The Spread of Epidemic Diseases: Public Spending on Health as Political Instrument?

by

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Abstract:

This paper takes a closer look on the infection rates of epidemic diseases in developing country, in particular HIV/AIDS and tuberculosis. The question which arises is why large differences in prevalence rates can be observed in countries with comparable economic performance. A short panel analysis is conducted for 104 low- and middle income states which are classified as non-democratic regimes. The paper argues that the type of the political regime does not only drive public spending on health and therewith affect the prevalence of epidemic diseases, but rather that dependent on the type of autocratic regime inequality in health status within its population are fostered by applying selective strategies. A simple political economic framework is implemented in order to analyze the rational of policy makers in implementing effective health care provision.

Keywords: dictatorship, epidemic diseases

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1. Introduction

To eradicate epidemic diseases and therewith to boost economic growth is one of the central features of the Millennium Development Goals of the United Nations. Thereby, it is assume that the occurrence of diseases hampers economic growth, in particular in Sub-Saharan Africa, and therewith directly and indirectly the well-being of the population in this area. However, case studies of, for example, Brazil, South Africa or Uganda show that prevalence of epidemic diseases such as HIV/AIDS are not only to be explained by economic characteristics of the respective state, but rather political commitment and institutional quality seems to be here one of the key determinant for combating diseases (e.g. Gauri/Lieberman 2006). Moreover, it is shown in existing studies that political regimes differ in their spending and commitment to fight diseases (see e.g. Gizelis 2009). So, higher degrees of public spending on health as well as higher life expectancy are found in democratic regimes (e.g. Besley/Kudamatsu 2006). Hereby, it is argued that democratic regimes serve the interest of low- and middle income groups, are hold accountable for political failure as well as increasing their chance of re-election by providing extensively public goods such as health. However, as the majority of regimes in low- and middle income countries are in fact mainly autocratic regimes (or dictatorships), the question arises if the type of the autocratic regime plays an important role in fighting epidemic diseases. Thus, based on the theory of dictatorship this paper seeks to explore in more detail if dictators pursue selective strategies to secure loyalty of its population and thereby foster inequality in health provision according to the political power of the population segment. In more detail, it is aimed here on the differentiation between 'totalitarian' and 'tinpots' regimes (see Wintrobe 1998). So, the argumentation of the following work is that autocratic regimes may not apply the same selective strategies in the provision of public goods (e.g. health) but rather can be differentiated according to their spending behaviour. Thus, public spending on health may depend on the type of autocratic regimes. This selective strategy of autocratic regimes is reflected in difference in prevalence rate of epidemic disease rates. In other words, prevalence of epidemic diseases may be a function of regime type and public spending on health.

In the next section, a closer look is taken on the literature on health before focus is turned towards the theory to dictatorships. This is followed by the empirical research conducted to examine the relationship between type of autocratic regime and the prevalence of epidemic diseases. This paper concludes with the result section and a short discussion.

2. Literature review

In general, it is assumed that increasing overall health level in the population has a positive effect on economic growth (e.g. Bhargava et al. 2001). Moreover, economic growth and the therewith connected raise in living standard reduce mortality rates (Birchenall 2007), which inevitably leads to higher economic standard. Thus, health seems to be a decisive factor for economic growth. A reasonable conclusion therefore is that epidemic diseases actually hamper economic growth. Based on this notion some empirical work has been already conducted, mainly with focus on low- and middle income countries. While some studies found only weak evidence for the claim 'diseases reduce growth' (Acemoglu/Johnson 2007, Weil 2007/2010, Ashraf/Lester/Weil 2008), other identifies epidemic diseases, e.g. Malaria, as the leading cause for poor economic growth (Gallup/Sachs 2001, Jamison/Sachs/Wang 2001, Bhattacharyya 2009, Bleakley 2009). In the latter stream of literature, the lack of evidence in some cases is related to the fact that diseases may not only directly impede economic growth but rather affect measured economic growth on severe channels such as education/human capital (Bleakley 2003, Miguel/Kremer 2004, Castello-Climt/Domenech 2008, Fortson 2010), fertility (Lorentzen et al. 2008, Bleakley/Lange 2009, Fortson 2009, Boucekkine/Desbordes/Latzer 2010), productivity (Young 2005/2007), social capital (David/Li 2010), inequality (Deaton 2003), or conflict history (Ghobarah/Hutt/Russett 2003). However, also in these studies results are not accord but rather contradict each other. Hence, for example the effect of HIV/AIDS on fertility, while Fortson (2009) does not find any impact, the study of Boucekkine/Desbordes/Latzer (2010) yield negative effects (reduced fertility) and the one of Lorentzen et al. (2008) displayed even a positive effect of HIV/AIDS on net fertility.

