



# Political regimes and publicly provided goods: why democracy needs development

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## Abstract

While most of the theoretical literature suggests that democracy promotes the provision of public goods, the findings of empirical studies are inconclusive. Drawing on a simple model, this paper aims at reconciling theory and evidence. We argue that the stronger dependence of more democratic governments upon public support has two opposing effects: on the one hand, it encourages these governments to increase goods provision in order to generate more loyalty. On the other hand, it raises the leaders' incentives for kleptocratic behavior. The model predicts that the latter effect may dominate in poor countries. In countries with higher income levels, democracy is expected to increase public goods provision. Utilizing 11 indicators of education, health, infrastructure and governance both hypotheses are confirmed by panel regressions including 154 countries over the period from 1960 to 2014. We also show that the omission of per capita income as a moderator variable of democracy may result in small and insignificant empirical estimates.

**Keywords** Publicly provided goods · Public goods · Democracy · Political regimes

**JEL classification** H11 · H40 · H51 · H52 · H54

## 1 Introduction

From a global perspective, the last decades have seen both remarkable economic development and a considerable increase in the share of democratic political regimes (Marshall and Cole 2014). The positive association between economic development and democracy has fueled more than 50 years of research on the underlying mechanisms. Some authors, most prominently Lipset (1959), consider economic development to be a requisite for democracy. Other scholars argue that causality runs from democracy to development (see,

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e.g., Acemoglu et al. 2008, forthcoming). In that regard, one strand of the literature emphasizes the link between political regimes and the provision of goods like education, health-care and infrastructure.<sup>1</sup> Theoretical studies agree widely that democracy induces higher levels of those publicly provided goods (see, e.g., Bueno De Mesquita et al. 2003; Deacon 2009; Lake and Baum 2001; McGuire and Olson 1996). However, the purported positive relationship between democracy and goods provision appears to be less clear-cut empirically as several contradictory findings challenge the hypothesis of a “democratic advantage” (see, e.g., Lott 1999; Mulligan et al. 2004; Ross 2006; Truex 2017).

The contribution of this paper is twofold: (1) Emphasizing the interactions between economic development and political regimes, we re-consider the link between democracy and goods provision from a theoretical and an empirical perspective. On the one hand, and in line with previous studies, our theoretical model shows that democracy promotes goods provision by increasing the dependence of the government upon public support. On the other hand, the model highlights that democracy also increases the government’s incentives for kleptocratic behavior by reducing the gains from holding public office. We show that the adverse effect is particularly likely to dominate in countries with low income levels. Goods provision is positively related to democracy in countries with sufficiently high income levels only. (2) Showing that the omission of the interaction between democracy and income levels may result in small and insignificant empirical estimates, we propose an explanation for contradictory previous evidence on the link between democracy and publicly provided goods.

Building on the work of Deacon and Saha (2006), theoretical arguments for a positive relationship between democracy and goods provision can be characterized by two lines of reasoning: the first one postulates that autocratic governments enjoy more monopoly power than democratic governments. For that reason, autocratic regimes foster the exploitation of the general population in favor of small elites. The second argument states that democratic leaders have to generate the loyalty of a larger group of people in order to survive in office. From that perspective, goods such as education, healthcare, or infrastructure are provided in exchange for political support.

Drawing on the first argument, McGuire and Olson (1996) point out that democratic as well as autocratic governments have an incentive to provide certain goods because they increase the economy’s productivity, which, in turn, increases the rents that can be generated by the redistribution of income in favor of the ruling elite. As the democratic elite’s “stake” in the society is relatively strong, democratic governments will tend to reduce the deadweight loss associated with the generation of rents and to raise the level of publicly provided goods. Assuming that democratic governments maximize the utility of the median voter, whereas autocratic rulers maximize the amount of rents they can extract from the economy, Niskanen (1997) arrives at a similar conclusion with regard to goods provision.

Bueno De Mesquita et al. (2003) build on the assumption that all political leaders are striving for gains from office, irrespective of the type of the political regime in which they operate. Within the framework of their “selectorate theory”, the level of goods provision is driven fundamentally by the size of that group, i.e., the number of people eligible to select the ruler, and the size of the winning coalition, i.e., the number of supporters a leader

<sup>1</sup> In the following, we will refer to such goods as “publicly provided goods”. In the literature, those goods often are called “public goods”. They do, however, usually not satisfy the criteria of non-excludability and non-rivalry fully.

needs to remain in power. In order to stay in office, a political leader can provide private goods to the members of the winning coalition and public goods to the whole population. To minimize costs, the leader relies on the provision of private goods if the winning coalition is small. As the size of the winning coalition grows, public good provision becomes more attractive. Since democracies usually are characterized by relatively large winning coalitions, “selectorate theory” predicts that democratic regimes will be associated with high levels of public good provision.

Lake and Baum (2001) draw a parallel between economic and political markets by emphasizing that not the state’s monopoly position, but its openness to political contest determines the supply of public services. Less contestability corresponds to more monopoly power, which enables political leaders to extract more rents at the cost of public investment. Relative to autocracies, the political markets of democratic political regimes are characterized by vigorous contestability and, therefore, are expected to foster goods provision. Deacon (2009) identifies the relative political influence of different societal groups—in the simplest case, that of an elite and that of the rest of the population—as a crucial factor. The more even distribution of political power under democracy compared to dictatorship is shown to result in larger amounts of nonexclusive publicly provided goods.

From an empirical viewpoint, several studies find evidence in favor of the hypothesis that democracy promotes goods provision. More democratic countries are, for instance, found to perform better in terms of public education, population health, safe water and physical infrastructure (see, e.g., Baum and Lake 2003; Besley and Kudamatsu 2006; Deacon 2009; Justesen 2012; Kotera and Okada 2017; Kudamatsu 2012; Lake and Baum 2001; Stasavage 2005; Wigley and Akkoyunlu-Wigley 2011). In many countries, those goods are not provided exclusively by the public sector. Democracy also may foster private sector production of goods like education, healthcare, and infrastructure owing to the provision of a favorable institutional and regulatory environment. In that regard, multiple studies point to the crucial role of economic institutions and “good governance”, including the establishment of the rule of law and freedom from corruption (see, e.g., Acemoglu et al. 2001; Brunetti et al. 1998; Jain 2001; Nguyen and Van Dijk 2012). Governance, in turn, is found to be closely related to the type of political regime, with democracies generally showing “better” performance (see, e.g., Rigobon and Rodrik 2005; Rivera-Batiz 2002).

However, those results have not gone unchallenged. Lott (1999) analyses education expenditures and does not find a positive association with democracy. Totalitarian governments instead are shown to invest heavily in public education.<sup>2</sup> By investigating educational and social spending, Mulligan et al. (2004) also obtain the result that democracy does not have a systematic impact on those public policies. While the analysis of Ross (2006) indicates that democracies indeed do spend more on education and health, little evidence is found for democracy’s impacts on infant and child mortality rates. Ross concludes that the corresponding benefits of democracy accrue to middle- and upper-income groups, whereas the situation of the poor does not improve substantially. Dahlum and Knutsen (2017) raise more subtle doubts by distinguishing between the quantity and the quality of education. Their results show that democracies on average provide more, but not systematically better education than autocracies. Clague et al. (1996) find that democracies in general provide greater security of property and contract rights. However, short-lasting democracies are shown to perform worse than autocracies, particularly compared to situations

<sup>2</sup> According to Lott, his finding reflects the fact that totalitarian governments use education as an instrument for indoctrination.

wherein the autocratic leader has a long time horizon. The positive association between democracy and property and contract rights thus is driven by long-lasting democracies. In that regard, the authors argue that both the durability of democracy and the provision of property rights rely on adherence to individual freedoms and the rule of law. By focusing on a lower level of aggregation, Justesen (2015) highlights that political institutions that make governments accountable to larger groups in the society induce better protection of property rights, whereas the existence of veto players can have ambiguous effects. With respect to economic development, Justesen and Kurrild-Klitgaard (2013) emphasize interactions between property rights protection and political institutions. They argue that the “mere promise” of property rights protection is not sufficient for fostering economic development if the promise lacks credibility. Credibility, in turn, may be ensured by a political system with separation of powers, which implies the presence of veto players. In line with such reasoning, the authors provide evidence that the positive growth effects of property rights protection are explained, in particular, by legislative checks on the executive branch. Furthermore, the growth-promoting effects of institutions are found to be weaker in countries with smaller stocks of democratic capital, i.e., in young democracies and countries having limited historical experience with democratic forms of government. Truex (2017) notes that empirical studies usually rely on only a few model specifications, apply different methods, and use different sets of control variables and lag structures. Moreover, he suspects that the literature on democracy and goods provision could be subject to publication bias. Within the framework of global sensitivity analysis, Truex estimates various model specifications and finds little evidence of a “democratic advantage”.

Against that background, we present a simple model of goods provision that relies on the assumption that more democratic governments are required to generate the loyalty of a larger group of people to remain in office. We show that that requirement creates a trade-off for the government: on the one hand, democracy clearly promotes goods provision in exchange for the wider political support required to stay in office. On the other hand, the larger public investment a democratic government must provide to stay in power reduces its gains from holding office. In that way, democracy may affect goods provision negatively. The model indicates that adverse effects are particularly likely if income levels are low and, as a result, the budget available to the government is small. According to that reasoning, democracy needs development in the sense that positive impacts on goods provision arise only in countries with sufficiently high income levels. In less developed countries, more democratic regimes are associated with lower public investment. Utilizing 11 indicators of publicly provided goods, the hypotheses derived from the model are tested empirically. Our instrumental variables regressions confirm that democracy has a positive (negative) effect on goods provision in countries with high (low) income levels. The results are robust against different lag structures, alternative measures of democracy, and additional control variables. We conclude that the inconsistencies in previous evidence on the relationship between democracy and goods provision may be because of the omission of income as a moderator variable.

The rest of the paper is structured as follows. Section 2 develops our theoretical model and derives empirically testable hypotheses. Section 3 describes the data and our empirical strategy. Section 4 discusses the estimation results. Section 5 presents some robustness checks. Section 6 summarizes and concludes.

## 2 The model

The simple model outlined in this section aims to describe basic mechanisms determining the relationship between publicly provided goods and the type of the political regime. We consider two (groups of) agents: the government and the citizens. More government-goods provision is assumed to result in higher income levels which, in turn, raise the citizens' welfare and broaden the tax base. However, the provision of goods such as education, healthcare, infrastructure, and a favorable institutional environment affects an economy's output and income level only with a time lag. To capture that intertemporal structure, the model has two time periods,  $t$  and  $t + 1$ . The timing is as follows: the government enters office at the beginning of period  $t$  and decides on the tax rate and the level of publicly provided goods. Based on those policy choices, each citizen evaluates the government's performance and decides whether or not to be loyal. The population's aggregate level of loyalty finally determines whether the government is removed from office at the end of period  $t$  or survives until period  $t + 1$ . Accordingly, the government's objective is to maximize utility over both periods while facing the constraint that a threshold level of loyalty is required in order to stay in office in the next period. In line with core arguments of the literature, that threshold level is determined by the type of governing political regime.

