

Fiscal Transparency and Economic Growth

by

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Abstract

Following several corporate accounting scandals many opted for greater corporate transparency whereas people almost blindly trusted state authorities and their released information especially on fiscal data. This attitude changed in the aftermath of several crisis in emerging market economies during the second half of the 1990s, which led the IMF to push for greater transparency of countries' fiscal positions. This initiative steadily gained support and the case of Greek's misreporting of fiscal data to Eurostat revealed that a lack of fiscal transparency is not only a problem of low-income countries. Fiscal transparency can be defined as the openness about policy intentions, formulation, and implementation and is regarded as a key element of good governance. In addition to the more familiar factors, transparency and good institutions are now among the generally accepted fundamentals that promote investment and growth. This development is occurring in tandem with the focus on the role of institutions in promoting economic growth and explaining growth differentials around the world. Empirical studies reveal that countries that are less fiscally transparent tend to experience slower growth rates, lower levels of per capita GDP, higher budget deficits, and a higher debt to GDP level. While the empirical evidence is convincing there are only insufficient theoretical approaches to model the effects of fiscal transparency. Therefore, after a short review of the relevant literature on transparency this paper tries to shed light on the underlying transmission mechanism of fiscal transparency with respect to the economic outcomes of a country. In a simple neoclassical growth model based on the work of Barreto (2000) corruption is modelled as the rents a public agent can extract because he provides a public good necessary for private good production in a monopolistic way. In this context corruption will be defined here as in Shleifer and Vishny (1993, p.3) as the misuse of a government official of his role as public agent. Both, the probability of detection and the possible punishment in case of detection depend on the level of transparency in the fiscal system. It can be shown that in case of higher transparency the public agent moves away from the monopolistic equilibrium towards the competitive equilibrium of public good provision and therefore corruption declines. As it is common sense that corruption implies some kind of resource misallocation, corruption consequently leads to suboptimal growth rates. Therefore, the central result of the model is that higher transparency helps to curb corruption which eventually leads to higher economic growth.

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1 Introduction

Resulting from the sobering experience with 1st generation models of economic development, it is now generally acknowledged that among other factors institutional quality holds the key to prevailing patterns of prosperity around the world. The role of institutions[†] was stressed among others by North (1990, 1993), Rodrik (2000), Campos (2000), Lin and Nugent (2000), Havrylyshyn and van Rooden (2000), and Acemoglu, Johnson and Robinson (2004). Rodrik (2004, p.1) addresses the problem of causality of institutions and economic development by stating that “highquality institutions are perhaps as much a result of economic prosperity as they are their cause. But however important the reverse arrow of causality may be, a growing body of empirical research has shown that institutions exert a very strong determining effect on aggregate incomes.”

After the disillusioning experience with 1st generation policies of economic development[‡] from 1950 to 1975 it became clear that new ideas are needed. One main result from the so called 2nd generation models of economic development was the widely known fact that “institutions matter” and that market liberalization alone can only produce the desired outcomes if strong institutions support these changes.[§] The 2nd generation models of economic development

[†] Following North (1990, p.3) “Institutions are the rules of the game in society or, more formally, are the humanly devised constraints that shape human interaction.”

[‡] The 1st generation models were mainly concerned with the following three concepts: stabilization, liberalization, and privatization.

[§] This result is shared by Feige (1997, p.22): “The historical laboratory of the transition economies has revealed that liberalization, stabilization, and privatization may be necessary but are by no means sufficient conditions for creating ‘market economies’.”

argue that in addition to the more familiar factors of the Washington Consensus, governance and “good” institutions became generally accepted fundamentals to promote investment and growth.** Fiscal transparency promotion is thereby a newer element of 2nd generation policies of economic development. In the aftermath of financial crisis in several emerging market countries at the end of the 1990s international institutions, eventually, shifted their interest increasingly towards the relationship between good governance and better economic and social outcomes. By the same token the importance of transparency in successful economies is becoming increasingly recognized in the operational work of international organizations. In this regard the IMF paved the way by initiating the Code of Good Practices on Fiscal Transparency - Declaration on Principles at its 50th meeting in Washington, D.C. on April 16, 1998. According to IMF (2001b) the lack of transparency was a feature responsible for the buildup of the Mexican crisis of 1994-95 and of emerging market crisis of 1997-98 in Asia and Russia. In their view inadequate economic data, hidden weakness in financial systems, and a lack of clarity about government policies and policy formulation contributed to a loss of confidence that ultimately threatened to undermine global stability.†† Meanwhile, other international institutions started promoting more transparent policies among their member countries, as well. Examples are the OECD (2001) with its Best Practices for Budget Transparency or the 1997 founded Washington based organization International Budget Project that promotes civil society’s capacity to analyze and influence the budget process and its outcome.

** The common factors of the Washington Consensus include fiscal discipline, tax reform, financial liberalization, a unified and competitive exchange rate, openness, trade liberalization, privatization, deregulation, and secure property rights. Rodrik (2003) includes corporate governance and anti-corruption in an augmented Washington Consensus.

†† A more critical stance on this issue comes from Hoff and Stiglitz (2001, p.426):“The focus on transparency in financial reporting as a key factor behind the East Asian crisis served strong political interests. [...] It shifted blame from industrial countries that had pushed rapid capital account and financial liberalization - without a corresponding stress on the importance of strong institutions and regulatory oversight - to the governments of developing countries, which had failed to enforce information disclosure.”

Fiscal Transparency will be defined in this paper as the openness about policy intentions, formulation, and implementation. The economic literature shows a growing number of empirical evidence that countries that are less fiscally transparent tend to experience lower levels of foreign direct investments (FDIs), higher capture of corruption, slower growth rates, and lower levels of per capita GDP.

This paper is structured as follows: In *section 2* this paper will define the term transparency in a wider context as well as in a more specific way, i.e. fiscal and budgetary transparency and reviews the economic literature available on fiscal transparency. Aim is to shed light on the economic consequences of enhanced fiscal transparency. After this exercise, *section 3* provides some stylized facts about the relationship between fiscal transparency and key economic indicators such as FDI-inflows, the perception of corruption, the level of democracy, and GDP per capita. In *section 4* I will develop a simple neoclassical growth model based on the work of Barreto (2000). This model will be used to model the effects of fiscal transparency in more detail. In *section 5* the simulation of the model's solution will be presented. The focus in this section is to clarify which role fiscal transparency plays to curb corruption within a economy. *Section 6* summarizes the main results.

2 Literature Review

To start with, a comprehensive definition of transparency in general can be found at Drabek and Payne (2001, pp.4-5). They describe the term transparency as referring to the clarity and effectiveness of activities with impact on public policy. Moreover, they regret that in the economic literature, the discussion about transparency has remained almost limited to two key topics, on corruption and bribery and on the protection of property rights. Besides these two items, Drabek and Payne (2001) count three more origins of non-transparent policies: the level of bureaucratic inefficiency within the government, poor enforcement

of the rule of law, and economic policies *per se*. In the latter case, economic policy is regarded as non-transparent if it is subject to unpredictable changes and policy reversals.

A more specific definition of transparency can be derived if the concept is applied towards fiscal and budgetary policies. First, a comprehensive definition of fiscal transparency can be found in Kopits and Craig (1998, p.1): “Fiscal Transparency is defined [...] as openness toward the public at large about government structure and functions, fiscal policy intentions, public sector accounts, and projections. It involves ready access to reliable, comprehensive, timely, understandable, and internationally comparable information on government activities [...] so that the electorate and financial markets can accurately assess the government’s financial position and the true costs and benefits of government activities, including their present and future economic and social implications”. With regard to the budget one should first take into account that the budget is the single most important policy document of a government, where all policy objectives should be reconciled and implemented in concrete terms. In this context, the OECD (2001, p.3) defines budget transparency as “the full disclosure of all relevant fiscal information in a timely and systematic manner”. A further specific example of transparent budget reporting procedures can be found in Poterba and von Hagen (1999, pp. 3-4): “A transparent budget process is one that provides clear information on all aspects of government fiscal policy. Budgets that include numerous special accounts and that fail to consolidate all fiscal activity into a single ‘bottom line’ measure are not transparent. Budgets that are easily available to the public and to participants in the policymaking process, and that do present consolidated information, are transparent.” As features of non-transparent financial reporting, Alesina and Perotti (1996) identify optimistic predictions on key economic variables, optimistic forecasts of the effects of new policies, creative and

strategic use of what is kept on or off budget, strategic use of budget projections, and strategic use of multi-year budgeting.