Apart from the research carried out on the linkage between epidemic diseases and economic performance, another stream of literature is investigating the impact of public spending on the prevalence of diseases. So, Filmer & Pretchett (1999) already conclude from their analysis that public spending on health cannot significantly be related towards the overall health of the population. Characteristics such as income inequality, history of civil conflict, (female) education, ethnic/religious fragmentation and trade integration tend to be more appropriate explanation for cross-country variance in health levels than public spending on health (see also e.g. Castro-Leal et al. 2000, Evans et al. 2001, Ghobarah/Hutt/Russett 2004, Ram 2006, Bor 2007). Additionally, it is pointed out that the effectiveness of health measures does not only rely on financial resources (i.e. public and private spending) but also on the political support or goals of the government in charge (Cassels 1995, Hsiao/Heller 2007) and the

efficient use of existing resources (institutional quality/good governance) (Walt/Gilson 1994, Evans et al. 2001, Ghobarah/Hutt/Russett 2004, Gauri/Lieberman 2006, Lewis 2006, McGuire 2006, Gilson/Raphaely 2008). Thus, political/institutional features seem to play a crucial role explaining the spread of epidemic diseases in terms of allocating funds effectively on combating infectious diseases.

Taking a closer look on the relationship between the income level of a country and public spending for health measures, it is shown that with rising income also the expenditures on health increase (Parkin/McGuire/Yule 1987). However, relating health expenditure and income to each other involves econometric challenges in respect to effects over time (see e.g. Hansen/King 1996, McCoskey/Selden 1998, Gerdtham/Loethgren 2000) as well as in space (see e.g. Baltagi/Moscone 2010). Thus, overall spending on health tends to depend not only on income level but also on national characteristics such as the age structure of the population, level of technological progress, and effectiveness of implemented health policy measures as well as the characteristics of neighbouring countries (Hsiao/Heller 2007). Thus, it may be assumed that countries adapt their spending behaviour according to the level of neighbors in order to avoid migration or as result of political competition (see Franzese/Hays 2007). Moreover, differences in public spending patterns can be observed between low-, middle- and high income countries which may be related to dissimilarities in health challenges as well as institutional designs of the health sector (Gerdtham et al. 1992). Regarding health challenges, one major distinction between low- and high-income countries is that, while individuals in high-income countries mainly suffer from non-communicable diseases (e.g. stroke, cancer, heart attack), health systems in developing countries are to finance the burden of communicable and infectious diseases (e.g. AIDS/HIV, Malaria, tuberculosis) (Hsiao/Heller 2007).

Besides these cross-country disparities, also a high inequality in spending within the country can be observed. So, in high- and low income countries alike, approximately 20-25 percent of public health expenditure is spent on one percent of the population, while 50 percent is allocated to five percent of the population. For one quarter of the population even no spending can be detected (Hsiao/Heller 2007). This high inequality in health care spending is often referred to the issue that high- and middle income groups within the population may be able to pressure governments to organize health care provision according to their needs rather than to provide basic health care to low-income group. Thus, results from empirical research indicates that a welfare transfer from rich to poor households yields higher impact in

decreasing infant mortality than raising income of poor as such (Flegg 1982, Ross 2006). Inequality is here again emphasized as major driver for the spread of epidemic diseases. Moreover, redistributing welfare tend to increase empirically income inequality as well as to reduce the likelihood of system change, in particular for autocratic regimes. Thus, it appears that welfare transfer is used as a mean to prolong regime duration (Feng/Gizelis 2002).

Moreover, while an impact of regime type on economic growth is not detectable, autocratic regimes tend to score lower in education indices and life expectancy (Lake/Baum 2001, Baum/Lake 2003). This higher life expectancy in democratic countries is related further to higher spending rates on public good provision (e.g. health care and education) (Besley/Kudamatsu 2006, Ross 2006, Deacon 2009, Gizelis 2009). Theoretical explanations for this higher public spending in democratic regimes draw on the assumption that democratic regimes serve the interest of middle & low income groups, which is in contrast to empirical findings. Another explanation is that democratic regimes are hold accountable for their policy directly (see e.g. Gauri/Lieberman 2006), or at latest at the next election date. So, due to political competition, democratic regimes may spend more on public good provision in order to avoid to be blamed for having not transferred enough resource for the provision of public goods as well as to increase their re-election chances. In contrast, autocratic regimes are not restrained by the interest of different lobby groups, but rather are able to implement the strategy perceived as important (e.g. Deacon 2009). However, the claim that public spending in democracies are more effective in respect to life expectancy or child mortality of their population seems to be based on estimates which neglect 'well-doing' autocratic regimes (high-income autocracies). Including these countries as well, no significant difference in health indicators according to regime type (democracy vs. autocracy) can be observed (Ross 2006). This 'non-results' might be due to the fact that autocratic regimes as such are different in their level of repression and provision of public goods. Moreover, it seems that the actual political commitment to fight diseases as well as the prevalence of diseases in neighbouring countries contributes to national health levels (Bor 2007, Gizelis 2009).

To sum up, inequality within the population seems to foster the prevalence of epidemic diseases. Although democracies tend to spend more relatively on the provision of public goods, the effectiveness of their spending seems not to depend on the regime type per se. Therefore, it seems reasonable to have a closer look on the distinctive effects of regime type by not considering democratic versus autocratic regimes but rather by distinguishing between

different forms of autocratic regimes. In particular, as the majority of low and middle income countries are classified as non-democratic regarding the political rights.