### 2.1 Model setup

Following Bueno De Mesquita et al. (2003), we assume that political leaders primarily are striving for gains from holding office. Those gains include the use of public resources for private purposes (e.g., palaces, Swiss bank accounts, vanity projects) and the inherent value of holding power. As the latter is not crucial for our analysis, we focus on a government  $G$  drawing utility from current private consumption  $c_{G,t}$ ; consumption prospects are captured by the size of the future tax base  $y_{t+1}$ . Hence, the utility function of the government is defined as

$$U_G = \log c_{G,t} + \delta \cdot \log y_{t+1}, \quad (1)$$

where  $\delta \in ]0, 1[$  reflects time preference. Expression (1) describes the government's utility when it survives in office beyond period  $t$  since it benefits from the tax base in period  $t + 1$ . As outlined above, survival requires that the population's level of loyalty  $L_t \in [0, 1]$  is at least as high as a certain threshold level  $\bar{L}_t \in [0, 1]$ . Thus, the government survives until period  $t + 1$  if  $L_t \geq \bar{L}_t$  and is removed from office at the end of  $t$  otherwise. In line with the literature, we assume that the level of loyalty a government has to generate in order to stay in office is higher under more democratic regimes.<sup>3</sup> However, although to a lesser extent, non-democratic governments also rely on the population's loyalty as they face the threat of revolution (see, e.g., Bar-El 2009). Formally, we posit that

$$\bar{L}_t = \bar{L}(D_t), \quad (2)$$

with  $\bar{L}' > 0$ ,  $\bar{L}(0) > 0$ ,  $\bar{L}(1) < 1$ , and  $D_t \in [0, 1]$  as the level of democracy. Here,  $D_t = 0$  and  $D_t = 1$  represent fully autocratic and fully democratic political regimes, respectively. The positive derivative of  $\bar{L}(\cdot)$  reflects that governments under more democratic regimes

<sup>3</sup> This is obvious for full democracies where governmental survival is depends on the electoral support of the citizenry.

must secure higher levels of loyalty in order to stay in office. However, as  $\bar{L}_t$  is positive for  $D_t = 0$ , even governments under fully autocratic regimes have to generate some popular support.

The population consists of a continuum of citizens  $i \in [0, 1]$  with mass normalized to unity. Generally, the decision of an individual whether or not to support the government is determined by her utility from consumption  $c_{i,t}$  and  $c_{i,t+1}$  according to

$$U_{i,t} = \log c_{i,t} + \delta \cdot E[\log c_{i,t+1}], \quad (3)$$

where  $E[\cdot]$  denotes the expectations operator. For simplicity, the citizens' time preference is equal to that of the government. Given proportional tax rates  $\tau_t, \tau_{t+1} \in [0, 1]$ , consumption is given by net income, i.e.,  $c_{i,t} = (1 - \tau_t)y_{i,t}$  and  $c_{i,t+1} = (1 - \tau_{t+1})y_{i,t+1}$ , where  $y_{i,t}$  and  $y_{i,t+1}$  denote the individual's gross income in the respective period. While income in period  $t$  is treated as exogenous, each citizen's income in period  $t + 1$  is affected by the level of previously supplied publicly provided goods  $g_t$ . Formally, that relationship is expressed by the micro-level production function

$$y_{i,t+1} = \theta_i \cdot g_t^\alpha, \quad (4)$$

where  $\theta_i > 0$  is an individual-specific productivity factor and  $\alpha \in ]0, 1[$  is the elasticity of income in  $t + 1$  with respect to goods provision in  $t$ . Aggregating individual incomes yields the macro-level production function

$$y_{t+1} = \int_0^1 y_{i,t+1} di = \theta \cdot g_t^\alpha, \quad (5)$$

where  $\theta = \int_0^1 \theta_i di$  reflects aggregate productivity.<sup>4</sup> Using (4), a citizen's consumption in period  $t + 1$  can be written as  $c_{i,t+1} = (1 - \tau_{t+1}) \cdot \theta_i \cdot g_t^\alpha$ . While the level of publicly provided goods is observed by each individual at the end of the first period, the tax rate in the next period is unknown when evaluating governmental performance. Citizens therefore may have different beliefs about  $\tau_{t+1}$ , which are represented by the individual-specific density functions  $b_t(\tau_{t+1})$ . Thus, the expected utility from consumption in period  $t + 1$  is

$$E[\log(c_{i,t+1})] = \int_0^1 \log \{ (1 - \tau_{t+1}) \cdot \theta_i \cdot g_t^\alpha \} \cdot b_t(\tau_{t+1}) d\tau_{t+1}. \quad (6)$$

Based on (3) and (6), we can write a citizen's utility as

$$U_{i,t} = \log \{ (1 - \tau_t)y_{i,t} \} + \delta \int_0^1 \log \{ (1 - \tau_{t+1}) \cdot \theta_i \cdot g_t^\alpha \} \cdot b_t(\tau_{t+1}) d\tau_{t+1}. \quad (7)$$

Each citizen's utility declines in the tax rate  $\tau_t$  as it reduces current consumption and increases in goods provision  $g_t$  because the latter generates a higher income in the following period. The specification implies a tradeoff between the citizens' current and future consumption as investments in publicly provided goods have to be financed by tax revenue. In deriving the latter, we follow Acemoglu and Robinson (2005) and others by accounting for the distortionary costs of taxation  $\varphi(\tau_t) \cdot y_t$ , where  $\varphi(\cdot)$  is assumed to be convex, differentiable and non-decreasing ( $\varphi' > 0, \varphi'' > 0, \varphi(0) = 0$ ). Tax revenue in period  $t$  therefore is  $[\tau_t - \varphi(\tau_t)] \cdot y_t$ . Thus, from the perspective of an individual, an optimal policy  $\{\tau_t^{\text{opt}}, g_t^{\text{opt}}\}$

<sup>4</sup> Note that  $y$  denotes both total and per capita income because the size of the population is normalized to unity.

maximizes (7) subject to the constraint  $g_t = [\tau_t - \varphi(\tau_t)] \cdot y_t$ . Hence, the optimal policy is described by

$$\varphi'(\tau_t^{\text{opt}}) = 1 - \frac{\tau_t^{\text{opt}} - \varphi(\tau_t^{\text{opt}})}{\alpha\delta \cdot (1 - \tau_t^{\text{opt}})}, \quad (8)$$

$$g_t^{\text{opt}} = \alpha\delta \cdot (1 - \tau_t^{\text{opt}}) \cdot [1 - \varphi'(\tau_t^{\text{opt}})] \cdot y_t. \quad (9)$$

As shown by (8), the optimal tax rate  $\tau_t^{\text{opt}}$  increases in the income elasticity of goods provision  $\alpha$  and the rate of time preference  $\delta$ . The level of goods provision consequently also increases in both parameters. Moreover, (9) reveals that the optimal level of goods provision  $g_t^{\text{opt}}$  is proportional to the income level  $y_t$ .

When deciding whether or not to be loyal to the government, each citizen compares her actual utility to her utility under the optimal policy  $U_{i,t}^{\text{opt}}$ . We assume that an individual is loyal to the government if  $U_{i,t}^{\text{opt}} - U_{i,t} \leq \varepsilon_i$ , where  $\varepsilon_i \geq 0$  measures the individual's willingness to accept deviations from the optimal utility level. Using (7) and (9), the condition can be rewritten as

$$\eta_t \cdot (1 - \tau_t) \cdot \left(\frac{g_t}{y_t}\right)^{\alpha\delta} \geq \tilde{\varepsilon}_i, \quad (10)$$

where  $\eta_t := \{\alpha\delta \cdot (1 - \tau_t^{\text{opt}})^{1+\alpha\delta} \cdot [1 - \varphi'(\tau_t^{\text{opt}})]^{\alpha\delta}\}^{-1}$ .  $\tilde{\varepsilon}_i := \exp(-\varepsilon_i) \in [0, 1]$  reflects the extent to which the government must approach the optimal utility level in order to win the individual's support. To derive the citizens' aggregate level of loyalty, the distribution of  $\tilde{\varepsilon}_i$  in the population is described by the distribution function  $L(\tilde{\varepsilon})$ . As a general assumption, we impose that  $L'(\tilde{\varepsilon}) > 0 \forall \tilde{\varepsilon} \in [0, 1]$ . The population's level of loyalty, defined as the share of the citizens supporting the government, is then given by

$$L_t = l(\tau_t, g_t) = L\left(\eta_t \cdot (1 - \tau_t) \left(\frac{g_t}{y_t}\right)^{\alpha\delta}\right). \quad (11)$$

Thus, (11) implies that a lower tax rate and a higher level of goods provision broaden the population's support for the government. However, according to its utility function (1), the government has an incentive to use at least part of the tax revenue for private consumption  $c_{G,t}$ . That is obvious from the government's budget constraint

$$[\tau_t - \varphi(\tau_t)] \cdot y_t = g_t + c_{G,t}, \quad (12)$$

stating that tax revenue is divided between investments in publicly provided goods and officials' private consumption. Based on those considerations and taking into account that a certain level of loyalty is required to survive in office, the government's utility can be expressed as

$$U_{G,t} = \begin{cases} \log\left\{[\tau_t - \varphi(\tau_t)] \cdot y_t - g_t\right\} + \delta \cdot \log\{\theta \cdot g_t^\alpha\} & : l(\tau_t, g_t) \geq \bar{L}(D_t) \\ \log\left\{[\tau_t - \varphi(\tau_t)] \cdot y_t - g_t\right\} & : l(\tau_t, g_t) < \bar{L}(D_t) \end{cases} \quad (13)$$

The government draws utility from tax revenue not spend on publicly provided goods in period  $t$  and the size of the tax base in period  $t + 1$  if  $l(\tau_t, g_t) \geq \bar{L}(D_t)$ , i.e., if the population's level of loyalty is at least as high as the regime-specific threshold level. If the level of

goods provision is too low to reach that threshold, i.e., if  $l(\tau_t, g_t) < \bar{L}(D_t)$ , the government is removed from office at the end of period  $t$  and benefits from consumption in that period only. In the following, we examine the government's decisions on the tax rate and investments in publicly provided goods when the loyalty constraint is non-binding and when it is binding, respectively.

## 2.2 Non-binding loyalty constraint

Without the loyalty constraint, the government's problem is to choose  $\{\tau_t^*, g_t^*\}$  to maximize

$$U_{G,t} = \log\{[\tau_t - \varphi(\tau_t)] \cdot y_t - g_t\} + \delta \cdot \log\{\theta \cdot g_t^\alpha\}. \quad (14)$$

Hence, the government's preferred policy is given by

$$\varphi'(\tau_t^*) = 1, \quad (15)$$

$$g_t^* = \xi \cdot [\tau_t^* - \varphi(\tau_t^*)] \cdot y_t, \quad (16)$$

where  $\xi := (\alpha\delta)/(1 + \alpha\delta)$  is the share of tax revenue spent on goods provision. According to (15), the government chooses  $\tau_t^*$  such that tax revenue is maximized by equating the marginal distortion and the marginal gain associated with a rise in the tax rate. Equation (16) states that the government's preferred level of publicly provided goods rises in the level of income as such an increase generates more tax revenue and, ceteris paribus, more private consumption for officials. To maximize utility, the government shifts the share  $\xi$  of that gain in tax revenue to goods provision in order to increase future consumption possibilities.

## 2.3 Binding loyalty constraint

If the government's preferred policy does not generate support in the population sufficient to survive in office, i.e., if  $l(\tau_t^*, g_t^*) < \bar{L}(D_t)$ , the loyalty constraint becomes binding. In that scenario, the government will either (1) choose a policy that fulfills the loyalty constraint or (2) maximize current consumption while accepting loss of office at the end of period  $t$ .

