4 \mathrm{GINI}_{it} + \epsilon_{it}. && (13) \end{aligned}$$

Model (12) captures the transmission effect C, while (13) captures the direct effect of FD on poverty (effect E) and the indirect effect through welfare expenditure (effect D).

Columns (1)–(5) of Table 3 present the standard fixed-effect estimation results based on Equations (12) and (13). Column (1) shows that FD has a strongly negative effect on welfare expenditure. Column (2) replaces the contemporary value of FD by its first-order lagged value D_{L1}, and shows a similar result, confirming that a high degree of FD leads to less welfare expenditure. This suggests that the negative effect of FD on welfare expenditure dominates in our case. In particular, since the poor are mobile, an increase of welfare expenditure in one jurisdiction attracts the poor to this region, which adds

Table 3: Results for separate transmission channels

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	TWE	TWE	p	p	p	p	p
D	−1.1031		7.4507	5.4731	4.7246	3.3062	4.6255
	(−3.58)		(4.54)	(3.49)	(2.29)	(1.54)	(1.82)
D_{L1}		−1.0418					
		(−3.56)					
TWE				−1.7927	−2.2731	−0.4419	−2.3902
				(−3.38)	(−3.57)	(−0.72)	(−3.48)
GINI					−0.1913		0.6650
					(−0.08)		(0.29)
UNEM					0.5519		0.5784
					(6.07)		(5.78)
RCV						4.5906	0.1824
						(3.19)	(0.13)
CONST	0.7922	0.7796	12.037	13.457	10.960	12.142	10.518
	(28.15)	(27.82)	(80.16)	(30.95)	(8.46)	(22.83)	(8.00)

to the burden of this jurisdiction but reduces the burden of others. Therefore, if most jurisdictions are free riders, then FD leads to a coordination failure and the inefficient provision of public goods. Column (3) shows a significant and positive overall effect of FD on poverty, challenging the conventional viewpoint that it has a positive impact on social welfare. This effect is largely reduced (in size and significance) when we include welfare expenditure (column (4)), but remains strong, and the coefficient of welfare expenditure is significantly negative. This suggests that part of the FD effect on poverty is explained by the intermediate transmission through welfare expenditure, and it provides evidence for strong effects C and D. These effects are robust when we include the Gini coefficient and unemployment (column (5)).

To examine effect B, we first add RCV as an explanatory variable in the poverty regression. Columns (6) and (7) show that the FD effect remains strong and positive after we control for welfare expenditure and the CV ratio, and this suggests the existence of effect E. The strongly positive and robust effect of FD again confirms the negative effect of FD on poverty reduction. The CV ratio is positively related to poverty, but this effect

becomes insignificant when we control for unemployment and the Gini index. It shows that the CV ratio can be positively related to poverty, but the delicate coefficient suggests that the standard panel data model may not fully capture the effect of the CV ratio on poverty. Also, we see that including RCV can affect the estimated coefficient of WE, which suggests possible interactions between RCV and WE. In fact, the CV ratio influences poverty by interacting with the effect of welfare expenditure. An excessively large (or small) CV ratio reduces the effect of welfare expenditure on poverty reduction, while an appropriate value of the ratio can maximise the effect of welfare expenditure. Therefore, effect B cannot be fully captured by the standard fixed-effect model with RCV as a control variable, and more appropriate methods are required.

4.2 Endogeneity of welfare expenditure

A potential issue is the endogeneity of welfare expenditure. The endogeneity is due to possible reverse causality between welfare expenditure and poverty; in particular, welfare expenditure can reduce poverty, while regions with a higher poverty rate are likely to have more welfare expenditure. To reduce the potential bias caused by reverse causality, we consider instrumental-variable estimation. We propose to use public expenditure on health and/or hospitals as the instrumental variable of welfare expenditure. Expenditure on health and hospitals is highly correlated with welfare expenditure because factors such as citizens' interest in government services, politicians' attention to citizens' wellbeing, and the power of the public-sector unions can influence the expenditure on welfare, health, and hospitals. Moreover, this instrument does not depend on poverty because government hardly increase or reduce health expenditure for poverty reason. Also, there is no clear transmission channels from public health expenditure on poverty other than welfare expenditure. This is because only a proportion of public expenditure on health and hospital may be distributed to *individual* health care, and only this part of expenditure is possibly related with poverty. Even if part of public expenditure on health and hospital is related with poverty, it is still unclear how much assistance to individual health expenditure can alleviate poverty.Therefore, health and hospital expenditure satisfies the requirements of relevance and exogeneity, so it is an appropriate instrumental variable. This instrument is in the similar spirit of Levitt (2002) who used expenditure on fire fighting as an instrument

of expenditure on police when investigating the determinants of crime.