3. On the Theory of Political Regimes

Political regimes can be divided into democracy on the one hand and dictatorship on the other hand. In reality, systems which are in between can be found widely. However, let us consider firstly the 'extreme' cases: democracy and dictatorship. In a democratic system politicians are elected by the population, are held accountable for their actions, are obliged to stick to the rule of law and may be punished by misconduct (even if it is only by not being voted again). Therefore democratic regimes shall theoretically act in the interest of the majority of the population and provide public goods such as health care, education, road and safety. Thus, at least from a humanitarian point of view the democratic regime seems to be the favourable one.

The other extreme case is the political regime of a dictator. Thus, political actions are determined by one person (or one small group), which have the monopoly power of formal political offices. Referring to the theory of dictatorship (Wintrobe 1998) the utility of the dictator depends on consumption and power. Consumption refers hereby to his own consumption such as luxury goods (e.g. castles, shoes etc.). Power, on the other hand, is gained by buying loyalty or by using repression on the citizenship. Thus, loyalty is acquired by transferring resources to population segments; while repression, on the other hand, refers to the usage of force on possible opposition groups in order to prevent the organization of a 'coup d'etat'. In order to stay in office, the dictator has to decide on the strategy and on the applied level of loyalty and repression, both which are not independent from each other. Thus, by aiming on an increase of loyalty, repression is to be reduced and the other way around. Moreover, both strategies are not costless and have decreasing marginal returns. In particular 'buying' loyalty is more effective if the strategy applied is to be selective. Hence, discrimination between population segments may not only raise loyalty but also prevent the organization of opposition groups. By implementing such a selective strategy, former public goods are only obtainable then for specific groups within the population and therefore becoming club goods for the groups recognized by the dictator as regime loyal.

Assuming that both, consumption and power (including loyalty and repression) are not costless while at the same time the dictator also face a budget constrain, the question on the optimal mixture of the strategies arises to secure office. Hereby, Wintrobe (1998)

differentiates between the so-called ‘tinpot’-dictator and the totalitarian regime. The ‘tinpot’ aims on the maximization of its private consumption. Repression is on a low level and with this also interventions in the social and economic life of the citizens. Public spending is rather used to ensure loyalty. A thread to this regime will be answered (theoretical optimal solution) by reducing consumption in order to finance loyalty. In contrast thereto, the totalitarian dictator intervenes massively into the economic and social life of the population. Repression is his major tool in order to secure office. However, the political apparatus acts more effectively than the one of the ‘tinpot’, as it is not considered to only redistribute resources. Thus, a pure selective strategy (in most case target on the military elite) can be found in a totalitarian regime. In particular, as this regime is based on repression (and selective targeting of resources) a higher military apparatus shall be noticeable. To sum up, a higher level of bureaucratic efficiency, fewer public spending, and higher level of repression characterises the totalitarian regime, whereas the ‘tinpot’ regime displays a high level of consumption, high level of spending on public good, low level of repression as well as low efficiency (high corruption) of the bureaucratic system. However, both types of regimes are rather corner solutions in real world settings. A mixture of both kinds of autocratic regimes can be found instead empirically.

Regarding the economic system under dictators, one also finds different types. Thus, a pure redistributive economic system, with low efficiency, high amount of rent-seeking activity is referred to as ‘kleptocracy’. The pure redistribution strategy is targeting the dictator himself or population groups seen as essential for survival of dictatorship or loyal supporters. This economic system is more often observable in ‘tinpot’ regimes, as efficient long-term repression of the majority of the population is harder to obtain with an ineffective political apparatus. In contrast to the ‘kleptocratic’ economic system, in a ‘capitalist authoritarian’ regime redistribution of resources is suppressed by implementing high efficient political apparatus. This regime is often found in soft autocratic regimes combined with market economy structures. Due to the aim to prevent redistribution, redistribution will be less than in democratic regimes, while in kleptocratic economic systems and/or tinpot regimes redistribution supersedes the one in democratic regimes. This however, does not mean that the provision of public goods is higher in autocratic regimes than in democracies. It is rather the other way around. Thus, autocratic regimes shall redistribute more than democracies in order to finance private consumption or repression rather than to provide public goods. Hence, democracies provide a higher level of public goods but redistribute less.

Another version of economic system under autocratic regimes is the 'command economy'. This term refers to planned economies in which bureaucrats maximizes their budgets to control (Wintrobe uses here the example of communist countries such as Russia). Thus, a large bureaucratic system is noticeable, which is mostly inefficient. Highly connected with the command economy is the shadow economy, in which informal mechanism repairs the 'holes' of the centralized planning system.

Assuming that the efficiency of public spending on health is reflected in the prevalence of epidemic diseases, it shall in the following be separated between the different political regimes: tinpot regime and totalitarian regime. As autocratic regimes are in the real world more complex (due to e.g. differences in economic systems) they shall be classified according to their consumption and military expenditure patterns. The latter shall account for the costs of repression. Hence, the prevalence of epidemic diseases such as tuberculosis shall be here seen as function of regime type and its respective spending on the public good 'health'. It can be argued that the totalitarian regime is more selective in its spending on health (also more effective), higher prevalence of tuberculosis in general shall be found in these regimes as only a small fraction of population have access to health provision. In contrast, tinpot regimes are not so selective in their spending patterns, thus the public good 'health' maybe available to a broader fraction of the population. Therefore, one should find lower prevalence rates of tuberculosis in these respective countries.