In case of choosing option (1), the government's policy maximizes private consumption while securing office in  $t + 1$ . Hence, the government chooses  $\{\tau_t^D, g_t^D\}$  such that the loyalty constraint is fulfilled with equality, i.e.,  $l(\tau_t^D, g_t^D) = \bar{L}(D_t)$ . The Lagrangian is

$$\begin{aligned} \mathcal{L}(\tau_t, g_t, \lambda) = & \log\{[\tau_t - \varphi(\tau_t)] \cdot y_t - g_t\} + \delta \cdot \log\{\theta \cdot g_t^\alpha\} \\ & + \lambda \left[ L\left(\eta_t \cdot (1 - \tau_t) \left(\frac{g_t}{y_t}\right)^{\alpha\delta}\right) - \bar{L}(D_t) \right]. \end{aligned} \quad (17)$$

Utilizing the first-order conditions resulting from (17), the government's policy fulfilling the loyalty constraint is described by

$$\varphi'(\tau_t^D) = \frac{1 - \varphi(\tau_t^D)}{1 - \tau_t^D} - \frac{1}{\xi \cdot (1 - \tau_t^D)} \left( \frac{\Psi(D_t)}{\eta_t \cdot (1 - \tau_t^D)} \right)^{\frac{1}{\alpha\delta}}, \quad (18)$$

$$g_t^D = \xi \cdot [1 - \varphi(\tau_t^D) - (1 - \tau_t^D) \cdot \varphi'(\tau_t^D)] \cdot y_t, \quad (19)$$



where  $\Psi(D_t) := L^{-1}(\bar{L}(D_t))$ . The properties of  $L(\cdot)$  and  $\bar{L}(\cdot)$  imply that  $\Psi(0) > 0$  and  $\Psi' > 0$ . Hence, the right-hand side of (18) declines in the level of democracy. Since  $\varphi'' > 0$ , the latter implies that  $d\tau_t^D/dD_t < 0$ . A rise in the level of democracy therefore leads to a reduction in the tax rate set by the government. From (19) follows

$$\frac{dg_t^D}{dy_t} = \xi \cdot [1 - \varphi(\tau_t^D) - (1 - \tau_t^D) \cdot \varphi'(\tau_t^D)] > 0, \quad (20)$$

$$\frac{dg_t^D}{dD_t} = -\xi \cdot \varphi''(\tau_t^D) \cdot y_t \cdot \frac{d\tau_t^D}{dD_t} > 0, \quad (21)$$

$$\frac{d^2 g_t^D}{dD_t dy_t} = -\xi \cdot \varphi''(\tau_t^D) \cdot \frac{d\tau_t^D}{dD_t} > 0. \quad (22)$$

While (20) shows that higher income levels induce higher levels of goods provision, (21) implies that rises in the level of democracy also increase the level of publicly provided goods. Under a binding loyalty constraint, democracy therefore is related to a smaller tax burden and larger goods provision. As such, the government sacrifices private consumption by using both instruments to secure a return to office by generating the required increase in the population's loyalty. Furthermore, (22) states that the increase in goods provision triggered by an increase in the level of democracy is larger at higher than at lower income levels. Given the policy  $\{\tau_t^D, g_t^D\}$ , the government's utility when fulfilling the loyalty constraint is

$$U_{G,t}^D = \log \{ [\tau_t^D - \varphi(\tau_t^D)] \cdot y_t - g_t^D \} + \delta \cdot \log \{ \theta \cdot (g_t^D)^\alpha \}. \quad (23)$$

In case of choosing option (2), the government accepts losing office at the end of period  $t$  and therefore sets  $\{\tau_t^K = \tau_t^*, g_t^K = 0\}$  to maximize current consumption. Thus, the government maximizes tax revenue by setting the tax rate to  $\tau_t^*$  and reduces expenditures on publicly provided goods to zero. In the following, case (2) is referred to as kleptocracy. Accordingly, the government's utility under kleptocracy is

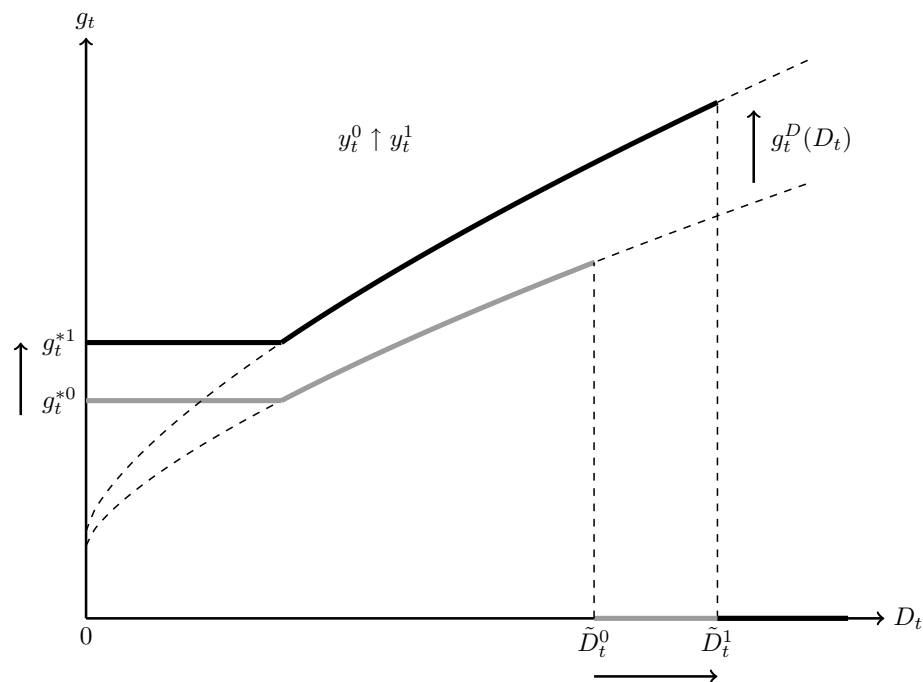
$$U_{G,t}^K = \log \{ [\tau_t^* - \varphi(\tau_t^*)] \cdot y_t \}. \quad (24)$$

As (24) shows, in that scenario the government does not draw utility from the tax base in period  $t + 1$  but consumes the total available budget in period  $t$ .

When facing a binding loyalty constraint, the government decides between the two options described above based on their respective utility levels. Define  $\Delta(D_t) := U_{G,t}^D - U_{G,t}^K$  as the difference in utility between fulfilling the loyalty constraint by providing  $g_t^D$  and opting for kleptocracy. Applying the envelope theorem yields

$$\Delta'(D_t) = \frac{dU_{G,t}^D}{dD_t} = -\lambda \cdot \bar{L}'(D_t) < 0. \quad (25)$$

The difference in utility between fulfilling the loyalty constraint and opting for kleptocracy therefore declines in the level of democracy. Intuitively, the binding loyalty constraint requires the government to choose a lower tax rate and a higher level of publicly provided goods in order to stay in power than it would provide in line with its preferred policy. Thus,



**Fig. 1** Effect of a rise in income  $y_t$  on the level of publicly provided goods  $g_t$  and the critical level of democracy  $\tilde{D}_t$

the government's utility is lower in the constrained than in the unconstrained scenario. An increase in the level of democracy further reduces the tax rate and increases the required level of goods provision, leading to an additional reduction in utility. On the contrary, the utility that the government obtains when it maximizes current consumption at the cost of losing office is independent of the regime type. Thus, higher democracy levels strengthen the government's incentives for kleptocratic behavior, *ceteris paribus*. For that reason, democratization may first lead to an increase of the level of publicly provided goods, but result in a reduction of the latter when a certain democracy level is reached. We will refer to the lowest level of democracy at which the government favors kleptocracy as the critical level of democracy  $\tilde{D}_t$ . For further investigation, suppose that the government fulfills the loyalty constraint if  $\Delta(D_t) > 0$  and opts for kleptocracy otherwise. Utilizing the previous results,  $\tilde{D}_t$  thus is given implicitly by

$$\Delta(\tilde{D}_t) = \log \{ \omega(\tau_t^D(\tilde{D}_t), \tau_t^*) \} + \alpha \delta \cdot \log y_t = 0, \quad (26)$$

where  $\omega(\cdot)$  captures the tax rates under the government's preferred policy  $\tau_t^D(\tilde{D}_t)$  and under kleptocracy  $\tau_t^*$ . Implicit differentiation of (26) shows that the critical level of democracy increases in the level of income:

$$\frac{d\tilde{D}_t}{dy_t} = \frac{1}{-\Delta'(\tilde{D}_t)} \cdot \frac{\alpha \delta}{y_t} > 0. \quad (27)$$

A rise in the current income level increases tax revenue and thereby leads to more private consumption of the government irrespective of whether it fulfills the loyalty constraint or opts for kleptocracy. However, a rise in income also induces a higher level of goods provision, which broadens the tax base in the next period and, hence, increases the government's consumption prospects. Since the government benefits from the latter effect only if it stays in office, a rise in the level of income increases the government's incentives to fulfill the loyalty constraint.

Figure 1 illustrates the effects of a rise in income  $y_t$  on goods provision  $g_t$  for different levels of democracy  $D_t$ . The gray curve depicts the level of goods provision in the initial situation where the population's income is  $y_t^0$  and the government's preferred level of goods provision is  $g_t^{*0}$ . At a certain democracy level the loyalty constraint, which is given by the curve  $g_t^D(D_t)$ , becomes binding. Therefore, the level of goods provision henceforth rises with the level of democracy. However, when reaching the critical democracy level  $\tilde{D}_t^0$  the government's utility when fulfilling the loyalty constraint no longer exceeds the utility obtained under kleptocracy. Hence, the level of publicly provided goods drops to zero for  $D_t \geq \tilde{D}_t^0$ . The black curve depicts the situation after the population's income has increased from  $y_t^0$  to  $y_t^1$ . Owing to higher tax revenue, the government's preferred level of goods provision rises to  $g_t^{*1}$  (see Sect. 2.2). At the same time, the loyalty constraint is shifted upwards as the higher income level increases the citizens' utility-maximizing level of goods provision, thereby forcing the government to provide more publicly provided goods to generate the same level of loyalty as in the initial situation. Furthermore, the critical level of democracy shifts to the right from  $\tilde{D}_t^0$  to  $\tilde{D}_t^1$ . Thus, kleptocracy sets in at later stages of democratization. Evidently, if income exceeds a certain threshold, no critical level of democracy exists as the government never has an incentive for kleptocratic behavior. Hence, the government of a sufficiently rich economy always provides goods in the amount of  $g_t^D$  or higher.

Given the foregoing results from comparative static analysis, we formulate the following hypotheses for empirical examination<sup>5</sup>:

**H<sub>1</sub>** Higher income levels induce higher levels of publicly provided goods.

**H<sub>2</sub>** Democracy increases the level of publicly provided goods in countries with high income levels.

**H<sub>3</sub>** Democracy reduces the level of publicly provided goods in countries with low income levels.

<sup>5</sup> Note that we abstain from formulating hypotheses regarding the tax rate. The main reason is that the model presented here focuses on the use of tax revenue for public spending and does not account for the redistribution of income among citizens by transfers. The latter perspective may lead to the result that democracy is associated with higher tax rates (see Acemoglu and Robinson 2005). However, since this paper focuses on publicly provided goods, the redistributive role of taxes is not considered further for the sake of simplicity.