Table 4: Results of poverty regression: IV estimation

	(1)	(2)	(3)	(4)	(5)	(6)
Instrument	HE	HO	HH	HH	HEO	HEO
D	3.5819	5.1961	4.4651	4.6046	4.0719	4.5837
	(1.90)	(2.56)	(2.44)	(2.44)	(2.50)	(2.54)
TWE	−3.5619	−1.7413	−2.5657	−3.2093	−2.9985	−3.5670
	(−2.87)	(−1.14)	(−2.25)	(−1.73)	(−3.05)	(−2.06)
GINI	0.9078	−0.6449	0.0582	0.7794	0.4733	0.7590
	(0.35)	(−0.24)	(0.02)	(0.31)	(0.18)	(0.30)
UNEM	0.5360	0.5585	0.5483	0.5943	0.5424	0.6001
	(8.75)	(9.01)	(9.03)	(7.79)	(9.12)	(7.64)
RCV				−0.9291		−1.4686
				(−0.33)		(−0.55)
First-stage F-stat.	122.13	75.64	146.95	76.61	80.98	38.27
p-value of first-stage F-test	0.00	0.00	0.00	0.00	0.00	0.00
p-value of Hansen's J-test					0.24	0.24

Note: The dependent variable in all models is poverty. Columns (1)–(4) are 2SLS, and columns (5) and (6) are GMM. Using 2SLS to estimate columns (5) and (6) leads to consistent results.

We consider four variations of the instrument: expenditure on health (HE), expenditure on hospitals (HO), expenditure on health and hospitals (HH), and expenditure on health together with expenditure on hospitals (HEO). In the first three cases, the model is exactly identified, and we estimate it using two-stage least squares (2SLS). In the last case, we estimate the overidentified model using the generalised method of moments (GMM). The results are presented in Table 4. We see that using the instrumental variable does not change our results. In particular, the estimated coefficient of welfare expenditure using 2SLS/GMM remains significantly negative, and it is slightly larger (in absolute value) than the standard fixed-effect coefficient estimate, except in column (2). The estimates of the other covariates are generally unaffected when we use 2SLS. The first-stage F statistic and its p-value show that the instruments are in general highly correlated with the endogenous variable. However, the single-instrument HO is relatively weak compared with HE, and

this explains the small absolute value of the welfare-expenditure coefficient in column (2). In columns (5) and (6), the rejection of Hansen's J test suggests that the overidentified instruments satisfy the orthogonal conditions, and thus are valid instruments.

To conclude, the results from a separate estimation of each channel show that effects A–E indeed exist. FD can have an impact on poverty by reducing welfare expenditure and, more interestingly, through the CV ratio. However, we also note that the interaction between poverty and the CV ratio (effect B) cannot be fully captured by the standard panel data model, and more thorough studies will be required.

5 Joint estimation using functional coefficient model

The above analysis specifies each channel separately, and shows that each effect is strong and significant. However, these channels may not be jointly strong and their relative importance is not yet clear. For example, it is possible that the transmission channel through the CV ratio (effects A and B) is individually significant, but plays a minor role when we control the channel through the welfare expenditure. Also, the standard fixed-effect model considered in the previous section cannot capture the interaction between the CV ratio, welfare expenditure, and poverty. A frequently used method to capture the interaction effect is difference-in-difference estimation:

$$p_{it} = \alpha_i + \beta_0 + \beta_1 \mathrm{D}_{it} + \beta_2 \mathrm{TWE}_{it} + \beta_4 \mathrm{RCV}_{it} + \beta_5 \mathrm{TWE}_{it} \times \mathrm{RCV}_{it} + \sum_{k=1}^{2} \gamma_k x_{it,k} + \epsilon_{it}, \quad (14)$$

where $x_{it} = (\mathrm{GINI}_{it}, \mathrm{UNEM}_{it})$. We argue that this approach does not work here, for two reasons. First, since RCV is influenced by D, the interaction term TWE $\times$ RCV can be highly correlated with the level terms even if all the variables are centred to remove multicollinearity, and therefore the estimated coefficient of the interaction term can be inefficient. Second, the interaction term provides only a positive or negative (linear) interaction effect, and this effect is the same for all CV ratio levels. However, it is possible that the welfare-expenditure effect on poverty depends *nonlinearly* on the CV ratio; in particular, both extremely large and small values of the CV ratio reflect the distortion of welfare expenditure, and this distortion can weaken its effect on poverty reduction. Therefore, the welfare-expenditure effect is expected to be a nonlinear function of the CV ratio (roughly

U-shaped). This nonlinear relationship cannot be captured by Equation (14). Indeed, estimates of Equation (14) show that $\hat{\beta}_5$ is not significant.