4. Data

This theoretical consideration shall be tested empirically by using data on 104 low- & middle-income countries for the years 1995-2006. Data is obtained from WHO, World Bank as well as from the Quality of Governance Institute (QoG, Goeteborg). The original dataset was set up for 144 countries. However, countries were dropped if too much data was missing but also if country's score in the combined Freedom House & Polity 2 indicator (as stated by the QoG) are nine and above. A score of nine and above is here assumed to denote (established) democracies. The focus here is on autocratic regimes only and in particular on low-middle income autocratic regimes. High income autocracies are here neglected as their 'burden of disease' is supposed to be caused rather by communicable diseases than by non-communicable ones. The list of low and middle income country (as classified by the World Bank), which are supposed to be autocratic regimes and considered in the empirical analysis can be found in the appendix.

As dependent variable the prevalence of *tuberculosis* as stated by the WHO (2010) is here implemented. Although these figures are just estimates, they shall capture the quick response of tuberculosis prevalence (and mortality due to tuberculosis) on improvements in the treatment (and in the health provision, respectively). Tuberculosis as such is an infectious bacterial disease, which is transmitted via droplets from person to person. In particular, persons with weak immune systems are affected. Thus, especially the poor fraction of the population is weakened by this disease. Besides the fast reaction on improvements in health care provision, which shall be observable in the data, another advantage of these figures is that they are highly correlated with other health indicators such as Life Expectancy and Infant Mortality, but not so severely with GDPpc. Hence, it can be assumed that the tuberculosis prevalence also captures general health issues (as infection is more likely if the immune system of the person is weakened), but is not only to be found in poor countries, but rather affects also middle-income countries. Moreover, data is available, and in contrast to malaria it is not climate dependent, or as argued in the case of HIV/Aids, not dependent on sexual behaviour or unobserved ethical/social norms. Additionally, as our argumentation is based on selective public health commitment, using tuberculosis prevalence bears another advantage: treatment is available (a six-month course of antibiotics). Thus, treatment is dependent on resources but not on knowledge and it is not a complex task. As the distribution of tuberculosis prevalence in our dataset is skewed (see Figure 1, Appendix), the natural logarithm of tuberculosis prevalence serves as dependent variable.

The independent variable of interest is *regime* type. Thus, after regimes are excluded which score high in the combined Freedom House and Polity 2, the ratio of public *consumption* to *military* expenditure is used to differentiate between tinpots and totalitarian regimes. Thereby, the variable 'General government final consumption expenditure' as published by the World Bank shall indicate public consumption expenditure. This variable includes all government current expenditures for purchases of goods and services. The drawback of this figure is that is also includes most expenditures on national defence and security, but excludes government military expenditures as this is assumed to be part of government capital formation. Thus, military expenditure (the deviator variable here) is defined as all current and capital expenditures on the armed forces, defence ministries and other government agencies engaged in defence projects as well as paramilitary forces, if these are judged to be trained and equipped for military operations. It is argued here that the higher the ratio consumption/military expenditure as higher the chance that the regime is a tinpot. This calculated regime type indicator varies between 1.25 and 48.18, whereby the median is at

6.96. Thus distribution of the variable is skewed (see also Figure 2, Appendix) and the majority of the regimes in this dataset may be more likely to be totalitarian regimes than rather pure tinpots.

To approximate *public* spending on health the variable 'Per capita government expenditure on health (PPP int. $)' as stated by the WHO is implemented. Although, these figures also include expenditure on health by parastatal or other entities, focus is here on resources collected and polled by public agencies, irrespective of the source of revenue. Hence, donor funding may be included, however these resources are then allocated by public authorities according to their guidelines or preferences.

Apart from public spending, health provision is also financed by either private revenues or external donors. Thus, the level of public spending as well as the spread of tuberculosis may be actually dependent on *external* (donor) spending on health. Therefore, the variable 'External resources for health' is integrated which denotes funds or services in kind that are provided by foreign entities, e.g. international organizations or foreign NGOs. Additional the variable '*Private* health expenditure' is included which sums up direct household (out-of-pocket) spending, private insurance, charitable donations, and direct service payments by private corporations. Both variables are obtained from the WHO.

As control variables serves, besides *GDPpc*, the percentage of urban population (both derived from the World Bank database). *Urban* population is included as tuberculosis is more likely to be transmitted in agglomeration areas due to the closer contact of people. In particular, together with poverty, urbanisation enhances the spread of this disease. Furthermore, as it is argued above, that civil wars may not only destroy health infrastructure but also creates poverty and with this the environment for the spread of tuberculosis among *refugees*, an additional control variable is the number of people who are recognized as refugees or granted refugee-like humanitarian status, and people provided temporary protection in the respective country of asylum.