### 3 Data and method

To test the hypotheses derived above, we draw on multiple indicators of publicly provided goods that frequently are utilized in the literature. The indicators can be classified into the categories education, health, infrastructure and governance quality. With regard to education, we use data on secondary and tertiary gross school enrollment ratios. School enrollment ratios have shortcomings, e.g., as they do not reflect attendance, dropout rates and repeaters. However, we expect them to capture changes induced by government policies relatively quickly. The same is, for instance, not true for indicators measuring the population's average years of schooling, which may respond only with a long time lag.<sup>6</sup> Health indicators include the infant mortality rate, the number of physicians per 1000 people, and measles and DPT (diphtheria, pertussis and tetanus) immunization rates. Infrastructure is represented by the number of telephone subscriptions per 100 people and the number of Internet users per 100 people. All data are retrieved from the World Development Indicators (World Bank 2017). With regard to governance, we utilize three indicators from the Varieties of Democracy (VDem) Project (Coppedge et al. 2017) measuring rule of law and corruption. The VDem "Rule of law" index ranges from zero to one, with higher values indicating stronger establishment of the rule of law. Corruption is measured by the "Executive corruption" index and the "Public sector corruption" index. While the former focuses directly on members of the executive branch, the latter relates to the behavior of public sector employees. Both indexes capture bribery as well as theft, embezzlement and misappropriation of state resources for private use. All indicators of goods provision capture outcomes of rather than expenditures on goods provision since expenditure data may be distorted, e.g., by corruption, unnecessary spending, or hidden rents (see, e.g., Baum and Lake 2003; Deacon 2009; Truex 2017). To avoid highly skewed distributions, the variables "Physicians", "Telephone", and "Internet" are defined as the logarithms of the respective indicators. As some observations on those indicators are zero, we transform them by adding 1 beforehand. Infant mortality rates are inverted before calculating the logarithm, so that higher values of the variable "Mortality" indicate "better" outcomes. A slightly different approach is used regarding the variables "Measles" and "DPT". In addition to skewed distributions, the underlying indicators are characterized by several observations with values of 100%. Therefore, we use the transformation  $\log(100/(100 - x + 1))$  to define the variables entering the analysis, where  $x$  denotes the respective indicator. Thus, we calculate the logged inverses of the complements of the indicators (e.g., the number of people per person without measles immunization), but add one to the denominators to avoid dividing by zero. While that procedure preserves the interpretation of higher values as indicating "better" outcomes, it also mitigates concerns about skewness. Regarding "Executive corruption" and "Public sector corruption", higher values indicate more corruption on the original scales. Hence, we reverse their signs to measure freedom from corruption as a publicly provided good. Table 1 gives an overview of our proxy variables for the level of publicly provided goods and the indicators used for operationalization.

Our main explanatory variables are democracy and income. To measure democracy, we rely on two indicators often used in the empirical literature (see, e.g., Acemoglu et al. 2008; Deacon 2009; Mulligan et al. 2004). First, we utilize the "Polity scores" from the

<sup>6</sup> Using data on the population's average years of schooling provided by Barro and Lee (2013) and accounting for the mentioned delay by time lags of democracy and income yields results consistent with the findings presented in this paper. The regression tables are available upon request.

**Table 1** Dependent variables and indicators of publicly provided goods

Category	Variable	Indicator
Education	Secondary	Ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of secondary education
	Tertiary	Ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of tertiary education
Health	Mortality (inv.) <sup>b</sup>	Number of infants dying before reaching one year of age, per 1,000 live births in a given year
	Physicians <sup>a</sup>	Generalist and specialist medical practitioners per 1000 people
	Measles <sup>c</sup>	Percentage of children ages 12–23 months who received DPT vaccinations
	DPT <sup>c</sup>	Percentage of children ages 12–23 months who received DPT vaccinations
Infrastructure	Telephone <sup>a</sup>	Sum of active number of analogue fixed telephone lines, voice-over-IP (VoIP) subscriptions, fixed wireless local loop (WLL) subscriptions, ISDN voice-channel equivalents and fixed public payphones per 100 people
	Internet <sup>a</sup>	Number of individuals who have used the Internet (from any location) in the last 3 months per 100 people
Governance	Rule of law	Extent to which laws are transparently, independently, predictably, impartially, and equally enforced, and the extent to which the actions of government officials comply with the law
	Executive corruption (rev.) <sup>d</sup>	Extent to which members of the executive or their agents routinely grant favors in exchange for bribes, kickbacks, or other material inducements, and how often they steal, embezzle, or misappropriate public funds or other state resources for personal or family use
	Public sector corruption (rev.) <sup>d</sup>	Extent to which public sector employees grant favors in exchange for bribes, kickbacks, or other material inducements, and how often they steal, embezzle, or misappropriate public funds or other state resources for personal or family use

Indicators and descriptions on education, health, and infrastructure are derived from World Bank (2017). Indicators and descriptions on governance are from Coppedge et al. (2017). If marked, variables are defined by the following transformations: <sup>a</sup>  $\log(x + 1)$ , <sup>b</sup>  $\log(1/x)$ , <sup>c</sup>  $\log(100/(100 - x + 1))$ , <sup>d</sup>  $-x$ , where  $x$  denotes the respective indicator

Polity IV Project (Marshall and Gurr 2016), which code institutional characteristics of the political regime on a scale ranging from  $-10$  (full autocracy) to  $10$  (full democracy). Second, we take the “Freedom House Political Rights scores” (FHPR) (Freedom House 2016), which range from  $1$  (highest level of political rights) to  $7$  (lowest level of political rights). To harmonize interpretation, we reverse the signs of the FHPR scores such that higher values denote more political rights. To measure income levels, we use real GDP per capita from the Penn World Table 9.0 (Feenstra et al. 2015). GDP data are expressed in purchasing power parities (PPP), adjusted to 2011 US\$ to avoid distortions owing to price and exchange rate fluctuations.

In addition, we control for several popular covariates. These include “Urbanization” (urban population in percent) and “Population” (logged number of inhabitants), both derived from World Bank (2017). Furthermore, we use data on “Resources” (logged oil and gas rents in 2014 US\$ per capita) from Ross and Mahdavi (2015), and on “Civil conflict” (magnitude of civil war and violence) provided by the Major Episodes of Political Violence (MEPV) project (Marshall 2016). Higher levels of “Urbanization” are expected to indicate lower unit costs of goods provision. “Population” is included because the public sector may exhibit economies of scale (Mulligan and Shleifer 2004; Mulligan et al. 2004). “Resources” captures the potential adverse effects of natural resource endowments highlighted in the “resource curse” literature (see Frankel 2010, for an overview). “Civil conflict” is employed to control for the likely negative impacts of civil war and violence. Descriptive statistics are provided in the “Appendix”.<sup>7</sup>

To prevent our results from being driven by short-term fluctuations in the variables, we rely on 5-year averages. This empirical strategy also to some extent accounts for the fact that outcomes of investments in publicly provided goods may not be fully observable in the same year, but evolve over time. We additionally control for the effects of time by entering different lags of the explanatory variables as described in more detail below. Our final dataset constitutes an unbalanced panel of 154 countries in the period from 1960 to 2014.

Given the hypotheses derived in Sect. 2, our econometric model has to capture the effect of democracy on goods provision conditional on income. We therefore estimate the following model for each indicator of publicly provided goods  $g$  of country  $i$  in period  $t$ :

$$g_{it} = \beta_1 D_{i,t-l} + \beta_2 y_{i,t-l} + \beta_3 D_{i,t-l} \times y_{i,t-l} + X_{i,t-l} \gamma + v_i + \delta_t + \varepsilon_{it}, \quad (28)$$

where  $D$  denotes the democracy indicator,  $y$  denotes logged GDP per capita,  $X$  is the matrix of control variables, and  $\beta_0, \beta_1, \beta_2, \beta_3$ , and  $\gamma$  are the regression coefficients. Since our indicators of goods provision may respond to investments by the government and changes in other influential factors with a time lag of unapparent length, we estimate the model for different 5-year period lags  $l \in \{0, 1, 2\}$  of the independent variables. The error term in (28) is split into an unobserved country fixed effect  $v_i$ , an unobserved time fixed effect  $\delta_t$  and an idiosyncratic error  $\varepsilon_{it}$ . In the presence of correlation between our explanatory variables and  $v_i$  or  $\delta_t$ , pooled OLS estimates would be subject to omitted variable bias. We therefore remove country fixed effects by a suitable transformation of the data (described below) and include period dummies to control for time fixed effects. Another econometric issue arises with regard to the likely endogeneity of  $D$  and  $y$ . As the literature and also the theoretical model outlined in Sect. 2 indicate that the supply of publicly provided goods increases income levels, we face the threat of simultaneous causality bias when estimating the effect of GDP per capita on goods provision. The latter likewise may affect democracy.

<sup>7</sup> The data are available from the author upon request.

Although the evidence is not conclusive (see, e.g., Acemoglu et al. 2005, 2008), higher levels of wealth and education could spur the population's demand for political rights and thereby lead to democratization (see, e.g., Castelló-Climent 2008; Lipset 1959). To handle those endogeneity problems, a common approach that also is adopted here is to estimate instrumental variables (IV) regressions. Unfortunately, little guidance is available from the literature regarding suitable external instruments for our setting. However, as our data have a time dimension, we utilize lags of  $\bar{D}_{i,t-l}$ ,  $y_{i,t-l}$ , and their interactions  $\bar{D}_{i,t-l} \times y_{i,t-l}$ , where  $\bar{D}$  denotes the democracy indicator not used in (28). Thus, we use the lag of the Polity index as an instrument for the FHPR scores and vice versa. This strategy is similar to the one pursued by Deacon (2009). The rationale underlying the choice of these instruments is that past levels of income and democracy are strongly correlated with their current levels, but are unaffected by current goods provision. Moreover, as the two democracy indicators are coded by different organizations, measurement errors may not be correlated perfectly. Thus, instrumenting one democracy index with the other is hoped to reduce the impact of measurement error on our results. Both the results obtained when instrumenting the Polity index with the FHPR and vice versa are reported below.

With regard to the choice of the estimation method, we adopt generalized method of moments instrumental variables estimation (GMM IV) based on forward orthogonal deviations. The forward orthogonal transformation removes country fixed effects by “demeaning” the data based on future observations only. Lags of the endogenous variables thus can potentially serve as instruments. However, specific lags are valid instruments only in the absence of autocorrelation of the error term. For that reason, we choose the order of the first lag entered as instrument based on Arellano-Bond autocorrelation tests (see Roodman 2009a, for a more detailed description of GMM estimations).<sup>8,9</sup> Furthermore, using too many instruments may overfit the instrumented variables and result in biased coefficient estimates (see Roodman 2009b). To mitigate that concern, we restrict the order of lags used as instruments to a maximum of five. As specification tests, we apply the Hansen  $J$ -test and the difference-in-Hansen test. In both cases, low  $p$  values indicate potential validity problems.

To facilitate the interpretation of our regression results, we normalize all dependent and independent variables between zero and one. That procedure has two major advantages. The first one is that a specific regression coefficient now reflects the expected change in the dependent variable relative to its sample range associated with a sample-range increase in the respective independent variable. The second advantage is that the regression coefficients on the democracy indicator and the interaction terms can be interpreted directly in a meaningful way. The marginal effect of democracy on goods provision can be derived from (28) as

$$\frac{\partial E[g_{it}|D_{i,t-l}, y_{i,t-l}]}{\partial D_{i,t-l}} = \beta_1 + \beta_3 y_{i,t-l}. \quad (29)$$

<sup>8</sup> A specific lag order is chosen if the null hypothesis of no autocorrelation cannot be rejected at the 5% significance level.

<sup>9</sup> As further measures of goods provision, the share of people with access to fresh water sources and sanitation facilities were considered. However, within our econometric framework, valid inferences for those variables were not possible owing to their short time coverage and their high-order residual autocorrelation.