5.1 Standard functional coefficient model

To investigate the relative importance of each channel and capture the possibly nonlinear relationship between the CV ratio and poverty, we consider the functional coefficient model in which the slope coefficients are allowed to vary over a common variable. We first consider a standard functional coefficient model,

$$p_{it} = \delta_0 + \delta_1 \mathrm{D}_{it} + \delta_2 \mathrm{TWE}_{it} + \delta_3 \mathrm{GINI}_{it} + \delta_4 \mathrm{UNEM}_{it} + \eta_{it}, \tag{15}$$

where the slope coefficient δ_k $(k = 0, 1, \ldots, 4)$ is a continuous function of the CV ratio. The variables D, TWE, GINI, and UNEM in Equation (15) are the same as in Equation (13), except that DINC is not included to avoid possible multicollinearity between TWE and DINC. Our robustness check suggests that including DINC does not change the shape of the curves, but just widens the confidence bands. One advantage of a functional coefficient model is that it allows regressors to be correlated with the smoothing variable RCV, and thus avoids the multicollinearity problem in (14). Moreover, it provides information on how the effect of welfare expenditure varies (possibly nonlinearly) for different values of the CV ratio. The model also allows us to rule out other possible transmission channels from the CV ratio to poverty, at least to some extent, if the other functional coefficients (δ_1, δ_3, and δ_4) do not vary over RCV or show no clear trends. For the moment, we consider a standard functional model without an individual-specific effect α_i (pool estimation), and the estimated coefficients are consistent if α_i is assumed to be uncorrelated with the regressors. In the next subsection we will allow correlation between α_i and the regressors and estimate a fixed-effect functional coefficient model.

The parameters in this model are estimated by local linear estimation (Fan and Gijbels (1996); see also Cai et al. (2000)). Thus we specify

$$\delta_k = \delta_{Ck} + \delta_{Sk}(\mathrm{RCV} - u_0) \quad (k = 0, 1, \ldots, 4) \tag{16}$$

where $\min(\mathrm{RCV}) \leq u_0 \leq \max(\mathrm{RCV})$. The parameters $(\delta_{Ck}, \delta_{Sk})$ are estimated by min-

imising the following objective function:

$$\min_{\delta_{Ck},\delta_{Sk}} \sum_i \sum_t \left(p_{it} - \sum_{k=0}^{4} \{\delta_{Ck} + \delta_{Sk}(\text{RCV}_{it} - u_0)\} x_{itk} \right)^2 K_h(\text{RCV}_{it} - u_0),$$

where x_{itk} is the kth regressor, and $K_h(\cdot) := h^{-1}K(\cdot/h)$ with bandwidth h and kernel function $K(\cdot)$. Various data-driven methods could be used to select the bandwidth, e.g. cross-validation (Fan and Gijbels, 1996). We choose the bandwidth by minimising the averaged mean square error, following Cai et al. (2000).

Figure 2: Marginal effect of control variables on poverty as function of CV ratio (standard functional coefficient model)

Figure 2 shows the slope parameters as a function of the CV ratio. The solid line plots the coefficient estimate, and the dashed lines are $\pm 2 \times$ the bootstrap standard errors (cal-

culated over 200 replications). We see a rough U-shape of the welfare-expenditure effect on poverty (upper-left subfigure). The effect is significantly negative when the proportion of the cash assistance is relatively small, and it becomes stronger (more negative) as the ratio increases to around 0.2. However, when the ratio is more than 0.3, increasing the cash proportion weakens the welfare-expenditure effect on poverty reduction, with wide confidence bands. The effect even becomes weakly positive when the ratio is particularly high. The nonlinear behaviour shows that a deviation of the CV ratio from its optimal value, and in particular an increase in its value, can weaken the poverty-reduction effect of welfare expenditure. This provides evidence for the efficiency loss caused by an overemphasis on visible products.