Erbaş (2004) states that procedures could be more transparent in four distinct ways. *First*, more transparent procedures should process more information, and, other things equal, in fewer documents. This speaks to openness and ease of access and monitoring. *Second*, transparency is increased by the possibility of independent verification, which has been shown experimentally to be a key feature in making communication persuasive and/or credible. *Third*, there should be a commitment to non-arbitrary language: words and classifications should have clear, shared, unequivocal meanings. *Finally*, the presence of more justification increases transparency, reducing the optimism and strategic creativity referred to above.

Besides these definitions, Stiglitz (2002, p.354) denounces that transparency “has become the subject of intense political discussion, though [...] analytical work remains scarce.” Aim of this paper is to close this gap by introducing fiscal transparency as exogenous variable in a simple neoclassical growth model with corruption. Admittedly, the above definitions remain very vague and consequently the following section will take a deeper look into the different ways to analyze the economic impacts of fiscal transparency. This task will not only enhance the reader’s understanding of the importance of fiscal transparency for economic policies, but will also help to further elucidate the term fiscal transparency itself. Before I will present the model in more detail in the next sections it seems useful to take a closer look at possible transmission channels of fiscal transparency discussed in the economic literature. There are two possible transmission mechanisms. The first transmission channel is through the financial markets, i.e. more transparent countries are likely to receive a higher level of FDIs than their less transparent counterparts. The second way to model the effects of fiscal transparency on the economic situation of a country is based on insights of economic growth theory. Most approaches model government

officials as agents providing public goods, where less transparent countries *ceteris paribus* suffer higher state capture of corruption and consequently grow less than their less corrupt counterparts.

To begin with, the underlying principle of the first mechanism, the impact of the degree of transparency on the level of FDI-inflows into a country is pretty simple: lower transparency leads to higher risk associated with an investment. Consequently potential investors are more cautious what leads *ceteris paribus* to lower investment inflows. In case of more unpredictable and opaque governments potential investors are more chary. This issue is all the more important as the role of FDIs steadily increased over time as a look at the data confirms. According to data from the UNCTAD Handbook of Statistics over the period 1970-2003, the value of annual FDI outflows multiplied more than *43 times* (from US Dollar 14 billion in 1970 to US Dollar 612 billion in 2003) while the value of merchandise exports multiplied only by round about *23 times* (from US Dollar 316 billion in 1970 to US Dollar 7,444 billion in 2003). These numbers clarify that while the value of international trade is still by far greater than the value of FDIs, the latter are becoming more important. Erbaş (2004) is analyzing this link between transparency and the level of investments a country may attract. He shows with a model based on cumulative prospect theory that for a given probability and payoff structure the expected return on investment is higher in more transparent countries as the uncertainty of possible outcomes is being reduced. Therefore, those countries attract more capital investment and grow more than less transparent countries.

A similar result can be found in Gelos and Wei (2002). They analyze the role of both, government and corporate transparency, with respect to shifts in portfolio investments by international investment funds. Low transparency tends to be associated with a lower level of international investment. Moreover, they provide evidence of increased herding behavior by international investors in less

transparent countries, therefore, contributing to a higher volatility and to a higher likeliness of financial crisis in emerging markets.^{‡‡}

With respect to the second possible transmission channel one first of all has to admit that there are only few theoretical analysis available. Building on the work of Andvig and Moene (1990), Mauro (1995) models the probability of an individual act of corruption being detected and punished to decrease with the overall level of corruption. Multiple equilibria may be used to explain high and low steady state levels of corruption. Ehrlich and Lui (1999) develop a model of endogenous growth with multiple equilibria, in which consumer/bureaucrats may invest in human capital or political rent seeking capital. A somewhat different approach by Barreto (2000) incorporates corruption into a neoclassical growth model in which government agents extract rents by acting as monopoly suppliers of a public good. The corrupt agents are constrained from extracting maximal monopoly rents by the possibility of being caught and punished. Finally, Ellis and Fender (2004) analyze corruption and transparency using a Ramsey-type of economic growth. Thereby, they place a greater emphasis on the role of government behavior. Most particularly they can show that the more fiscal transparent a country is, the lower is the share of corruption in total output along the stable branch.

One further aspect present in the economic literature is the widely spread believe that fiscal transparency has large and positive effects on the fiscal performance. According to Kopits and Craig (1998), “transparency in government operations is widely regarded as an important precondition for macroeconomic fiscal sustainability, good governance, and overall fiscal rectitude.” Alesina and Perotti (1996) and Poterba and von Hagen (1999) concur that more transparency leads to lower budget deficits and makes fiscal discipline and control of

^{‡‡} Herding is the phenomena that fund managers invest in certain countries only because they observe that other funds are invested as well. According to Gelos and Wei (2002) herding may result in a rush in and rush out of investors into countries even in the absence of changes in the fundamentals. This circumstance may increase the likelihood of a financial crisis within a country.

spending easier to achieve. Alt and Dreyer Lassen (2003) present a career-concerns model with political parties to analyze the effects of fiscal transparency on public debt accumulation. They construct a replicable index of fiscal transparency to test the predictions of this model. Simultaneous estimates of the level of public debt and transparency for a sample of 19 OECD countries strongly confirm that a higher degree of fiscal transparency is robustly associated with lower public debt and deficits. Based on these insights is the more public choice oriented approach by Hall and Taylor (1996) who show that greater transparency eases the task of attributing outcomes to the acts of particular politicians. This helps voters distinguish effort from opportunistic behavior or stochastic factors primarily by providing actors with greater or lesser degrees of certainty about the present and future behavior of politicians.

However, one should bear in mind that the problem of how to define exactly the term transparency and how to correctly measure the level of fiscal transparency remains one central weakness in all empirical findings. Alesina and Perotti (1996) note that the "results on transparency probably say more about the difficulty of measuring it, than about its effect on fiscal discipline", a view shared by Alesina and Perotti (1999) and Tanzi and Schuknecht (2000). By the same token, Drabek and Payne (2001, p.3) even speak of an overuse of the term transparency that "is often put forward out of context or without a specific meaning. This makes discussions about transparency too general and limits the scope of policy recommendations."^{§§}

Following this brief literature review I will provide in the next section some stylized facts regarding fiscal transparency before fiscal transparency is modeled in greater detail in *section 4* and *section 5*.

§§ Therefore, at least a somewhat cautious approach towards interpreting the results of all transparency assessments should be chosen.

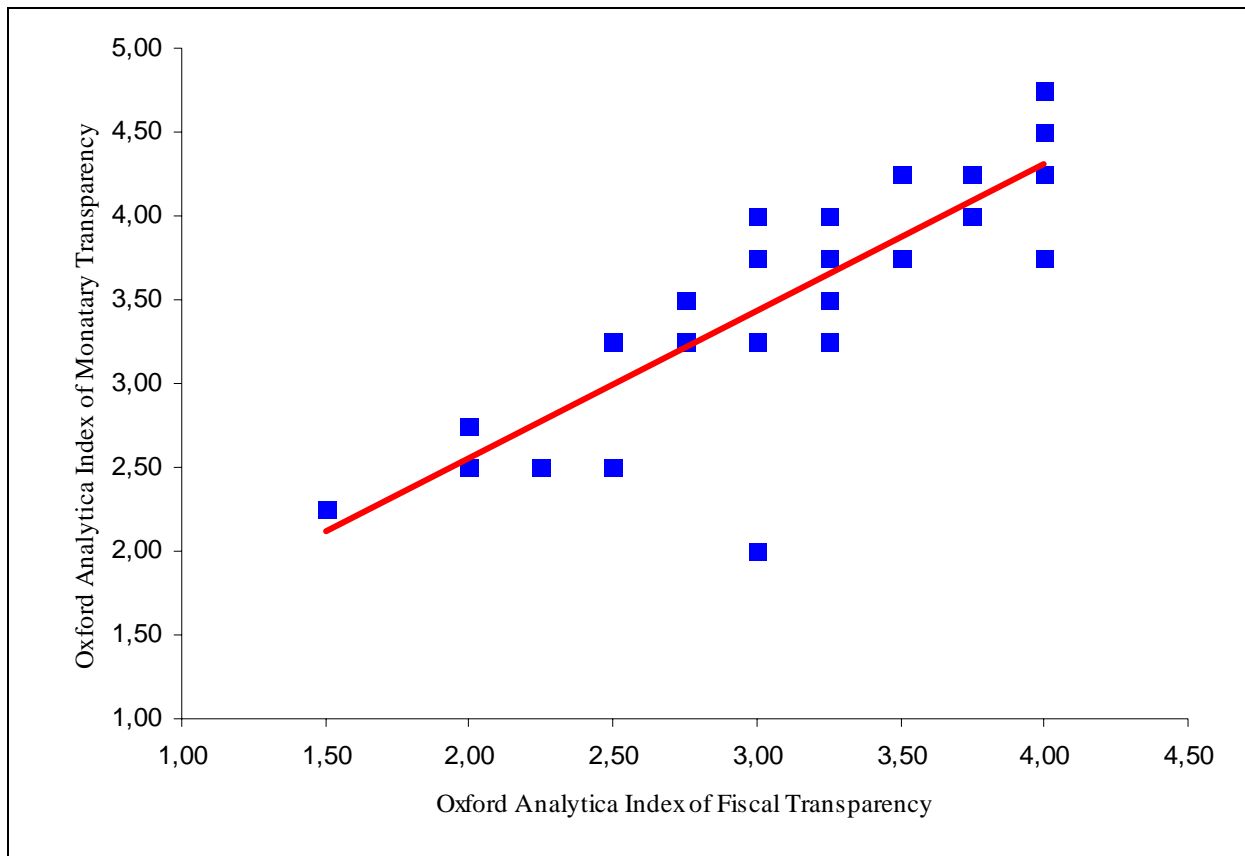
3 Some stylized facts on Fiscal Transparency