**Table 2** Results of fixed effects regressions without instrumental variables and GMM instrumental variables regressions both excluding the interaction term between the indicator of democracy and GDP per capita

Dependent var.	Fixed Effects			GMM IV		
	Polity <sub><i>t</i></sub>	FHPR <sub><i>t</i></sub>	(N/Ctry.)	Polity <sub><i>t</i></sub>	FHPR <sub><i>t</i></sub>	(N/Ctry.)
Secondary <sub><i>t</i></sub>	− 0.01		(1105/152)	− 0.07		(953/149)
		− 0.03*	(1115/153)		− 0.11**	(962/149)
Tertiary <sub><i>t</i></sub>	− 0.05**		(1078/153)	− 0.04		(925/149)
		− 0.01	(1093/154)		0.07	(939/150)
Mortality <sub><i>t</i></sub> (inv.)	− 0.00		(1337/153)	0.10		(1184/151)
		− 0.01	(1222/154)		0.09*	(1068/152)
Physicians <sub><i>t</i></sub>	− 0.02*		(1212/153)	− 0.04		(1058/151)
		− 0.02*	(1102/154)		0.02	(948/152)
Measles <sub><i>t</i></sub>	− 0.10**		(958/153)	− 0.10		(805/151)
		− 0.13***	(975/154)		− 0.06	(821/152)
DPT <sub><i>t</i></sub>	− 0.08**		(962/153)	− 0.12		(809/151)
		− 0.12***	(979/154)		− 0.07	(825/152)
Telephone <sub><i>t</i></sub>	0.01		(1296/153)	− 0.00		(1142/151)
		− 0.02	(1200/154)		− 0.08	(1046/152)
Internet <sub><i>t</i></sub>	− 0.16***		(753/153)	− 0.58***		(600/151)
		− 0.05	(760/154)		− 0.32*	(606/152)
Rule of law <sub><i>t</i></sub>	0.33***		(1359/153)	0.33***		(1205/151)
		0.32***	(1232/154)		0.50***	(1078/152)
Executive corruption <sub><i>t</i></sub> (rev.)	0.15***		(1359/153)	0.03		(1205/151)
		0.11**	(1232/154)		0.20*	(1078/152)
Public sector corruption <sub><i>t</i></sub> (rev.)	0.10**		(1359/153)	− 0.03		(1205/151)
		0.08*	(1232/154)		0.07	(1078/152)

Fixed effects regressions without instrumental variables and GMM instrumental variables regressions. Each row represents an econometric specification with the dependent variable given by the first column. Each regression model is estimated twice by using the Polity IV scores (Polity) and the Freedom House Political Rights scores (FHPR), respectively, as the measure of democracy. The number of observations (N) and countries (Ctry.) included in the estimations are shown in parentheses. (Logged) GDP per capita and control variables are included but not shown in the table. The full regression results are available upon request. Standard error estimators are robust against heteroscedasticity and serial correlation within countries

Significance levels: \*10%, \*\*5%, \*\*\*1%

Hence, the marginal effect of democracy at the lowest income level in the sample ( $y_{i,t-l} = 0$ )<sup>10</sup> is given directly by  $\beta_1$ :

$$\frac{\partial E[g_{it}|D_{i,t-l}, y_{i,t-l}]}{\partial D_{i,t-l}} \bigg|_{y_{i,t-l}=0} = \beta_1. \quad (30)$$

For the highest sample income level ( $y_{i,t-l} = 1$ ) the marginal effect of democracy is

<sup>10</sup> To be precise,  $y_{it} = 0$  and  $y_{it} = 1$  are the lowest and the highest average per capita incomes of the 5-year periods in the sample, respectively. To simplify terminology, we will refer to them as the lowest / highest per capita income.



$$\left. \frac{\partial E[g_{it}|D_{i,t-l}, y_{i,t-l}]}{\partial D_{i,t-l}} \right|_{y_{i,t-l}=1} = \beta_1 + \beta_3. \quad (31)$$

Based on our theoretical model, we therefore expect that both  $\beta_1 < 0$  and  $\beta_1 + \beta_3 > 0$ .

## 4 Results

### 4.1 Unmoderated effects of democracy

For comparison, our econometric analysis starts with estimations of the unmoderated effects of democracy on our variables capturing goods provision. Hence, we estimate the model specified in (28) without the interaction term between the democracy indicator and logged GDP per capita. We also compare the results obtained from GMM instrumental variables estimations with those obtained from simple fixed-effects regressions without instrumental variables.

Table 2 reports the estimation outcomes. Except for the governance indicators, the simple fixed effects regressions without instrumental variables yield little evidence of a positive relationship between democracy and the level of publicly provided goods. In some cases, we even find statistically significant negative effects. In general, the coefficient estimates for the democracy indicators are small. The use of GMM instrumental variables regression does not change those findings substantially. Most of the effect estimates obtained by the use of that estimation method are insignificant.

These findings are unsurprising if the predictions of the theoretical model outlined in Sect. 2 are correct. While we expect that democracy positively affects the level of publicly provided goods in rich countries, we hypothesize a negative relationship in poor countries. Therefore, estimating an “average” effect of democracy on goods provision by neglecting the moderating role of income is likely to lead to small and insignificant coefficient estimates.

### 4.2 Estimation of the interaction model

In the following, we investigate whether the predictions of the theoretical model can be supported empirically. Using the Polity IV scores as the democracy index, Table 3 reports the results of GMM instrumental variables regressions of the econometric interaction model (28). Recall that the coefficient on the Polity scores  $\beta_1$  represents the estimated effect of a rise in the democracy index from its minimum to its maximum value<sup>11</sup> for a country with the lowest income in the sample. Since the estimates of  $\beta_1$  are negative and statistically significant for nine out of 11 regressions, the results indicate that higher levels of democracy generally are associated with lower levels of publicly provided goods if GDP per capita is low. The sizes of the effect are quite large in absolute terms. Exceptions are “DPT” and “Rule of law” for which we find negative, but insignificant effects. Turning to the coefficient on the interaction term between the Polity scores and logged GDP per capita  $\beta_3$ , we find evidence for a moderating role of income. All coefficient estimates are positive and, except for “DPT”, significant. Hence, strong evidence exists that the

<sup>11</sup> Since our sample includes full autocracies as well full democracies according to both democracy indicators, the estimated effect is that of full-scale democratization.

**Table 3** Results of GMM instrumental variables regressions using the Polity scores as democracy indicator

Dependent var.	Polity <sub><i>t</i></sub>	GDPCap <sub><i>t</i></sub>	Polity <sub><i>t</i></sub> × GDPCap <sub><i>t</i></sub>		N	Ctry.	Instr.	Hansen	Diff.
	$\beta_1$	$\beta_2$	$\beta_3$	$\beta_1 + \beta_3$					
Secondary <sub><i>t</i></sub>	− 0.21*** (0.07)	0.01 (0.18)	0.48** (0.21)	0.27* (0.16)	953	149	67	0.46	0.99
Tertiary <sub><i>t</i></sub>	− 0.55*** (0.12)	− 0.06 (0.26)	1.45*** (0.29)	0.90*** (0.23)	925	149	67	0.23	0.24
Mortality <sub><i>t</i></sub> (inv.)	− 0.23*** (0.05)	0.04 (0.12)	0.78*** (0.15)	0.56*** (0.12)	1184	151	99	0.06	0.13
Physician <sub><i>t</i></sub>	− 0.26*** (0.05)	− 0.03 (0.08)	0.64*** (0.13)	0.38*** (0.09)	1058	151	99	0.38	0.39
Measles <sub><i>t</i></sub>	− 0.44*** (0.13)	− 0.43 (0.33)	0.85** (0.42)	0.41 (0.33)	805	151	87	0.25	0.11
DPT <sub><i>t</i></sub>	− 0.19 (0.13)	− 0.41 (0.33)	0.34 (0.48)	0.15 (0.40)	809	151	77	0.18	0.93
Telephone <sub><i>t</i></sub>	− 0.30*** (0.07)	− 0.05 (0.21)	0.87*** (0.19)	0.57*** (0.15)	1142	151	99	0.13	0.42
Internet <sub><i>t</i></sub>	− 1.28*** (0.29)	0.70 (0.56)	2.65*** (0.84)	1.38** (0.63)	600	151	69	0.00	0.93
Rule of law <sub><i>t</i></sub>	− 0.11 (0.09)	− 0.39** (0.19)	1.25*** (0.23)	1.14*** (0.17)	1205	151	99	0.52	0.11
Executive corruption <sub><i>t</i></sub> (inv.)	− 0.40*** (0.12)	− 0.37 (0.25)	1.20*** (0.31)	0.80*** (0.22)	1205	151	99	0.20	0.00
Public sector corruption <sub><i>t</i></sub> (inv.)	− 0.57*** (0.11)	− 0.49** (0.24)	1.55*** (0.27)	0.98*** (0.19)	1205	151	99	0.85	0.50

Each row represents an econometric specification with the dependent variable given by the first column. The table presents the estimates for the Polity IV scores (Polity), logged GDP per capita (GDPCap), and their interaction. The table further shows the number of observations (N) and countries (Ctry.) included in the estimation, the number of instruments (Instr.), and the *p* values of the Hansen-J-test (Hansen) and the Difference-in-Hansen test (Diff.). Control variables are included but not shown in the table. The full regression results are available upon request. Standard errors are given in parentheses. Standard error estimators are robust against heteroscedasticity and serial correlation within countries

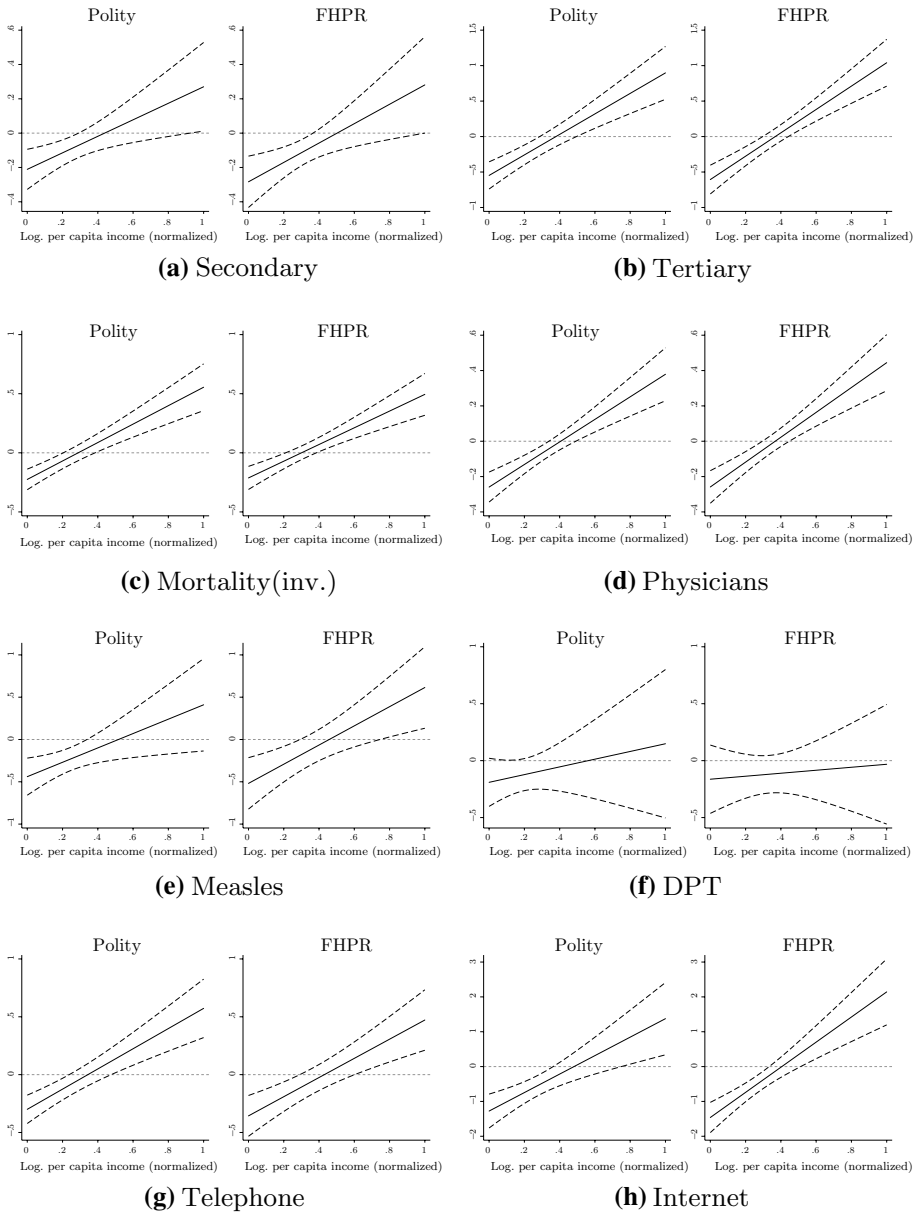
Significance levels: \* 10%, \*\* 5%, \*\*\* 1%