In order to account for possible inequalities, which may affect the prevalence of tuberculosis, the *GINI* index is included as additional control (obtained from the World Bank database). However, as the availability of the GINI index is very sparse for the years and countries under consideration (as well as poverty indicators), the *school* enrolment rate is used here based on the assumption that education drives income. Thus, the line of argumentation is that as higher the fraction of illiterates in the population as higher the difference between the educated and

uneducated people. As indicator for school enrolment the net enrolment ratio for primary education is applied.

In order to account for the *effectiveness* of the state apparatus, the variable 'government effectiveness' from the World Bank Governance Indicator (Kaufmann/Kraay/Mastruzzi 2009) is implemented.

5. Method

Regarding the data, endogeneity issues in the regression model becomes obvious. Therefore, it is refrained from using a simple fixed effect model, but rather a dynamic panel data model approach is chosen. The General Method of Moment (GMM) approach according to Arrelano/Bond (1991) seems to be here the most suitable method. In this approach a linear model with one dynamic dependent variable shall be estimated in order to fit the following model:

whereby i denotes the country, t indexes times, is the vector of independent and control variables. The error term consists of the fixed effects, , and idiosyncratic shocks, . The fixed effects are eliminated by first-differencing the data before the estimation process. In this model internal instruments are constructed from past observations of the instrumented variable ( ) (see Roodman 2009).

In order to test if the prevalence rate of tuberculosis is a function of regime type and public spending, a multiplicative interaction term of: per capita public spending on health × regime type is integrated (see Brambor/Clark/Golder 2006).

Testing for cross-sectional dependency (according to Pesaran 2004), and in particular for spatial correlation of the dependent variable, tuberculosis prevalence, Moran's I as well as Geary's C suggest strong spatial correlation. Due to the fact that tuberculosis is a communicable disease which may be transmitted by migration this spatial correlation between adjacent countries is not surprising. To take at least partly this into account, the average

tuberculosis prevalence rate in neighbouring countries (sea and/or land borders) is constructed.

6. Results

Starting with a simple model (0) which seeks to explain the prevalence of tuberculosis with the sources for health funding, results obtained show that public spending on health seems to reduce significantly the incidence of tuberculosis (see Table 1). Moreover, external funded health care is more likely in countries with high prevalence rates. Extending this simple model by including the regime type (i.e. ratio public consumption/military spending) (1), urbanization rate (2), and the tuberculosis prevalence in neighbouring countries (3), regression estimates show that public expenditure remains negatively related with the prevalence of tuberculosis. Thus, public spending on health seems to bring down the prevalence of tuberculosis. The same effect is shown in model (1) – (3) for private expenditure. External funding further seems to be higher in countries with high prevalence rates. However, the fraction of urban population seems to significantly reduce the prevalence of tuberculosis, which may be caused by better availability of medication in urban areas.

	(0)	(1)	(2)	(3)	(4)
VARIABLES	L.lnTub	L.lnTub	L.lnTub	L.lnTub	L.lnTub
L.lnPcPublic	**-0.428*** **	**-0.896*** **	**-0.758*** **	**-0.459** **	**-0.602*** **
	(0.141)	(0.215)	(0.228)	(0.201)	(0.208)
L.lnPrivateHealth	-0.240	**-1.056*** **	**-1.020*** **	**-0.566***	-0.495
	(0.216)	(0.368)	(0.365)	(0.320)	(0.321)
L.lnGDP	0.138	**0.764*** **	**0.822*** **	**0.548** **	**0.776*** **
	(0.177)	(0.279)	(0.278)	(0.240)	(0.257)
L.lnExternal	**0.202*** **	**0.185*** **	**0.196*** **	**0.147*** **	**0.128*** **
	(0.0286)	(0.0378)	(0.0381)	(0.0335)	(0.0343)
L.lnregime		-0.0816	-0.0804	-0.105	**-0.475*** **
		(0.0933)	(0.0925)	(0.0779)	(0.169)
L.lnUrban			**-1.097***	-0.696	**-0.942***
			(0.642)	(0.546)	(0.554)
L.lnNeighbor_Tub				**0.623*** **	**0.593*** **
				(0.125)	(0.126)
L.lnregime × spending					**0.338** **
					(0.138)
Constant	6.552***	7.006***	9.869***	4.343**	5.432**
	(0.803)	(1.060)	(1.978)	(2.001)	(2.212)
Year-Dummies	Yes	Yes	Yes	Yes	Yes
Observations	1114	940	940	940	940
sargan	60.39	43.90	41.79	34.39	28.53
No. of Instruments	56	56	56	56	56
Chi² (df)	97.36 (13)	64.85 (14)	68.96 (15)	122.2 (16)	128.8 (17)
RSS	34.78	26.94	26.42	18.66	18.55
Sig2	0.0174	0.0169	0.0166	0.0118	0.0117

Table 1: GMM estimates basic models; Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Hence, while the positive relationship between urbanization and tuberculosis might be explainable, another striking contradicting result is the positive relation between tuberculosis prevalence and GDP per capita rate. In particular, as tuberculosis is actually mostly connected with poverty. One possible explanation may lay in inequality. Thus, the sample of countries here used consists of low- and middle income countries, and neglects high income countries with low prevalence rates. Thus, a better proxy for poverty may perform with the expected sign.