The concept of “stylized facts” can be attributed to Kaldor (1961) and it postulates that one should be free to start economic modeling with a “stylized” view of the facts to be explained. Therefore, in this section I will briefly introduce six “stylized facts”, i.e. characteristic economic features with respect to transparency detectable in reality. I will concentrate here only on broad tendencies observable and will consequently ignore the details behind them.

The numerical index of fiscal transparency used hereafter was received from the U.K. based consulting company Oxford Analytica that generates numerical ratings out of the IMF’s non-numerical, qualitative Reports on Standards and Codes (ROCS), Fiscal Transparency Module. Oxford Analytica assigns an index value between 1 (least transparent) and 5 (most transparent). This index value will be used as variable in the following.

1. High correlation between monetary and fiscal policies.

The following figure shows the correlation between the assessments of fiscal and monetary transparency. The high correlation gives rise to the supposition that transparency is dependent on the general attitude of a country towards transparent policies. For the most part opacity therefore is not limited to single items of economic policy.

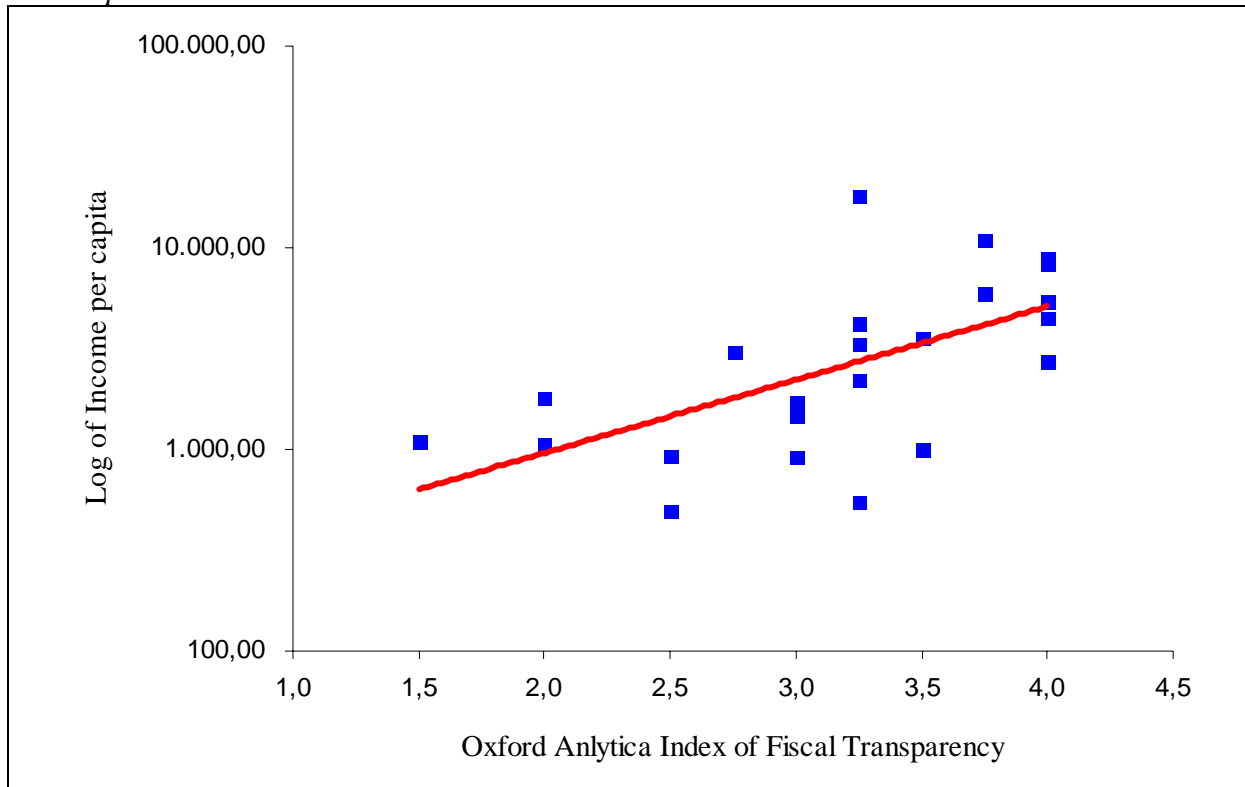
Figure 1: Correlation between Monetary and Fiscal Transparency

Data: Oxford Analytica

2. Fiscal Transparency and GDP per capita

There seems to be a strong link between the development of a country (measured as GDP per capita) and the level of fiscal transparency. It is likely that the more advanced a country is the better defined are the institutions of the respective country. Especially, the capacity of fiscal institutions is an important prerequisite for fiscal policy being conducted in an open and transparent way. On the other hand, empirical studies show that the level of fiscal transparency has also a strong determining effect on a country's growth rates. Thus, higher transparency might also lead to higher GDP per capita.

Figure 2: Fiscal Transparency and GDP per capita: Is Transparency a pattern of development?