**Table 4** Results of GMM instrumental variables regressions using the FHPR scores as democracy indicator

Dependent var.	FHPR <sub><i>t</i></sub>		GDPcap <sub><i>t</i></sub>		FHPR <sub><i>t</i></sub> × GDPcap <sub><i>t</i></sub>		β <sub>1</sub> + β <sub>3</sub>	N	Ctry.	Instr.	Hansen	Diff.	
	β <sub>1</sub>		β <sub>2</sub>		β <sub>3</sub>								
Secondary <sub><i>t</i></sub>	− 0.28***	(0.09)	0.01	(0.20)	0.56**	(0.24)	0.28*	(0.17)	962	149	87	0.77	0.95
Tertiary <sub><i>t</i></sub>	− 0.61***	(0.12)	− 0.38*	(0.22)	1.65***	(0.29)	1.04***	(0.20)	939	150	102	0.11	0.85
Mortality <sub><i>t</i></sub> (inv.)	− 0.21***	(0.06)	− 0.01	(0.12)	0.71***	(0.15)	0.49***	(0.11)	1068	152	114	0.07	0.23
Physicians <sub><i>t</i></sub>	− 0.26***	(0.06)	− 0.09	(0.10)	0.70***	(0.14)	0.45***	(0.10)	948	152	114	0.23	0.41
Measles <sub><i>t</i></sub>	− 0.52***	(0.18)	− 0.41	(0.29)	1.13***	(0.42)	0.62**	(0.29)	821	152	97	0.27	0.15
DPT <sub><i>t</i></sub>	− 0.16	(0.18)	− 0.32	(0.31)	0.13	(0.45)	− 0.03	(0.32)	825	152	91	0.38	0.74
Telephone <sub><i>t</i></sub>	− 0.36***	(0.11)	0.05	(0.19)	0.83***	(0.23)	0.47***	(0.16)	1046	152	114	0.07	0.67
Internet <sub><i>t</i></sub>	− 1.46***	(0.26)	0.49	(0.40)	3.60***	(0.77)	2.14***	(0.57)	606	152	81	0.01	0.82
Rule of law <sub><i>t</i></sub>	0.01	(0.13)	− 0.33	(0.20)	1.16***	(0.30)	1.17***	(0.20)	1078	152	114	0.57	0.73
Executive corruption <sub><i>t</i></sub> (inv.)	− 0.37***	(0.18)	− 0.42	(0.27)	1.48***	(0.42)	1.12***	(0.28)	1078	152	114	0.40	0.31
Public sector corruption (inv.)	− 0.57***	(0.18)	− 0.42	(0.27)	1.76***	(0.40)	1.19***	(0.27)	1078	152	114	0.57	0.69

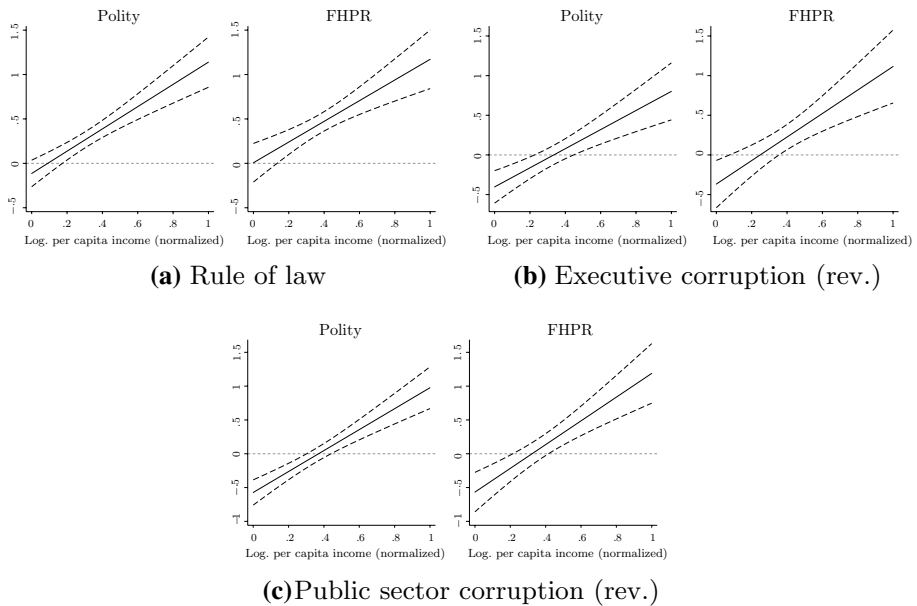
Each row represents an econometric specification with the dependent variable given by the first column. The table presents the estimates for the Freedom House Political Rights scores (FHPR), logged GDP per capita (GDPcap), and their interaction. The table further shows the number of observations (N) and countries (Cry.) included in the estimation, the number of instruments (Instr.), and the *p* values of the Hansen-J-test (Hansen) and the Difference-in-Hansen test (Diff.). Control variables are included but not shown in the table. The full regression results are available upon request. Standard errors are given in parentheses. Standard error estimators are robust against heteroscedasticity and serial correlation within countries

Significance levels: \* 10%, \*\* 5%, \*\*\* 1%



**Fig. 2** Marginal effects of democracy on the variables capturing education, health, and infrastructure for different levels of per capita income. *Note* the figures depict the income-moderated marginal effects of the democracy indicators on the variables capturing the level of publicly provided goods. The dashed lines are 90% confidence intervals. The marginal effect estimates are based on the GMM IV regressions shown in Tables 3 and 4. For each dependent variable, the left (right) subfigure shows the marginal effects estimated with the Polity scores (FHPR scores) as democracy indicator

effect of democracy on goods provision depends on per capita income. That conclusion is underlined by the estimated marginal effects of democracy on the indicators of goods provision for the

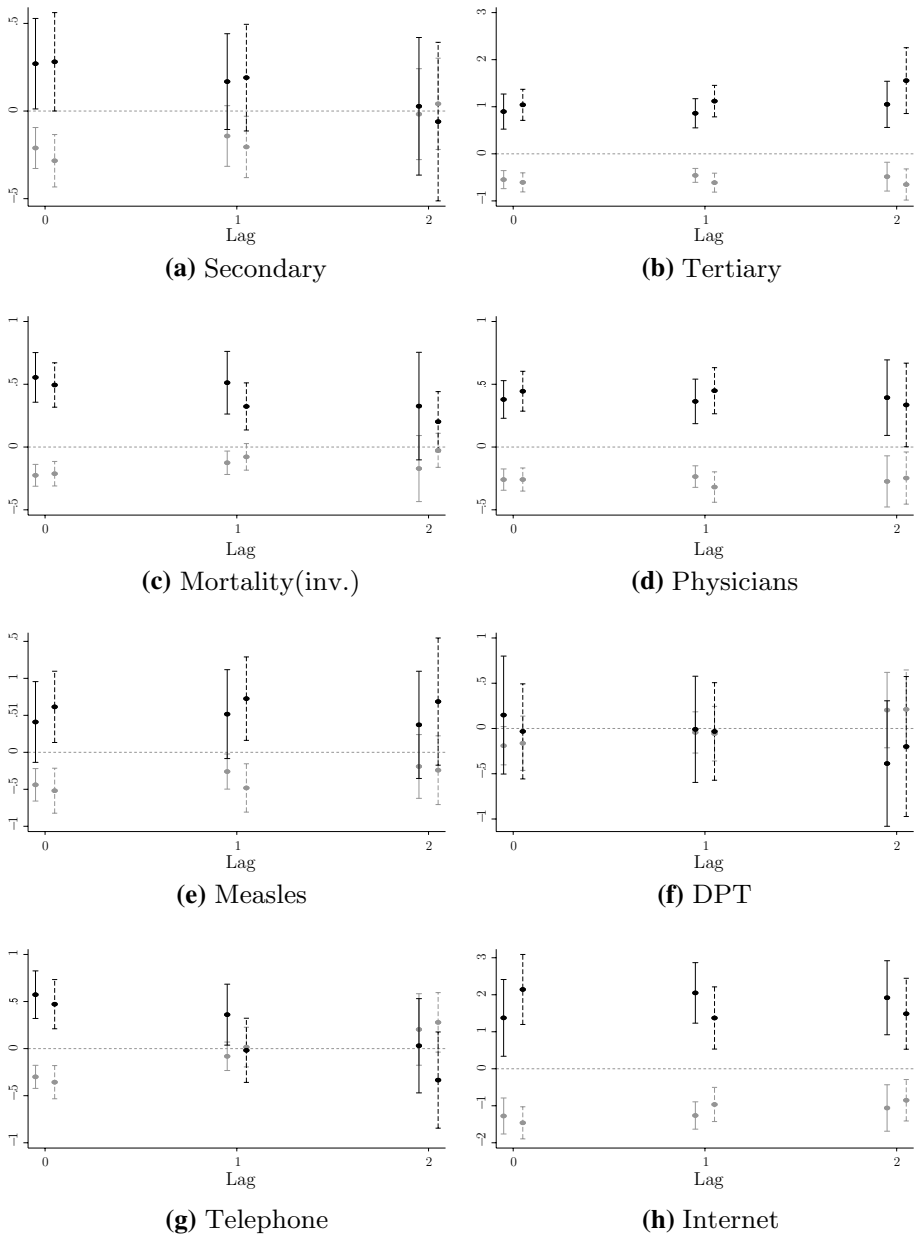


**Fig. 3** Marginal effects of democracy on rule of law and corruption for different levels of per capita income. *Note* the figures depict the income-moderated marginal effects of the democracy indicators on the variables capturing the level of publicly provided goods. The dashed lines are 90% confidence intervals. The marginal effect estimates are based on the GMM IV regressions shown in Tables 3 and 4. For each dependent variable, the left (right) subfigure shows the marginal effects estimated with the Polity scores (FHPR scores) as democracy indicator

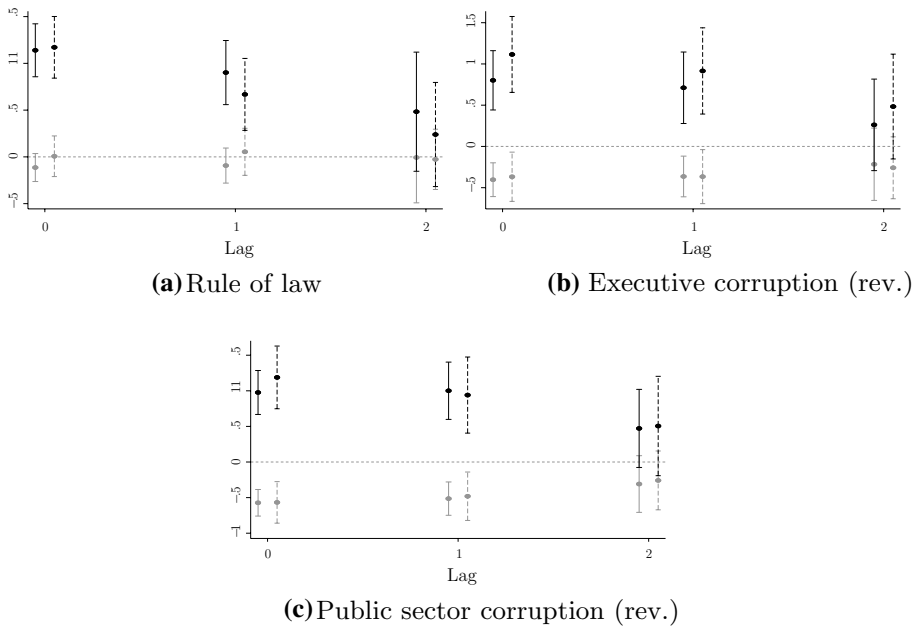
highest income in the sample ( $\beta_1 + \beta_3$ ). All of the estimates are positive and, except for “Measles” and “DPT”, significant. Again, the effects are quite large. Table 4 shows the regressions using the Freedom House Political Rights scores instead of the Polity scores as the measure of democracy. The results are in line with those reported in Table 3.