The FD effect on poverty (upper-right subfigure) is significantly positive for values of the CV ratio from around 0.1 to 0.4, and less significant for larger values. The estimated functional coefficients of the welfare expenditure and FD confirm the results from the standard fixed-effect model that the indirect channel (effects C and D) is strong, other channels also matter (effect E), but the evidence for the direct effects (A and B) is not as clear. We also see that the curves of FD, unemployment, and the Gini index have no particular shape, suggesting that the CV ratio does not influence poverty through these channels.

5.2 Fixed-effect functional coefficient model

Standard functional coefficient estimation works if the individual-specific effect α_i is independent of the control variables. However, it is possible that an unobserved individual effect α_i is correlated with the control variables, for example, the historical and cultural differences between states (an unobserved individual effect) may affect the government behaviour, and thus impact the degree of FD. To allow for possible correlation between the individual-specific effect and the regressors, we estimate a fixed-effect functional coefficient model:

$$p_{it} = \alpha_i + \delta_0 + \delta_1 \mathrm{D}_{it} + \delta_2 \mathrm{TWE}_{it} + \delta_3 \mathrm{GINI}_{it} + \delta_4 \mathrm{UNEM}_{it} + \eta_{it}, \tag{17}$$

where α_i can be correlated with the regressors in any (unknown) pattern. In a functional coefficient model, the fixed effect cannot be removed by a preliminary step of first-difference or within-transformation of the dependent and independent variables, because the slope

coefficients $\delta_k = \delta_k(\text{RCV}_{it})$ are no longer constant for all the observations. The transformation based on equations also does not work, because it involves an additive function that impedes kernel-based estimation, and also because it produces an inconsistent estimated coefficient of the time-invariant term (see Sun et al. (2009) for the details). Therefore, we follow Sun et al. (2009) and remove the fixed effects by deducting a smoothed version of the cross-time average from each individual unit. This approach first analytically finds the fixed-effect vector via a weighted least square dummy variable model, and then estimates the functional parameters nonparametrically using a concentrate weighted least square method. To calculate the bootstrap standard error in the panel data model, we follow Kapetanios (2008) and construct bootstrap samples by resampling whole cross-sectional units with replacement (cross-sectional resampling).

Figure 3 presents the fixed-effect functional coefficient estimates for each control variable. In general the shape of the curves is similar to those in the standard functional coefficient model. In particular, the trends of the welfare-expenditure effect are consistent: welfare expenditure has a significantly negative effect on poverty when the CV ratio is low, but a weakly positive effect when the ratio is high (the U-shaped curve). Also, this effect becomes less significant as the ratio increases. The estimated coefficients of FD are below the zero line; they are much lower than those in the standard panel data model, even though we observe only the upper bound of the confidence interval. Thus, FD has little impact on the poverty rate if we control for the size (effects C and D) and the structure (effects A and B) of welfare expenditure. The results for unemployment and the Gini index show no particular trends.

In contrast to the standard estimation, the fixed-effect estimation results provide evidence for both the direct channels (effects A and B) and indirect channels (effects C and D), while the other channels (effect E) become relatively weak. In general, the harmful effect of FD can be observed in the functional coefficient analysis when we take the fixed effect into consideration.

5.3 Robustness check

We investigate the robustness of our results in various ways. First, we focus on the coefficient of TWE and consider different subsets of auxiliary variables {D, UNEM, GINI}.

Figure 3: Marginal effect of control variables on poverty as a function of CV ratio: Fixed-effect estimation

The results from both the standard and fixed-effect models show that including different auxiliary variables does not affect the curves of the welfare-expenditure effect.

Second, we consider using an alternative data set, namely the local governments' expenditure on cash and vendor payments. To ensure that the ratio is well-defined, we assign zero to those observations with no such assistance or payments.[2] We estimate the functional coefficient model using the local government expenditure. The left panel of Figure 4 shows that the welfare-expenditure effect on poverty is negative when RCV is small but weakly positive when RCV is large. This result is consistent with our previous findings. The larger confidence bands for small values of RCV are partly because we assign zero to those observations with no assistance or payments, which reduces the accuracy.