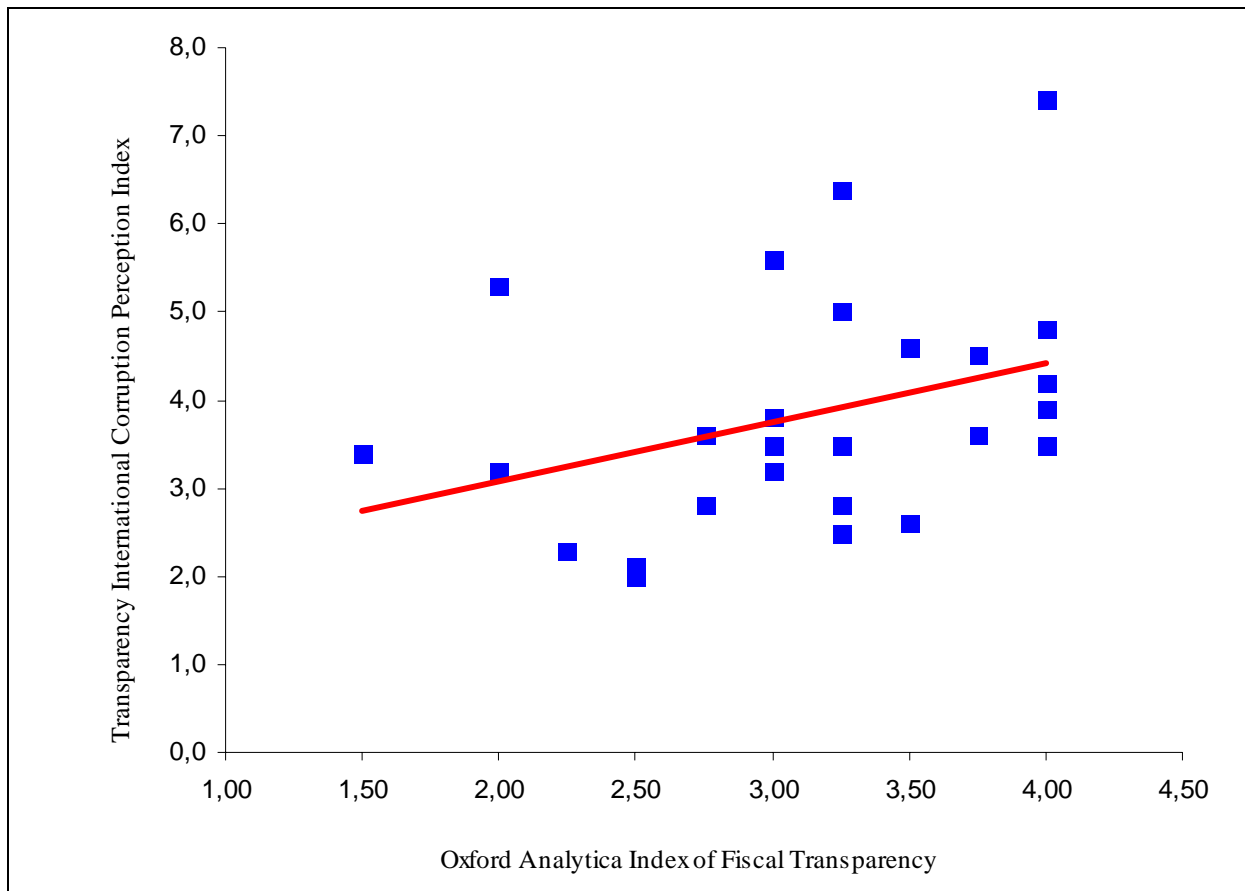


Data: Oxford Analytica

3. Fiscal Transparency and Corruption

As corruption can not be measured directly, the level of corruption is measured here indirectly with the Corruption Perception Index (CPI) published by Transparency International. This CPI value is 10 for the cleanest country and 0 for the most corrupt country. On the one hand opaque economic policies provide a perfect environment for high level of corruption. Resulting from weak fiscal transparency, corruption, more precisely bureaucratic corruption and state capture, is a more common feature to be observed within a country. Figure 3 supports this reasoning. On the other hand in countries suffering under a high degree of corruption, especially state capture, the political elite has no incentive to make the decision processes more transparent. This would be like to bite the hand that feeds you.

Figure 3: Does lower Fiscal Transparency leads to higher Corruption?

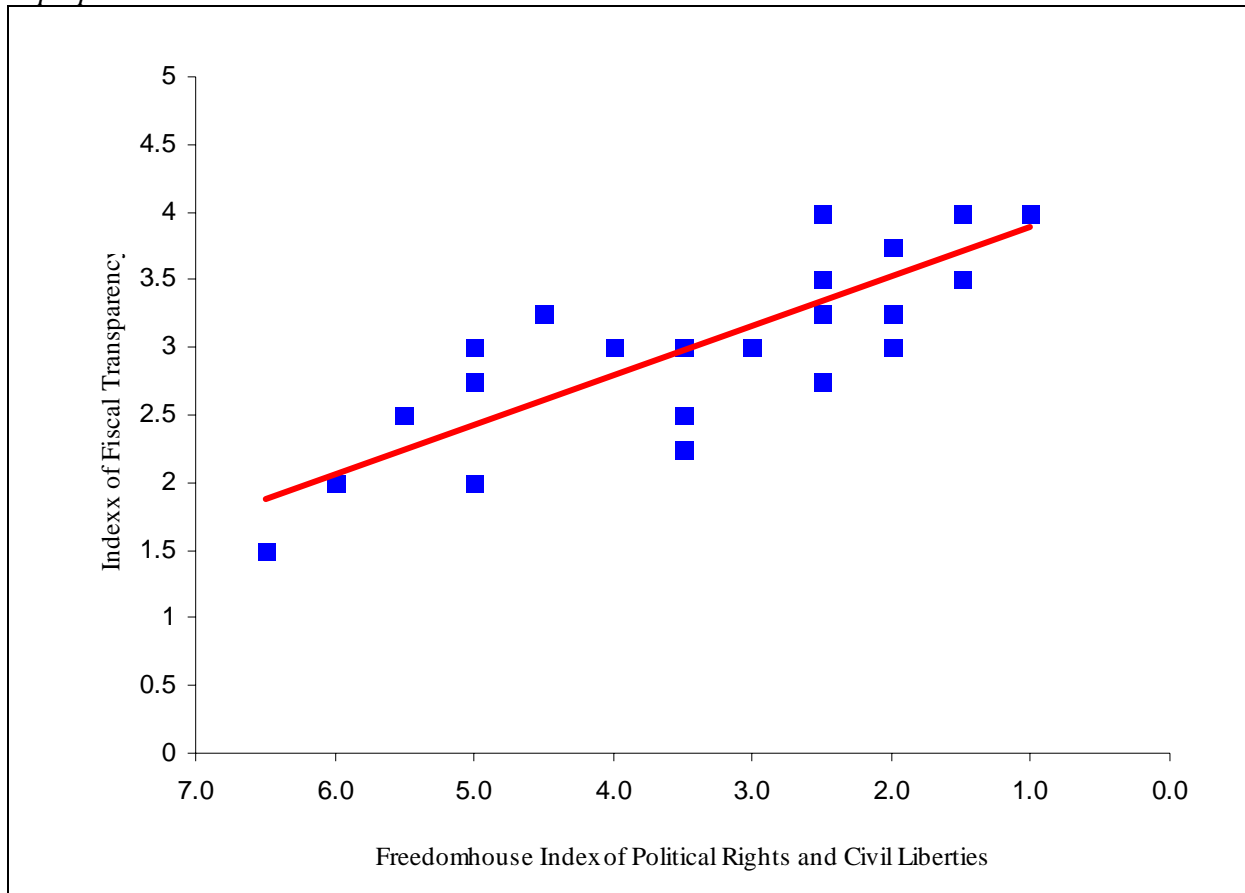


Data: Oxford Analytica and CPI-Value of Transparency International

4. Democracy and Fiscal Transparency

The next figure displays that the level of democracy of a country has a strong determining effect on the level of fiscal transparency. The level of democracy is measured here as the index of political rights and civil liberties published by the organization Freedom House. The rating used here is the average of the numerical ratings for the categories political rights and civil liberties. These numerical ratings are between 1 and 7, with 1 representing the most free and 7 the least free. In case of a low level of democracy more decisions are made by less people. In this context, the role of parliament remains often very limited and the control function of the media is usually limited in a non-democratic environment. Consequently, low level of democracy seems to be counterproductive to transparent fiscal policies.

Figure 4: Democracy and Fiscal Transparency: Tend less democratic countries to be more opaque?

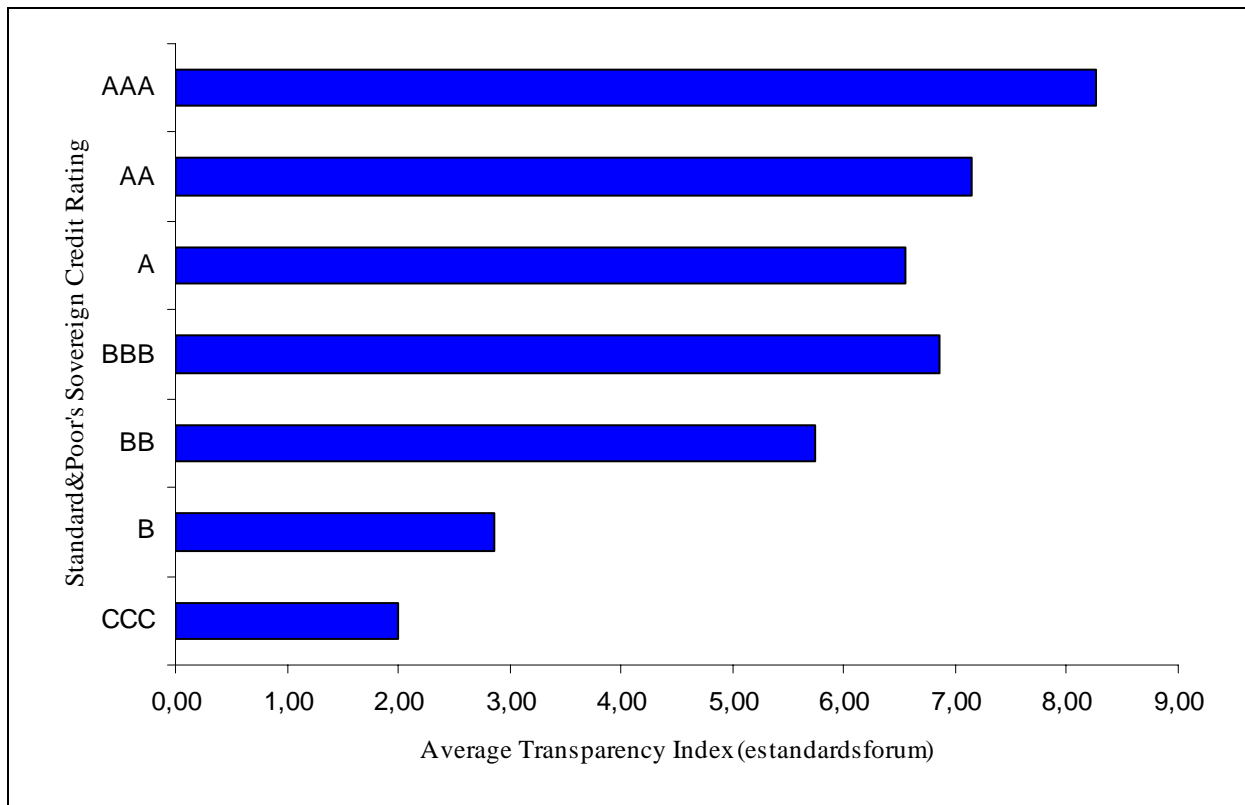


Data: Oxford Analytica and Index of Political Rights and Civil Liberties from Freedomhouse

5. Fiscal Transparency and Sovereign Credit Ratings

A further observation is the positive influence of fiscal transparency on the sovereign credit rating of a country. In case of more open policy-making the risk associated with an investment into a country decreases as the number of possible outcomes declines. Hence, on average the more fiscally transparent a country is, the better is the rating this country receives. In the figure below the sovereign credit ratings have been derived from the rating agency Standard&Poor's. In contrast to above, fiscal transparency is measured here with the fiscal transparency index of *estandardsforum* to allow for a larger sample of 60 countries in total. *Estandardsforum* asserts an index value of 10 for the most transparent and 1 for the most opaque country.