Figures 2 and 3 depict the marginal effects of the democracy indicators on the indicators of goods provision over the whole sample range of logged GDP per capita. With respect to the majority of the indicators, the 90% confidence intervals indicate that the estimated marginal effect is statistically significant at the 10% level for most values of per capita income. Furthermore, the plots show that, for most of the dependent variables, the sign of the estimated marginal effect changes at a value of normalized logged GDP per capita between 0.3 and 0.5. Taking the value of 0.3 as a conservative threshold, the estimates therefore indicate a negative effect of democracy for approximately 20% of the countries in the sample in 2014. The precise value of GDP per capita at which the effect of democracy is estimated to turn positive varies between the dependent variables. An overview of estimated threshold incomes and the share of countries for which negative effects of democracy are predicted is provided in the “Appendix” (see Table 9). In that regard, “Rule of law” is the only dependent variable for which no country is predicted to be adversely affected in 2014. However, democracy is found to lead to improvements in rule of law only in countries with relatively high income levels.

Since government investments may affect the level of publicly provided goods with a time lag, the econometric model (28) also was estimated for 5-year-period lags of the independent variables. Figures 4 and 5 show the estimated marginal effects of the democracy indicators at the lowest and highest income levels in the sample for the contemporaneous



**Fig. 4** Marginal effects of democracy on the variables capturing the level of publicly provided goods for different levels of per capita income. *Note* the figures depict the marginal effects of the Polity scores (solid line) and the FHPR scores (dashed line) on the variables capturing the level of publicly provided goods at the highest (black lines) and the lowest (gray lines) income level in the sample, respectively. The whiskers are 90% confidence intervals. The marginal effect estimates are based on the GMM IV regressions shown in Tables 3 and 4. The full regression results for the lagged variables are available upon request



**Fig. 5** Marginal effects of democracy on rule of law and corruption for different levels of per capita income. *Note* the figures depict the marginal effects of the Polity scores (solid line) and the FHPR scores (dashed line) on the variables capturing governance at the highest (black lines) and the lowest (gray lines) income level in the sample, respectively. The whiskers are 90% confidence intervals. The marginal effect estimates are based on the GMM IV regressions shown in Tables 3 and 4. The full regression results for the lagged variables are available upon request

( $l = 0$ ), the one-period ( $l = 1$ ) and two-period ( $l = 2$ ) lag models. For most regressions, the point estimates indicate that increases in the level of democracy are related to higher values of the dependent variables at high income levels, whereas the effect is negative at low levels of per capita income. According to the 90% confidence intervals, we find statistically significant marginal effects of lagged democracy on “Tertiary”, “Mortality”, “Physicians”, “Internet”, “Executive corruption” and “Public sector corruption”. In case of “Secondary” and “Rule of law”, the marginal effect at either the highest or the lowest GDP per capita is statistically significant when one-period lags of the independent variables are entered. On the whole, the estimation results presented in this section are in accordance with the hypotheses derived from the theoretical model in Sect. 2.

## 5 Robustness

### 5.1 Alternative democracy indicators

To assess the robustness of our results with regard to the measurement of democracy, we use different alternative democracy indicators. Although frequently employed in empirical analyses, the FHPR scores have been criticized especially in previous comparative studies (see, e.g., Munck and Verkuilen 2002). For that reason, we replace the FHPR scores

**Table 5** Results of GMM instrumental variables regressions using the VDem Electoral Democracy Index as democracy indicator

Dependent var.	EDI <sub><i>t</i></sub>	GDPcap <sub><i>t</i></sub>		EDI <sub><i>t</i></sub> × GDPcap <sub><i>t</i></sub>	β <sub>1</sub> + β <sub>3</sub>		N	Ctry.	Instr.	Hansen	Diff.
	β <sub>1</sub>	β <sub>2</sub>		β <sub>3</sub>							
Secondary <sub><i>t</i></sub>	− 0.37*** (0.12)	− 0.01 (0.18)		0.54** (0.24)	0.18 (0.16)		920	143	102	0.41	0.69
Tertiary <sub><i>t</i></sub>	− 0.66*** (0.14)	− 0.39* (0.22)		1.62*** (0.30)	0.96*** (0.19)		901	144	87	0.33	0.44
Mortality <sub><i>t</i></sub> (inv.)	− 0.14** (0.07)	0.11 (0.12)		0.64*** (0.18)	0.50*** (0.13)		1145	145	119	0.10	0.03
Physicians <sub><i>t</i></sub>	− 0.25*** (0.07)	− 0.07 (0.09)		0.75*** (0.19)	0.50*** (0.12)		1025	145	119	0.28	0.34
Measles <sub><i>t</i></sub>	− 0.44* (0.25)	− 0.16 (0.37)		0.93* (0.52)	0.49 (0.35)		779	145	91	0.12	0.02
DPT <sub><i>t</i></sub>	− 0.14 (0.21)	− 0.18 (0.36)		0.10 (0.47)	− 0.04 (0.33)		783	145	91	0.29	0.70
Telephone <sub><i>t</i></sub>	− 0.30** (0.12)	0.40* (0.21)		0.76*** (0.22)	0.46*** (0.15)		1103	145	119	0.20	0.58
Internet <sub><i>t</i></sub>	− 1.52*** (0.24)	0.64 (0.42)		3.18*** (0.74)	1.65*** (0.57)		583	145	83	0.01	1.00
Rule of law <sub><i>t</i></sub>	0.33*** (0.12)	− 0.12 (0.19)		0.72** (0.28)	1.05*** (0.18)		1167	145	119	0.31	0.66
Executive corruption <sub><i>t</i></sub> (inv.)	− 0.15 (0.20)	− 0.40 (0.28)		1.18*** (0.42)	1.02*** (0.26)		1167	145	119	0.68	0.93
Public sector corruption <sub><i>t</i></sub> (inv.)	− 0.43** (0.18)	− 0.49* (0.28)		1.63*** (0.39)	1.20*** (0.25)		1167	145	119	0.49	0.68

Each row represents an econometric specification with the dependent variable given by the first column. The table presents the estimates for the VDem Electoral Democracy Index (EDI), logged GDP per capita (GDPcap), and their interaction. Control variables are included but not shown in the table. The table further shows the number of observations (N) and countries (Ctry.) included in the estimation, the number of instruments (Instr.), and the *p* values of the Hansen-J-test (Hansen) and the Difference-in-Hansen test (Diff.). Control variables are included but not shown in the table. The full regression results are available upon request. Standard errors are given in parentheses. Standard error estimators are robust against heteroscedasticity and serial correlation within countries

Significance levels: \* 10%, \*\* 5%, \*\*\* 1%



with the the VDem “Electoral democracy index” (EDI) (Coppedge et al. 2017).<sup>12</sup> The EDI measures the degree to which the ideal of electoral democracy, particularly defined by the responsiveness of rulers to citizens, is achieved, on a continuous scale ranging from zero to one. Table 5 reports the results of the GMM instrumental variables estimations using the EDI as democracy indicator and the Polity scores as instrument. The marginal effect of the EDI is negative for all and significant for nine out of 11 dependent variables at the sample’s lowest income level. Again except for “DPT”, we find positive and significant interactions between democracy and income. In addition, for most indicators we find a positive marginal effect that reaches a significance level of 1% for the highest per capita income in the sample. Hence, the use of the EDI confirms our previous results.

In another variant, we replace the continuous democracy indicators utilized in the previous analyses with the dichotomous democracy measures provided by Cheibub et al. (2010) and Bjørnskov and Rode (2014), respectively.<sup>13</sup> Drawing on the work of Alvarez et al. (1996), the “Democracy-Dictatorship” measure (in the following denoted by CGV) of Cheibub et al. (2010) distinguishes democracies from non-democracies based on a minimalist conception of democracy as a method for choosing rulers. Bjørnskov and Rode (2014) (in the following denoted by BR) provide an updated and extended version of the CGV data. Because of averaging, the CGV and the BR scores entering our analysis represent the fractions of democratic years within the respective 5-year time period. Analogous to the empirical strategy described in Sect. 3, we estimate equation (28) by using the BR scores as independent variable and the CGV scores as instrument.<sup>14</sup>

The estimation results are shown in Table 6. Except for “Rule of law”, the marginal effect estimates of democracy given the lowest GDP per capita in the sample are negative and statistically significant. For ten out of 11 dependent variables, a positive and significant interaction effect with income is revealed. Also in line with theory, the regression results show that moving from non-democracy to democracy increases the level of publicly provided goods in rich countries. The marginal effects of the BR indicator on the dependent variables are positive and, except for “DPT” and “Measles”, statistically significant for the sample’s highest income. The estimated effects in general point to substantial impacts of democracy.

## 5.2 Control variables and nonlinearity

For further robustness checks, we extend the set of control variables by including “Trade” (imports plus exports as a percentage of GDP) and the square of logged GDP per capita to account for potential nonlinearities in the relationship between goods provision and logged per capita income. Since per capita income and democracy are correlated, neglecting such nonlinearities might lead to the erroneous estimation of a significant interaction between GDP per capita and the democracy indicators. The data on trade are derived from World Bank (2017). The modified econometric model is

$$g_{it} = \beta_1 D_{i,t-l} + \beta_2 y_{i,t-l} + \beta_3 D_{i,t-l} \times y_{i,t-l} + \beta_4 y_{i,t-l}^2 + X_{i,t-l} \gamma + v_i + \delta_t + \varepsilon_{it}. \quad (32)$$

Since  $y_{i,t-l}$  is suspected to be endogenous, the same also is true for its square. The lag of the latter therefore enters the set of instruments used for GMM IV estimation.

<sup>12</sup> Note that no overlaps exist between the indicators used to form the “Electoral democracy index” and our indicators of rule of law and corruption taken from the VDem data.

<sup>13</sup> We also estimated models using the democracy indicator of Boix et al. (2013), with qualitatively similar results. The regression tables are available upon request.

<sup>14</sup> Instrumenting the CGV scores with the BR scores gives similar results.