In model (4) the variable of interest, the interaction term between regime type and public spending, is introduced. Regarding the marginal effects of the interaction term, the majority of the regime types are involved, meaning, that the lower upper bound of the confidence interval is in the positive area up from 2.98, which means that more than 90 percent of the observations in the sample are considered by the interaction term (see Figure 3). Moreover, results of the estimation show a significant effect of regime spending on the prevalence of tuberculosis. Thus, the higher the likelihood of the regime to be a tinpot the lower the prevalence rate of tuberculosis. One may explain this result with the higher rate of spending on loyalty in a tinpot regime which may be reflected in lower tuberculosis rates, while the more selective spending in a totalitarian regime may increase inequality, but does not be reflected in effective treatment (reduced prevalence rate) of tuberculosis. In order to test whether inequality drives the results, the GINI index is implemented (with 1 denoting pure inequality) (see model 5, Table 2). Including the GINI index does not alter the results regarding the regime type. Thus, the tinpot-like regimes still have lower prevalence rates of tuberculosis.

Considering the interpretation of the interaction term, holding public spending on health constant (see also Figure 3, Appendix), as well as military expenditure, a rise of public spending on consumption leads to an increase in infection rate of 0.3. This results points to the fact that maybe not inequality is driving the results but rather the effectiveness of spending is decisive for the spread of tuberculosis. However, due to data availability, including the GINI index into the analysis reduces the sample size on 89 countries and only 228 observations (from originally 940) over the 11 years time period. Thus, conclusion can be hardly drawn from this model. Therefore, in model (5) & (6) primary net school enrolment ratio and number of refugees in the country are included as further control variables as education differences may also capture income differences and refugees tend to add to the lower income groups in the country. However, including both variables does not change the

results. Thus, it seems that inequality in this dataset does explain significantly while tinpot regimes have lower prevalence rates of tuberculosis.

Considering the effectiveness argument, an adapted World Bank Governance indicator, government effectiveness, is implemented (Kaufmann/Kraay/Mastruzzi 2009). The indicator is altered in this respect that instead of being scaled between -2.5 – 2.5, the indicator is rescaled by adding 10, thus ranging between theoretically between 7.5 and 12.5. In our dataset, the effectiveness of autocratic regimes with low and middle income varies between 7.73 and 11.39.

	(5)	(6)	(7)	(8)
VARIABLES	L.lnTub	L.lnTub	L.lnTub	L.lnTub
L.lnPcPublic	-0.0494	**-0.315****	**-0.576****	**-0.447*****
	(0.396)	(0.159)	(0.225)	(0.173)
L.lnPrivateHealth	0.271	-0.258	**-0.556***	**-0.626*****
	(0.571)	(0.251)	(0.328)	(0.178)
L.lnGDP	-0.262	0.211	**0.848****	**0.632*****
	(0.353)	(0.206)	(0.344)	(0.184)
L.lnExternal	**-0.0984***	**0.0658****	**0.0983*****	0.0303
	(0.0530)	(0.0335)	(0.0359)	(0.0433)
L.lnregime	**-0.754*****	**-0.248***	-0.254	0.242
	(0.265)	(0.132)	(0.189)	(0.174)
L.lnUrban	0.227	0.662	-0.501	**-0.519*****
	(0.221)	(0.573)	(1.108)	(0.176)
L.lnNeighbour Tub	**1.155*****	**1.017*****	**0.681*****	**1.010*****
	(0.241)	(0.127)	(0.220)	(0.0895)
L.lnregime × spending	**0.627****	**0.232****	0.210	**-0.322****
	(0.275)	(0.103)	(0.150)	(0.145)
L.GINI	**-0.0293****			
	(0.0118)			
L.lnRefugee		0.0360	-0.0124	-0.0561
		(0.0228)	(0.0255)	(0.0395)
L.lnschool			0.258	
			(0.307)	
L.lneffectiveness				**-3.300*****
				(0.895)
Constant	-0.361	-2.757	-0.0216	9.917***
	(3.319)	(2.267)	(3.882)	(2.113)
Year-Dummies	Yes	Yes	Yes	Yes
Observations	226	867	479	551
sargan	27.09	34.70	37.70	24.92
No. of Instruments	42	56	56	35
Chi² (df)	970.3 (18)	186.3 (18)	82.27 (19)	6954 (12)
RSS	1.517	11.03	4.637	3.427
Sig2	0.0316	0.00763	0.00709	0.00808

Table 2: GMM estimates extended models; Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Using this adapted indicator in the estimation model (Model 8), results remain largely the same regarding public spending on health (reduces tuberculosis occurrence), private spending

on health (reduces tuberculosis occurrence), GDPpc (positively associated with tuberculosis prevalence) and fraction of urban population (reduces tuberculosis occurrence). But, the sign for regime and of the interaction term changes. Hence, this estimation shows that increasing governmental effectiveness leads to sinking tuberculosis prevalence. Controlling for government effectiveness, the constructed variable 'regime' (ratio of public consumption/military expenditure) turns into a positive coefficient. Thus, the more totalitarian the regime is the lower the prevalence of tuberculosis. However, the multiplicative interaction term reveals that an increase in consumption spending about 1 unit will lead to a decrease of the tuberculosis prevalence about 0.3. Thus, selective spending of the totalitarian may actually lead to a general worse health status of the population, in particular if this selective spending is effectively allocated.