Figure 5: Sovereign Credit Ratings and the level of Fiscal Transparency

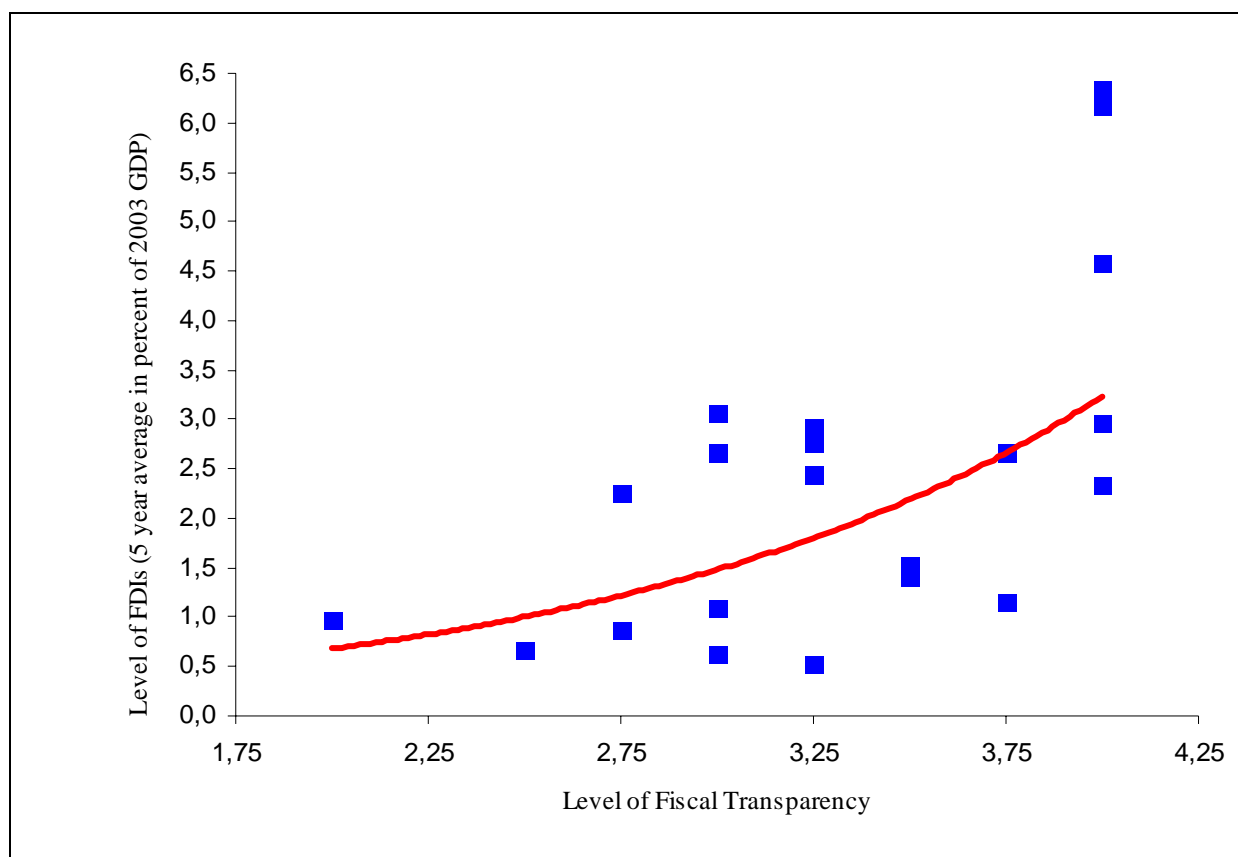


Data: Estandardsforum and Standard & Poor's

6. Fiscal Transparency and Foreign Direct Investments

Last but not least figure 6 shows that higher fiscal transparency seems to have a positive effect on investors' decisions to invest into a country. In figure 6 the level of FDI-inflows is measured as the five-year average FDI-inflow for the years 1999 to 2003 as percentage of the GDP for the year 2003. This result can be seen in accordance with the positive influence of transparency on a countries sovereign credit rating. Less transparency translates into a higher level of uncertainty with respect to the potential outcomes a potential investor faces, i.e. the non-diversifiable systematic risk of an investment increases. This is not only true for FDIs but also for portfolio investments. Also, non-transparent economic policies are often seen as a synonym for an unclear and unpredictable regulatory environment which shies away investors.

Figure 6: Can more transparent countries attract more FDI-inflows?



Data: Oxford Analytica and FDI-inflows from UNCTAD

These “stylized facts” showed that possible effects of fiscal transparency are manifold. Due to the limited scope of this paper I will mainly focus on explaining the third point, i.e. the link between fiscal transparency and corruption in more detail. This will be the task of the next two sections.

4 Fiscal Transparency, Corruption, and Economic Growth

To analyze the effects of fiscal transparency I have adopted the work of Barreto (2000) as a cornerstone of this paper. Barreto in turn builds on Barro (1990). Barro analyzes the properties of government spending using a simple constant returns to scale model of economic growth where tax-financed government services affect production or utility. Barreto augments Barro’s model to allow for a deeper analysis of corruption. In this context Barreto defines public sector

corruption in line with Shleifer and Vishny (1993) as the illegal profiting by a public agent from his position as a representative of the government. For Barreto's model it is assumed that governments act as a natural monopoly regarding public goods provision. In an ideal world governments should provide these public goods as efficiently as possible.

Assuming there is no corruption, the government would provide the public goods at their respective marginal costs. On the other hand, in case of corruptible government officials public goods are provided at a price above their marginal costs.

Barreto models public agents as representatives of the government and as self-seeking individuals. The agents are cognizant of the monopoly rents available from public goods provision and the retention of these monopoly rents into their own pockets represents corruption.^{***}

Barreto's work is based on neoclassical endogenous growth theory and models explicitly the above mentioned monopoly position of the public agents to provide public goods. The aim of this paper is to focus on the role of fiscal transparency within this process of corruption. To perform this task, in a first step I will describe the basic setting of Barreto's growth model. In a second step the detection function of corruption will be analyzed in more detail to model explicitly the effects of fiscal transparency.

The basic setup of the model

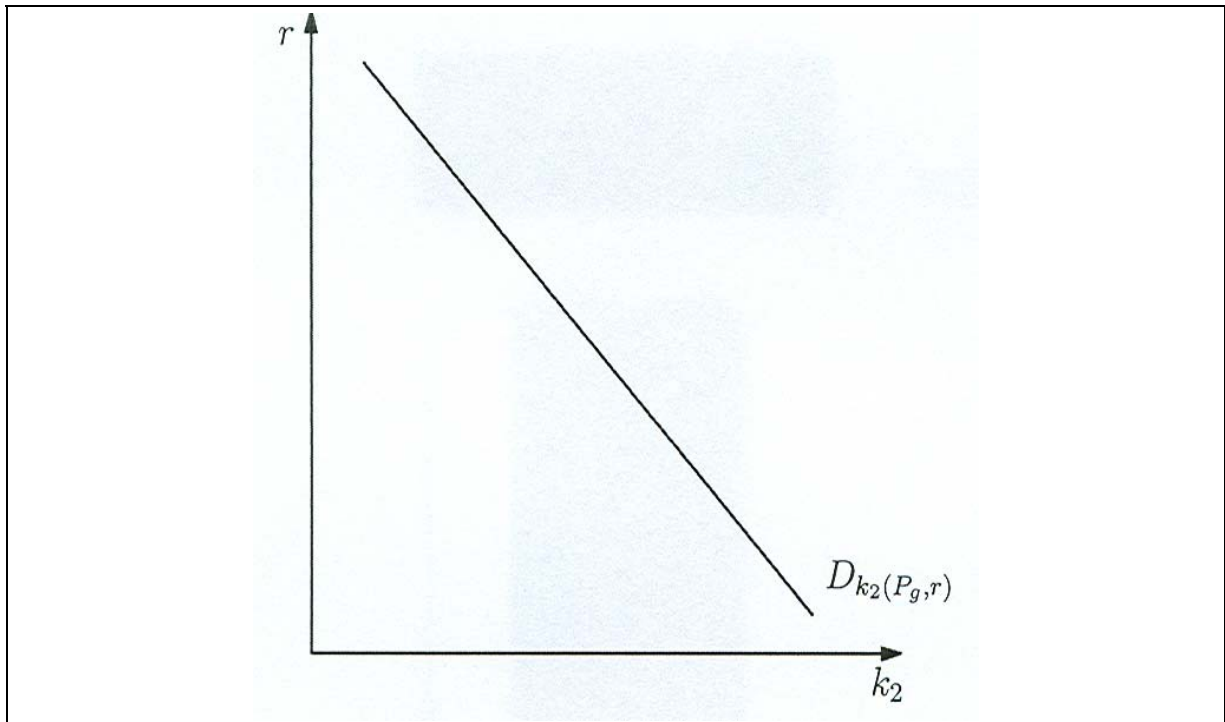
It will be assumed that for the production of the public good, $g = H(k_1)$, capital k_1 is needed. For the production of the private good, both, capital k_2 and the public good is needed, $y = F(k_2, g)$. The total capital available in the economy at any given time is k . This capital can then either be invested in the production