**Table 6** Results of GMM instrumental variables regressions using the BR scores as democracy indicator

Dependent var.	BR <sub><i>t</i></sub>	GDPcap <sub><i>t</i></sub>	BR <sub><i>t</i></sub> × GDPcap <sub><i>t</i></sub>	$\beta_1 + \beta_3$		N	Ctry.	Instr.	Hansen	Diff.
	$\beta_1$	$\beta_2$	$\beta_3$							
Secondary <sub><i>t</i></sub>	− 0.18*** (0.06)	0.09 (0.15)	0.38*** (0.14)	0.20** (0.09)		962	149	87	0.23	0.64
Tertiary <sub><i>t</i></sub>	− 0.35*** (0.07)	− 0.08 (0.17)	0.99*** (0.19)	0.64*** (0.13)		939	150	114	0.11	0.34
Mortality <sub><i>t</i></sub> (inv.)	− 0.14*** (0.04)	0.19 (0.13)	0.43*** (0.12)	0.29*** (0.08)		1202	152	104	0.03	0.11
Physicians <sub><i>t</i></sub>	− 0.12*** (0.03)	0.14 (0.10)	0.32*** (0.09)	0.20*** (0.07)		1074	152	119	0.08	0.83
Measles <sub><i>t</i></sub>	− 0.27*** (0.10)	− 0.17 (0.29)	0.54* (0.28)	0.27 (0.20)		821	152	97	0.32	0.69
DPT <sub><i>t</i></sub>	− 0.18* (0.10)	− 0.45 (0.29)	0.24 (0.27)	0.06 (0.20)		825	152	97	0.67	0.84
Telephone <sub><i>t</i></sub>	− 0.19*** (0.04)	0.40** (0.18)	0.56*** (0.12)	0.37*** (0.08)		1159	152	119	0.06	0.46
Internet <sub><i>t</i></sub>	− 0.98*** (0.19)	1.03** (0.46)	2.23*** (0.50)	1.25*** (0.35)		612	152	77	0.00	0.81
Rule of law <sub><i>t</i></sub>	0.03 (0.11)	0.14 (0.26)	0.66*** (0.25)	0.69*** (0.17)		1225	152	104	0.10	0.70
Executive corruption <sub><i>t</i></sub> (inv.)	− 0.17* (0.09)	− 0.10 (0.26)	0.79*** (0.23)	0.61*** (0.15)		1225	152	119	0.18	0.23
Public sector corruption <sub><i>t</i></sub> (inv.)	− 0.28*** (0.09)	− 0.15 (0.27)	0.96*** (0.23)	0.68*** (0.15)		1225	152	119	0.36	0.15

Each row represents an econometric specification with the dependent variable given by the first column. The table presents the estimates for the Bjørnskov-Rode democracy indicator (BR), logged GDP per capita (GDPcap), and their interaction. Control variables are included but not shown in the table. The table further shows the number of observations (N) and countries (Ctry.) included in the estimation, the number of instruments (Instr.), and the *p* values of the Hansen-J-test (Hansen) and the Difference-in-Hansen test (Diff.). The full regression results are available upon request. Standard errors are given in parentheses. Standard error estimators are robust against heteroscedasticity and serial correlation within countries

Significance levels: \* 10%, \*\* 5%, \*\*\* 1%

**Table 7** Results of GMM instrumental variables regressions using the Polity scores as democracy indicator—estimations including further control variables

Dependent var.	Polity <sub><i>t</i></sub>		GDPcap <sub><i>t</i></sub>		Polity <sub><i>t</i></sub> × GDPcap <sub><i>t</i></sub>		GDPcap <sub><i>t</i></sub> <sup>2</sup>		β <sub>1</sub> + β <sub>3</sub>	N	Ctry.	Instr.	Hansen	Diff.	
	β <sub>1</sub>		β <sub>2</sub>		β <sub>3</sub>		β <sub>4</sub>								
Secondary <sub><i>t</i></sub>	− 0.26**	(0.08)	0.43	(0.30)	0.54**	(0.21)	− 0.59***	(0.22)	0.27*	(0.15)	882	145	92	0.48	0.77
Tertiary <sub><i>t</i></sub>	− 0.34***	(0.10)	− 0.95***	(0.32)	0.77***	(0.22)	1.14***	(0.35)	0.43***	(0.15)	851	147	112	0.16	0.53
Mortality <sub><i>t</i></sub> (inv.)	− 0.19***	(0.06)	− 0.09	(0.18)	0.61***	(0.14)	0.12	(0.17)	0.42***	(0.09)	1087	150	134	0.24	0.80
Physicians <sub><i>t</i></sub>	− 0.16***	(0.05)	− 0.50***	(0.15)	0.33***	(0.12)	0.72***	(0.15)	0.18**	(0.08)	968	149	134	0.30	0.43
Measles <sub><i>t</i></sub>	− 0.32**	(0.15)	− 0.57	(0.53)	0.41	(0.45)	0.24	(0.50)	0.09	(0.35)	767	150	116	0.13	0.20
DPT <sub><i>t</i></sub>	− 0.16	(0.13)	− 0.05	(0.46)	0.02	(0.44)	− 0.33	(0.44)	− 0.14	(0.35)	772	150	116	0.24	0.64
Telephone <sub><i>t</i></sub>	− 0.21***	(0.08)	0.22	(0.33)	0.61***	(0.21)	− 0.42	(0.33)	0.40**	(0.16)	1057	150	134	0.18	0.56
Internet <sub><i>t</i></sub>	− 0.77***	(0.22)	− 1.23*	(0.67)	1.68***	(0.60)	2.13***	(0.56)	0.91**	(0.43)	589	150	91	0.01	0.98
Rule of law <sub><i>t</i></sub>	0.00	(0.10)	− 0.38	(0.35)	0.95***	(0.28)	0.28	(0.31)	0.96***	(0.20)	1103	150	134	0.67	0.26
Executive corruption <sub><i>t</i></sub> (inv.)	− 0.24*	(0.15)	− 0.67	(0.41)	0.82**	(0.38)	0.60	(0.38)	0.56**	(0.27)	1103	150	134	0.31	0.30
Public sector corruption <sub><i>t</i></sub> (inv.)	− 0.39***	(0.13)	− 0.92**	(0.44)	1.07***	(0.33)	0.71*	(0.37)	0.68***	(0.23)	1103	150	134	0.51	0.81

Each row represents an econometric specification with the dependent variable given by the first column. The table presents the estimates for the Polity IV scores (Polity), logged GDP per capita (GDPcap), a squared term of logged GDP per capita (GDPcap<sup>2</sup>) and the interaction between the Polity scores and logged GDP per capita. The table further shows the number of observations (N) and countries (Ctry.) included in the estimation, the number of instruments (Instr.), and the *p* values of the Hansen-*J*-test (Hansen) and the Difference-in-Hansen test (Diff.). Control variables are included but not shown in the table. The full regression results are available upon request. Standard errors are given in parentheses. Standard error estimators are robust against heteroscedasticity and serial correlation within countries

Significance levels: \* 10%, \*\*5%, \*\*\*1%

The results of estimating (32) with the Polity scores as the measure of democracy are shown in Table 7.<sup>15</sup> Overall, the results do not deviate substantially from those of previous estimations.<sup>16</sup>

## 6 Conclusion

Although most of the theoretical literature posits that democracy promotes government goods provision, the empirical evidence on that link is inconclusive. While some econometric studies indicate a “democratic advantage”, others find no evidence for a relationship between political regimes and the level of publicly provided goods.

This paper reconsidered the connection between democracy and goods provision by means of a simple theoretical model. In line with the literature, the model relies on the assumption that democratic governments must satisfy a larger share of their citizenry than autocratic governments do in order to stay in office. Thus, democracy promotes goods provision as a tool to generate popular political support. We argue, however, that the larger amounts of resources a democratic government has to spend on goods provision also increases its incentives for kleptocratic behavior. Such reasoning counteracts and may even outweigh the positive incentive effect of democracy. The model indicates that that effect is particularly likely if income levels are low. Utilizing panel data on 11 indicators of goods provision we provided evidence for the hypotheses derived from the theoretical model. The results of instrumental variables regressions confirm that democracy promotes goods provision in relatively rich countries, whereas it reduces goods provision in poor countries. In that regard, we found evidence for a moderating role of income not only with regard to indicators of education, health and infrastructure, but also with regard to public corruption and the establishment of the rule of law. Through those channels, the provision of goods by the private sector is likely to be affected in a way that reinforces the hypothesized interaction between democracy and income. Our empirical findings are robust against different lag structures, alternative measures of democracy and additional control variables.

The implications of our results are twofold. First, although a democratic regime may unambiguously be beneficial to the ordinary people in many respects, it may not always be a blessing with regard to publicly provided goods. According to our results, democratization can be expected to induce improvements in education, health, infrastructure, and governance only if a country has already reached a certain income threshold. In that sense, democracy may need development to materialize. Second, our results demonstrate that neglecting income as a moderator variable can obscure the relationship between regime type and government goods provision. Econometric analyses therefore should account for the interaction between democracy and per capita income.

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## Appendix

See Tables 8 and 9.

<sup>15</sup> Similar evidence is obtained when using the FHPR as independent variable.

<sup>16</sup> Further robustness checks not presented here included: (1) principal component analysis (PCA) to aggregate all indicators of goods provision into a single index that then is used as the dependent variable. (2) Changing time period length from 5 to 4 years and 8 years, respectively. In all cases, the results remain qualitatively stable. The results are available upon request.

**Table 8** Descriptive statistics

Variable	Obs	Mean	SD	Min	Max
Secondary school enrollment ratio (%)	1451	61.49	34.02	0.14	164.57
Tertiary school enrollment ratio (%)	1342	20.56	21.26	0.00	107.75
Infant mortality (per 1,000 live births)	1891	55.80	47.85	1.70	273.80
Physicians per 1,000 people	1687	1.17	1.69	0.01	47.35
Measles immunization (%)	1243	75.59	22.96	1.00	99.00
DPT immunization (%)	1250	77.28	23.15	1.00	99.00
Active telephone lines (per 100 people)	1951	13.84	17.76	0.00	122.88
Internet users (per 100 people)	1047	15.81	23.62	0.00	95.83
GDP per capita (PPP adjusted million 2011 US\$)	1710	11,658.01	17,214.70	253.63	231,222.90
Polity IV scores	1553	0.86	7.38	– 10.00	10.00
Freedom House Political Rights scores	1510	3.82	2.17	1.00	7.00
Vdem Electoral Democracy index	1563	0.45	0.28	0.01	0.96
CGV democracy measure	1604	0.44	0.48	0.00	1.00
BR democracy measure	2201	0.46	0.48	0.00	1.00
Urban population (%)	2304	49.37	25.52	2.15	100.00
Population (millions)	2319	23.88	99.33	0.00	1350.84
Natural resources rents (2014 US\$ per capita)	1646	1032.66	4645.92	0.00	63,682.32
Civil conflict index	1582	0.66	1.55	0.00	9.00
Trade (% of GDP)	1624	78.40	50.37	0.67	444.81

The numbers shown in the table are descriptive statistics for the 5-year averaged “raw” data. Note that the indicators are transformed previous to the regression analyses as described in Sect. 3

**Table 9** Estimated threshold incomes ( $\bar{y}$ ) (GDP per capita in 2011 US\$, PPP) based on Table 3 and the shares of countries in 2014 for which adverse effects of democracy are predicted ( $y < \bar{y}$ )

DV / Democracy measure	Polity		FHPR		EDI		BR	
	$\bar{y}$	$y < \bar{y}$ (%)	$\bar{y}$	$y < \bar{y}$ (%)	$\bar{y}$	$y < \bar{y}$ (%)	$\bar{y}$	$y < \bar{y}$ (%)
Secondary <sub><i>t</i></sub>	\$5035	27	\$7779	33	\$25847	72	\$6057	30
Tertiary <sub><i>t</i></sub>	\$3359	21	\$3118	18	\$4111	23	\$2757	16
Mortality <sub><i>t</i></sub> (inv.)	\$1814	11	\$1967	12	\$1152	3	\$2248	15
Physicians <sub><i>t</i></sub>	\$4042	23	\$3112	18	\$2455	15	\$3356	20
Measles <sub><i>t</i></sub>	\$8609	38	\$5743	29	\$6297	31	\$7505	33
DPT <sub><i>t</i></sub>	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Telephone <sub><i>t</i></sub>	\$2639	15	\$4762	26	\$3634	22	\$2661	15
Internet <sub><i>t</i></sub>	\$6742	31	\$4017	23	\$6673	31	\$5124	27
Rule of law <sub><i>t</i></sub>	\$471	0	\$244	0	\$11	0	\$187	0
Executive corruption <sub><i>t</i></sub> (rev.)	\$3151	18	\$2293	15	\$1526	8	\$1836	11
Public sector corruption <sub><i>t</i></sub> (rev.)	\$2486	15	\$1375	6	\$618	1	\$1141	3

The table shows the estimated threshold incomes ( $\bar{y}$ ) and the share of countries below these threshold incomes ( $y < \bar{y}$ ) for the Polity IV scores (Polity, Table 3), the Freedom House Political Rights Scores (FHPR, Table 4), the VDem Electoral Democracy Index (EDI, Table 5), and the Bjørnskov-Rode democracy indicator (BR, Table 6). If no significant interaction between democracy and GDP per capita was found, the correspondig cells are marked as not significant (n.s.)

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