Another striking result is the strong effect of the neighbourhood. In all models the average tuberculosis prevalence of the adjacent countries is positively significant related with the prevalence of tuberculosis in the country. Thus, effects due to spatial contagion should not be neglected in future research.

7. Conclusion

This paper aims on explaining health outcome of the population by examining the effect of regime type and its respective public spending on health. So far, empirical results on the spread of the infection rates of diseases such as malaria, HIV/Aids and tuberculosis lead to mixed results. Besides climate, poverty seems to be one leading cause of poor health status, while at the same time be caused by disease prevalence. Improvements in health provision, moreover, seem to depend not only on the institutional quality of the country under considerations and with this the effective allocation of resources, but rather political commitment is put forward as one determinant for effective health care systems. Drawing on the theory of dictatorship of Wintrobe (1998) this paper examines low and middle income autocratic regimes and their public spending on health. Thus, autocratic regimes are here differentiated according to their spending on consumption and their military expenditure in order to classify if they tend to be rather totalitarian regime (low ratio consumption/military expenditure) or tinpot regimes (high ratio consumption/military expenditure). The prevalence of epidemic diseases such as tuberculosis is here examined as being a function of regime type and its respective spending on the public good 'health'. Arguing that the totalitarian regime is more selective in its spending on health (also more effective), higher prevalence of

tuberculosis in general shall be found in these regimes as only a small fraction of population have access to health provision. In contrast, tinpot regimes are not so selective in their spending patterns, thus the public good 'health' maybe available to a broader fraction of the population. Therefore, one should find lower prevalence rates of tuberculosis in these respective countries. This hypothesis is tested for 104 countries, classified as low- and middle income countries as well as non-democracies for the years 1995-2006. Results of the regression confirm that the type of the political regime matters. Thus, a higher prevalence rate of tuberculosis is actually found in totalitarian regimes. Accounting for efficiency of the state apparatus, it is even shown that reallocating more public funds into consumption expenditure actually reduces the prevalence of tuberculosis. Hence, tinpot regimes seem to create with their ineffective spending rather positive external effects regarding health (measured as tuberculosis prevalence). These results may give a hint on the complexity regime type may influence people's well-being. Examining only democratic versus autocratic system may not capture all shadows of the set up of an autocratic system. Moreover, spatial contagion or common geographic features between adjacent countries should be not neglected, as it seems to add significantly to the explanation on the spread of epidemic diseases.

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APPENDIX

List of Countries

Albania	Cote d'Ivoire	Lebanon	Russia
Algeria	Djibouti	Lesotho	Rwanda
Argentina	Dominican Republic	Liberia	Senegal
Armenia	Ecuador	Libya	Serbia
Azerbaijan	Egypt	Macedonia	Seychelles
Bangladesh	El Salvador	Madagascar	Sierra Leone
Belarus	Eritrea	Malawi	Sri Lanka
Belize	Ethiopia	Malaysia	Sudan
Benin	Fiji	Mali	Swaziland
Bolivia	Gabon	Mauritania	Syria
Bosnia-Herzegovina	Gambia	Mexico	Tajikistan
Botswana	Georgia	Moldova	Tanzania
Brazil	Ghana	Mongolia	Thailand
Bulgaria	Guatemala	Morocco	Togo
Burkina Faso	Guinea	Mozambique	Tunisia
Burundi	Guinea-Bissau	Namibia	Turkey
Cambodia	Honduras	Nepal	Turkmenistan
Cameroon	India	Nicaragua	Uganda
Cape Verde	Indonesia	Niger	Ukraine
Central African Rep.	Iran	Pakistan	Uzbekistan
Chad	Jamaica	Panama	Venezuela
Chile	Jordan	Papua New Guinea	Viet Nam
China	Kazakhstan	Paraguay	Yemen
Colombia	Kenya	Peru	Zambia
Congo, Dem. Rep.	Kyrgyzstan	Philippines	Zimbabwe
Congo, Rep.	Laos	Romania	

Descriptive Statistics

Variable	N	Mean	Std. Dev.	Min	Max	Source
Regime type	1101	8.814	6.404	1.252	48.177	Own compilation
FH-Polity2	1273	4.091	2.695	0	8.92	QoG
Public Consumption	1265	14.553	6.602	3.460	69.542	World Bank
Military expenditure	1159	2.425	2.727	0	39.615	World Bank
Tuberculosis prevalence	1369	289.324	241.725	5	1490	WHO
External resource (health)	1368	9.576	11.841	0	66.5	WHO
GDPpc	1327	3311.376	3050.161	120.871	19014.13	World Bank
GINI	288	43.508	9.277	16.83	64.34	World Bank
Pc Public spending (health)	1373	103.908	116.144	0	758	WHO
Neighbour Tub.prev.	1379	273.942	190.583	17.333	998	Own compilation
Private Health exp.	1374	51.032	18.817	0	99	WHO
Refugees	1184	110114.1	289911.6	1	2358591	World Bank
School enrollment	727	79.805	18.450	23.228	100	World Bank
Urban population	1379	45.350	20.141	7.2	92.64	World Bank
Effectiveness	911	9.421	0.559	7.73	11.39	World Bank