^{***} The concept to model the supply by bureaucrats through self-seeking agents can already be found in Niskanen (1971) and (1994). According to Niskanen bureaucrats follow their personal objectives that may differ from those of the general public.

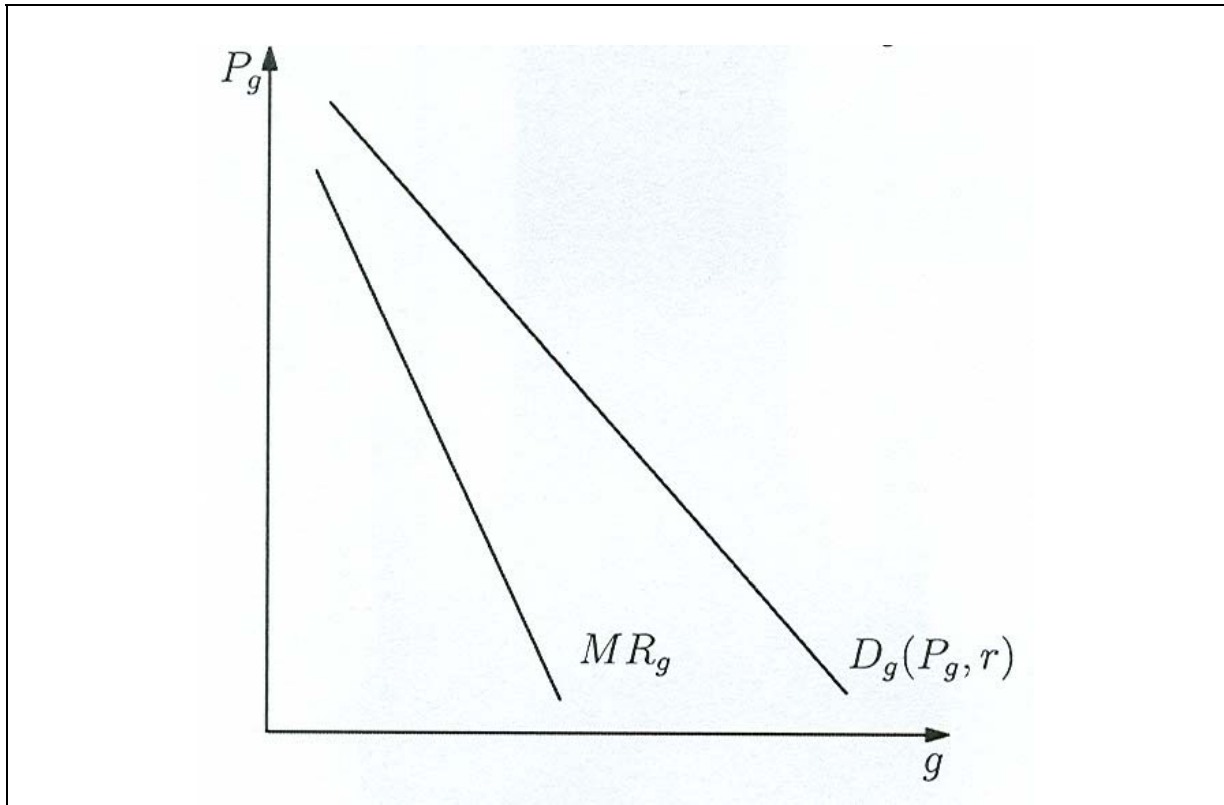
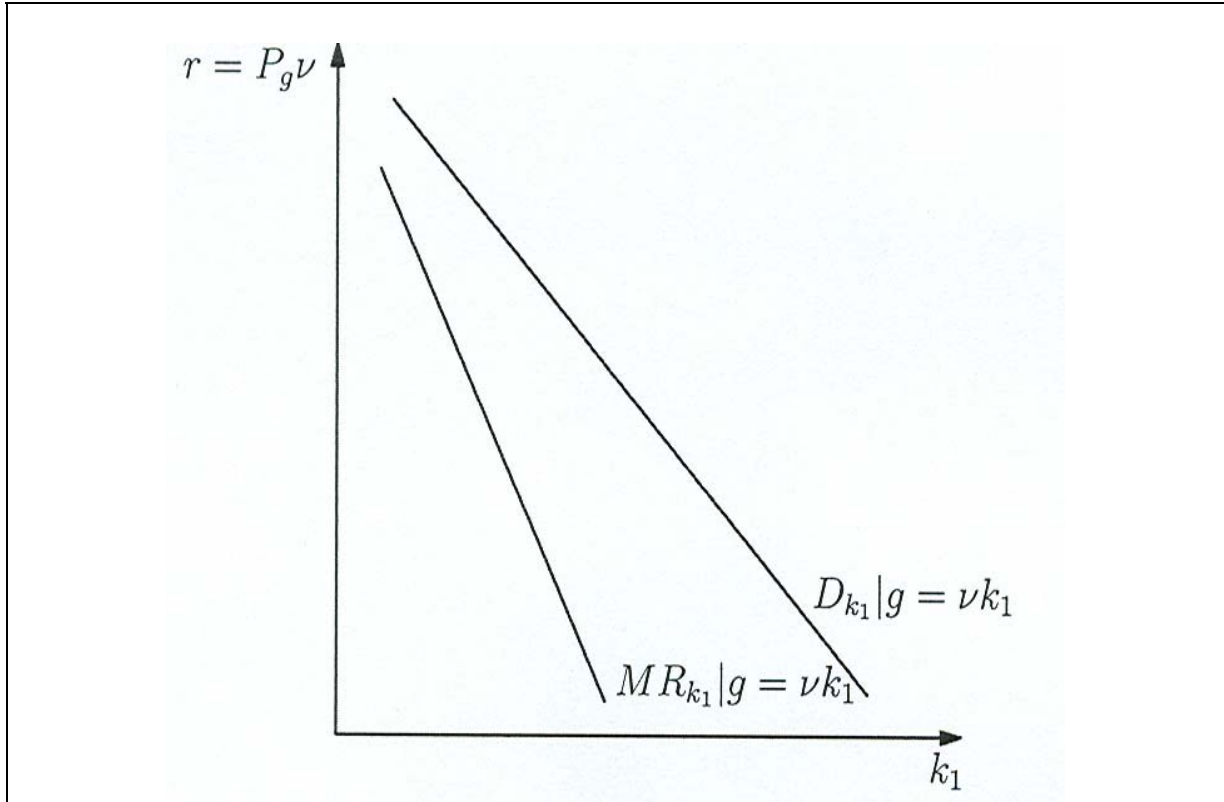
process of the public good or in the production process of the private good, therefore, the following equation holds $k = k_1 + k_2$.

The production of output y is assumed to be a linear homogeneous function of capital k_2 used and the public good g . The demand for k_2 (see figure 7) is equal to the partial derivative of F with respect to k_2 , $F_{k_2} = D_{k_2}(P_g, r)$.

Figure 7: Demand function for k_2



The demand for g is equal to the partial derivative of F with respect to g , $F_g = D_g(P_g, r)$. The marginal revenue of g , on the other hand, is the partial derivative of the total revenue in the production of g with respect to g (see figure 8). As g is also a function of k_1 , it is possible to express the demand for g indirectly in terms of k_1 . This function is simply $g = H(k_1) = \nu k_1$, where ν is the inverse of the red-tape coefficient (see figure 9).