Finally, we consider the possible effect of lagged variables. This captures the causal effect, and using the lagged value can also reduce the endogeneity to some extent. We consider the following model:

$$p_{it} = \alpha_i + \delta_0 + \delta_1 \mathrm{D}_{i,t-1} + \delta_2 \mathrm{TWE}_{i,t-1} + \delta_3 \mathrm{GINI}_{it} + \delta_4 \mathrm{UNEM}_{it} + \eta_{it}, \tag{18}$$

where δ_k is a function of $\mathrm{RCV}_{i,t-1}$. In this model, we take a first-order lag of the control variables D and TWE together with the smoothing covariate RCV, because they are related to the fiscal policies. We estimate (18) using both standard and fixed-effect models, and the right panel of Figure 4 shows that our main results are not affected.

6 Concluding remarks

This paper models and empirically identifies the dress-up contest introduced by FD and its harmful effect on social welfare. Because of asymmetric information, voters cannot observe politicians' capabilities, but they make assessments based on the outcome of public projects. Therefore politicians, under election pressures, are motivated to allocate more resources to more visible projects to improve their image. We show that the yardstick competition triggered by FD can turn into a competition for a better image, i.e. a dress-up contest, and this contest further causes a structural bias in public expenditure (more expenditure on visible projects) and reduces the efficiency of public expenditure.

[2]Setting these observations to zero cannot distinguish the case with no cash and vendor payments from the case with vendor payments but no cash assistance.

Figure 4: Functional coefficient estimates of welfare-expenditure effect: Robustness check
(a) Estimates using local data (b) Estimates using lagged variables

Our empirical analysis first examined each transmission channel separately using the standard panel data model, and found that each effect is individually strong. On the one hand, FD significantly reduces the welfare expenditure, and thus further increases poverty. On the other hand, it encourages governments to spend more on visible projects, leading to a higher CV ratio in welfare expenditure. To capture the possible nonlinear interaction between CV ratio, welfare expenditure, and poverty, and also to examine the relative importance of each channel, we estimated the effects jointly using the functional coefficient panel data model. It showed that the transmission effects through welfare expenditure and the CV ratio are both nontrivial. An excessively large CV ratio weakens the poverty-reduction effect of welfare expenditure because of the efficiency loss. Separate estimation and joint estimation together provide supporting evidence for the positive effect of FD on poverty, and our results are robust to different model specifications. Therefore, our empirical analysis suggests that FD in general has a dark side that can lead to a higher level of poverty through a dress-up contest.

Our main results have important policy implications. Policymakers, who consider FD to be an efficient policy tool, should also be aware of its dark side. Two methods can help to avoid dress-up contests and their negative effects on social welfare in the course of FD. First, there should be a minimum level of public expenditure on less visible projects, so that the structure of public spending does not become too distorted. Second, an evaluation

system could be introduced to increase the visibility of public projects, such as the CPA (comprehensive performance assessment) system used in the UK since 2002. Such an assessment system would allow voters to better evaluate politicians' capabilities.

Further research is needed in several areas. First, we plan to use an alternative measure of yardstick competition to provide further evidence for dress-up contests. Second, there are missing values in the current data set, and a better data set is thus required. Finally, we will consider functional coefficient estimation in the presence of instrumental variables.

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Appendix

Detailed data description

p Regional poverty rate. The share of people with an income lower than the regional standard (varying over regions), from 1992 to 2008. *Source: Statistical Abstract.*

D Fiscal decentralisation. Defined as

$$\mathrm{D} = \frac{\text{local expenditure}}{\text{local expenditure} + \text{state expenditure}},$$

where state expenditure refers to the expenditure by the state government, and local expenditure is the expenditure by all local governments. *Source: Statistical Abstract.*

UNEM Unemployment rate, from 1992 to 2008. *Source: Bureau of Economic Analysis.*

COMP$_r$ Yardstick competition based on the comparability of jurisdictions, the ratio of the number of local governments over the number of congressional districts.

COMP$_c$ Yardstick competition based on the competitiveness of local governments, the percentage of votes won by the leading party, from 1992 to 2008.

TWE Welfare expenditure. Total public welfare per thousand persons measured in thousands of dollars, from 1992 to 2008 excluding 2000, 2002, and 2006. *Source: Statistical Abstract.*

RCV The ratio of cash assistance to vendor payments. In this ratio, cash assistance is paid directly to needy persons under the categorical programs (Old Age Assistance, Temporary Assistance for Needy Families (TANF)) and any other welfare programs. Vendor payments are made directly to private purveyors for medical care, burials, and other commodities and services provided under welfare programs; and for the provision and operation by the government of welfare institutions. *Source: Statistical Abstract.*

GINI Gini index. *Source: Statistical Abstract.*

2011

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