Correlation matrix

	Tuber-culosis	Regime	fh_pol2	Consump-tion	Military	Public	Private	External	GDP	Urban	Neigh-bour	School	Refugee	Gini	Effective-ness
Tub	**1.00**														
Regime	-0.20	**1.00**													
fh_polity2	-0.30	0.23	**1.00**												
Consumption	0.21	0.09	-0.18	**1.00**											
Military	0.32	**-0.61**	-0.38	0.53	**1.00**										
Public	-0.55	0.03	0.38	0.20	0.02	**1.00**									
Private	-0.01	-0.07	-0.12	-0.34	-0.08	-0.52	**1.00**								
External	**0.71**	-0.05	-0.31	0.21	0.17	-0.50	-0.13	**1.00**							
GDPpc	**-0.61**	0.07	0.39	-0.07	-0.16	**0.79**	-0.26	**-0.63**	**1.00**						
Urban	-0.45	0.05	0.29	0.17	-0.01	**0.64**	-0.24	-0.53	**0.73**	**1.00**					
Neighbour	**0.77**	-0.10	-0.29	0.08	0.12	-0.52	0.06	**0.68**	**-0.61**	-0.57	**1.00**				
School	**-0.72**	0.14	0.39	-0.24	-0.31	0.44	0.04	**-0.62**	0.56	0.41	**-0.61**	**1.00**			
Refugee	-0.03	-0.18	-0.26	0.17	0.45	-0.01	0.15	0.04	-0.12	0.03	-0.07	-0.08	**1.00**		
Gini	-0.20	0.25	0.49	-0.03	-0.36	0.27	-0.12	-0.23	0.25	0.40	-0.10	0.20	-0.16	**1.00**	
Effectiveness	-0.40	0.00	0.27	-0.05	-0.02	0.51	-0.15	-0.40	0.52	0.44	-0.37	0.32	0.16	0.20	**1.00**

Figure 1: Histogram of prevalence of tuberculosis

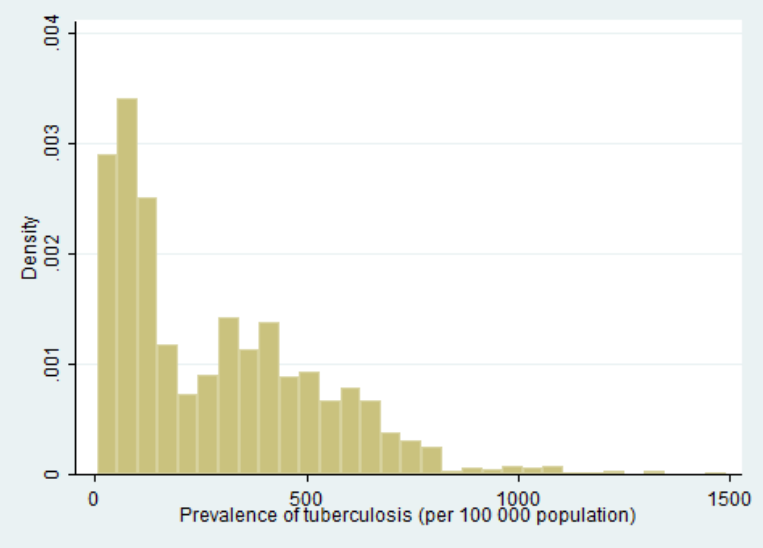

Figure 2: Histogram of variable: regime type

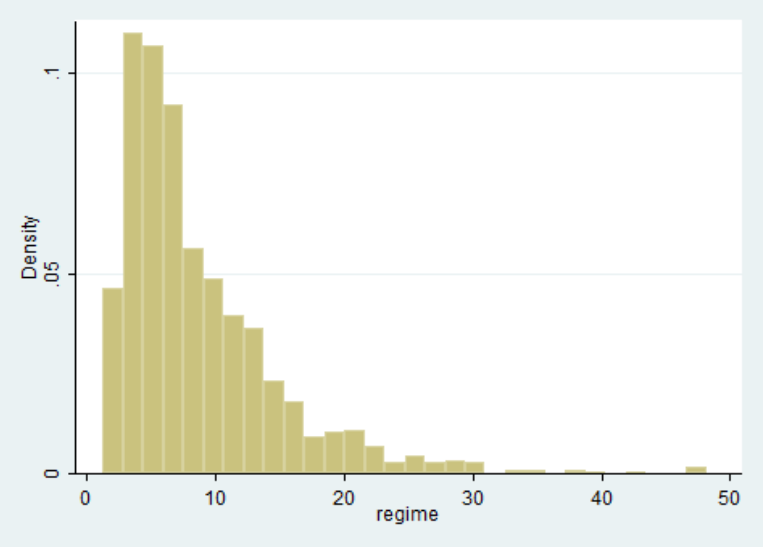

Figure 3: Marginal effect of the interaction term in model (4)