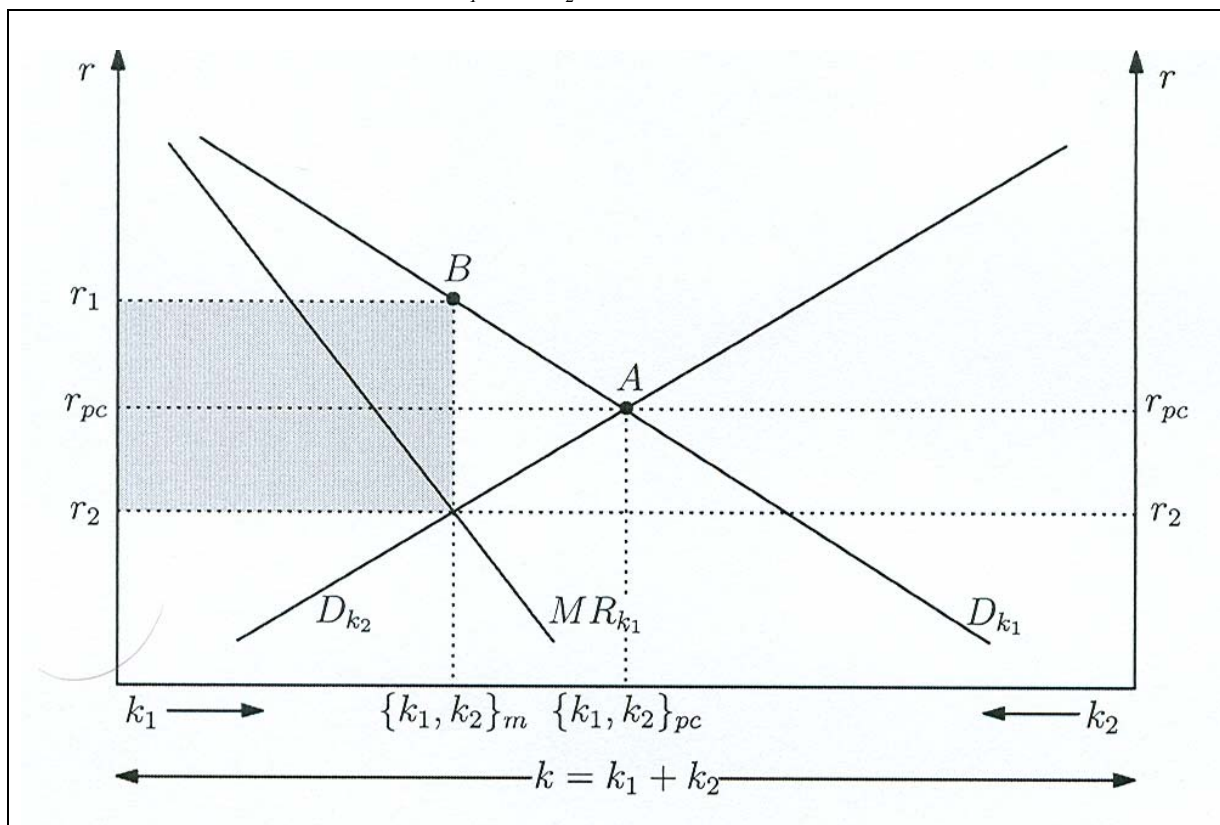
Figure 8: Demand function for the public good g Figure 9: Demand Function for g in terms of k_1 

The demand for g in terms of k_1 can be depicted as νD_g . There is always one common stock of capital k in the economy and it is assumed that capital is

perfectly mobile between the use in the public good sector (g) and the private sector (y).

The allocation of capital between the public and the private sector can be expressed graphically, if figure 7 is superimposed on figure 9. This exercise gives us figure 10.

Figure 10: Demand functions for k_1 and k_2 in one diagram



As more k_1 is needed to produce more of the public good g and thus less k_2 is left for the private sector y in figure 10 the demand function for k_2 can be interpreted as the social marginal cost of k_1 . This implies increasing marginal cost of k_1 and, therefore, the positive slope of the social marginal costs function of k_1 (labeled D_{k_2}) in figure 10.

At the intersection of the demand curve of k_1 and the social marginal costs of k_1 (equal to demand curve of k_2) one can find the competitive equilibrium (Point A) with $\{k_1, k_2\}_{pc}$ and r_{pc} . At the competitive equilibrium there exists no

corruption at all and this point represents the most efficient allocation of capital. Consequently, this equilibrium leads to the highest balanced growth rate.

Point B corresponds to the intersection of the marginal revenue of k_1 and the marginal cost of k_1 . Hence, point B represents the situation where the public agent would maximize the rents available from the monopolistic provision of the public good by charging the price $P_g = r_1 / \nu$. In point B the public agent would provide less of the public good compared to point A and less capital k_1 is allocated towards the public good production. The shaded area in figure 10 represents the maximal monopoly rents possible.

Note, that points A and B are just two possible outcomes for no corruption and unrestrained corruption, respectively. As soon as there is some possibility of detection and a subsequent penalty for corrupt government officials, the equilibrium will lie between these two benchmarks. In the next section I will model the optimization problem of the public and the private agent in more detail.

Transparency and endogenous corruption

In this section the model of Barreto (2000) will be used as a reference for a deeper analysis of the effects of fiscal transparency in the economy. First of all, throughout this section the public agent will be labeled agent 1 while the private agent will be labeled agent 2.

To start with, extracted monopoly rents represent the income of agent 1.^{†††} As monopoly rents are paid in final goods, the government agent maximizes the following utility function:

^{†††} The public agent tries to maximize the difference in the competitive value rental rate of capital devoted to the public sector, $r_2^* k_1$, and the value marginal product of public sector capital $r_1^* k_1$.

$$\text{Max } U_i = \int_{t=0}^{\infty} e^{-\rho t} u(c_{it}) dt = \int_{t=0}^{\infty} e^{-\rho t} \left(\frac{c_{it}^{1-\sigma} - 1}{1-\sigma} \right) dt \quad (1)$$

subject to

$$\psi_t = (r_{1t} - r_{2t})k_{1t} = P_g g_t - r_{2t}k_{1t}, \quad (2)$$

$$B_t = \left\langle \begin{array}{l} G\left(\frac{\psi_t}{y_t}\right) \Big| G \geq 0 \\ 0 \Big| G < 0 \end{array} \right\rangle = \left\langle \begin{array}{l} \ln\left(1 - \frac{\psi_t}{y_t}\right) \Big| -\beta \Big| 0 \leq \beta \leq 1, G \geq 0 \\ 0 \Big| G < 0 \end{array} \right\rangle, \quad (3)$$

$$(1 - B_t)\psi_t + B_t(-2\psi_t) = c_{1t} + s_{1t}, \quad (4)$$

$$g_t = H(k_{1t}) = \nu h(k_{1t}) = \nu k_{1t}, \quad (5)$$

$$\dot{k}_t = s_{1t} + s_{2t}, \quad (6)$$

$$k_t = k_{1t} + k_{2t}. \quad (7)$$

The variables of the equations (1) to (7) are defined in the following way:

- y_t = output at time t ,
- g_t = public good at time t ,
- P_g = price of the public good at time t ,
- ν = inverse productivity factor, i.e. red tape coefficient with $0 \leq \nu \leq 1$,
- c_{it} = consumption of agent i at time t ,
- s_{it} = saving of agent i at time t ,
- ψ_t = corruption at time t ,
- B_t = probability of detection at time t ,
- $G(\cdot)$ = detection function,
- r_{1t} = marginal product of capital used in the public sector k_1 ,
- r_{2t} = marginal product of capital used in the private sector k_2 ,
- k_{1t} = capital allocated to the public sector,
- k_{2t} = capital allocated to the private sector,
- ρ = rate of time preference,
- σ = coefficient of relative risk aversion.

The total costs of detection are a function of the probability of detection B_t and the possible punishment in case of detection, $2\psi_t$.

The parameter β in the detection function can be interpreted as the level of fiscal transparency. For higher fiscal transparency the value of β gets smaller and vice versa. A higher value of β , i.e. lower fiscal transparency, decreases the value of the detection function B_t for any given corruption rate $\frac{\psi_t}{y_t}$. Given any

level of fiscal transparency, the detection cost is a wedge such that the maximal rents attainable is at an equilibrium below complete monopoly rents. The public agent (agent 1) sells the public good for the highest price above the competitive rate such that the monopoly rents available get maximized while the probability of detection B_t is still zero. The public agent opts for the highest corruption rate $\frac{\psi_t}{y_t}$ possible under the restraint that the detection function does not become

larger than zero. Figure 11 shows that for an increase in the value of β (equivalent to a decrease of fiscal transparency) the maximal attainable corruption rate $\frac{\psi_t}{y_t}$ that corresponds with no probability of detection increases.

The private agent, agent 2, derives his revenue from the production of output y_t and utility from consumption c_{2t} . Agent 2 maximizes the following utility function:

$$\text{Max } U_2 = \int_{t=0}^{\infty} e^{-\rho t} u(c_{2t}) dt = \int_{t=0}^{\infty} e^{-\rho t} \left(\frac{c_{2t}^{1-\sigma} - 1}{1-\sigma} \right) dt \quad (8)$$

subject to

$$y_t = F(k_{2t}, g_t) = k_2 f\left(\frac{g}{k_{2t}}\right) = k_2 f\left(\frac{g}{k_{2t}}\right)^\alpha, \quad (9)$$

$$y_t = P_g g_t + r_{2t} k_{2t}, \quad (10)$$

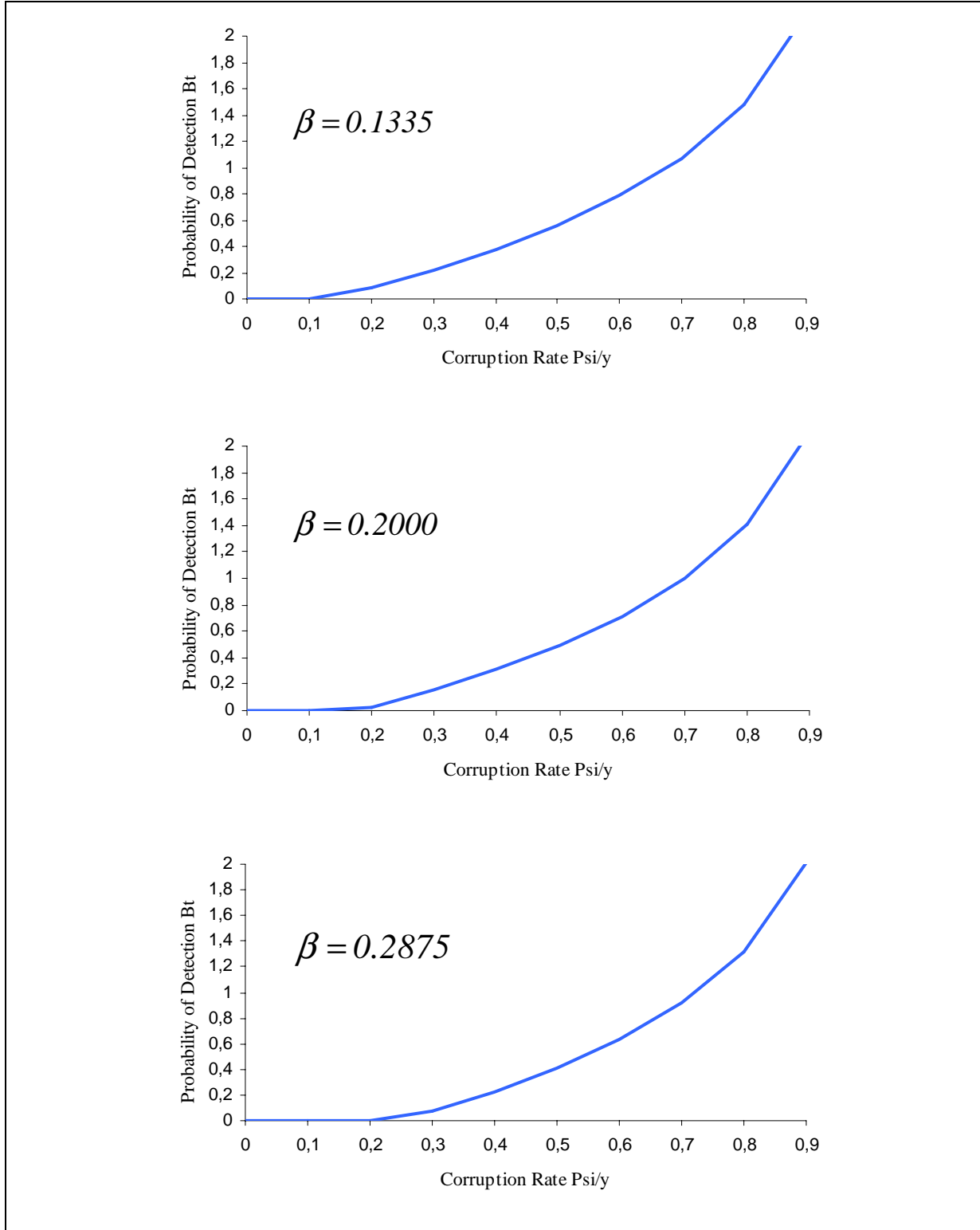
$$g_t = H(k_{1t}) = \nu h(k_{1t}) = \nu k_{1t}, \quad (11)$$

$$y_t - \psi_t = c_{2t} + s_{2t}, \quad (12)$$

$$\dot{k}_t = s_{1t} + s_{2t}, \quad (13)$$

$$k_t = k_{1t} + k_{2t}. \quad (14)$$

Figure 11: Different versions of the detection function for varying β -values



The variables of the equations (8) to (14) are defined according to the definitions given above.

At the beginning at $t=0$ there exists a certain amount of capital $k_{t=0}$. The public agent chooses the amount of $k_{It=0}$ needed to produce the public good g . As the public agent knows that the private agent needs the public good g for private good production y the public agent limits the amount of the public good $g_{t=0}$ available in order to raise the price of the public good. The public agent chooses $k_{It=0}$ such that his utility and ψ is maximized while he is restrained by the probability of detection. The private agent, on the other hand, accepts the amount of g_t available and pays the monopolistic price P_g . While the probability of detection limits the public agent to extract full monopoly rents in the long run, it is possible that in the balanced growth equilibrium some degree of rent income (i.e. corruption) is possible.

The balanced growth equilibrium is achieved if the public agent's growth rate of consumption

$$\gamma_1 = \frac{\dot{c}_{1t}}{c_{1t}} = \frac{I}{\sigma} [(r_{1t} - r_{2t}) - \rho] \quad (15)$$

is equal to the private agent's growth rate of consumption

$$\gamma_2 = \frac{\dot{c}_{2t}}{c_{2t}} = \frac{I}{\sigma} [f(1 - \alpha) - \rho] \quad (16)$$

The complete solution of the model can be found in Barreto (2000). The following section first replicates the basic results of Barreto (2000). Then in a second step the effects of a change in fiscal transparency are analyzed in more detail.

5 Simulation Results

The following table compares the model's outcomes in case of perfect competition (point A in figure 10) and the balanced growth equilibrium with endogenous corruption.

Tabelle 1: Basic results of Barreto's model for a β -value of 0.1335

	VARIABLES	Balanced growth with endogeneous corruption	Perfect competition in the production of g	% change from perfect competition
1	gamma=growth rate	0.026	0.031	-16.9%
2	k1=capital used in g	0.143	0.250	-42.9%
3	k2=capital used in y	0.857	0.750	14.3%
4	k=k1+k2=total capital	1.000	1.000	0.0%
5	v=inverse red tape coefficient	1.000	1.000	0.0%
6	y=total output	0.318	0.330	-3.9%
7	g=public good	0.143	0.250	-42.9%
8	psi=total corruption	0.040	0.000	#DIV/0!
9	y-psi=legitimate income	0.278	0.330	-15.9%
10	r1=marginal product of k1	0.556	0.330	68.2%
11	r2=marginal product of k2	0.278	0.330	-15.9%
12	Pg=r/v=price of g	0.556	0.330	68.2%
13	Pg*g/y=relative worth of g	0.250	0.250	0.0%
14	c1=consumption agent 1	0.036	0.000	#DIV/0!
15	c2=consumption agent 2	0.255	0.299	-14.7%
16	s1=savings agent 1	0.003	0.000	#DIV/0!
17	s2=savings agent 2	0.023	0.031	-27.3%
18	c1/psi=c2/(y-psi)=consumption rate	0.919	0.906	1.4%
19	s1/psi=s2/(y-psi)=saving rate	0.081	0.094	-13.6%
20	psi/y=corruption rate	0.125	0.000	#DIV/0!

The focus, however, of this paper is not to describe the outcomes of the Barreto model but to shed light on the effects in case of changes to the parameter β . The simulation exercise to be described in the following analyzes the effects of a change of the fiscal transparency parameter β on two core values, the equilibrium corruption rate $\frac{\psi_t}{y_t}$ and the equilibrium growth rate γ , respectively.

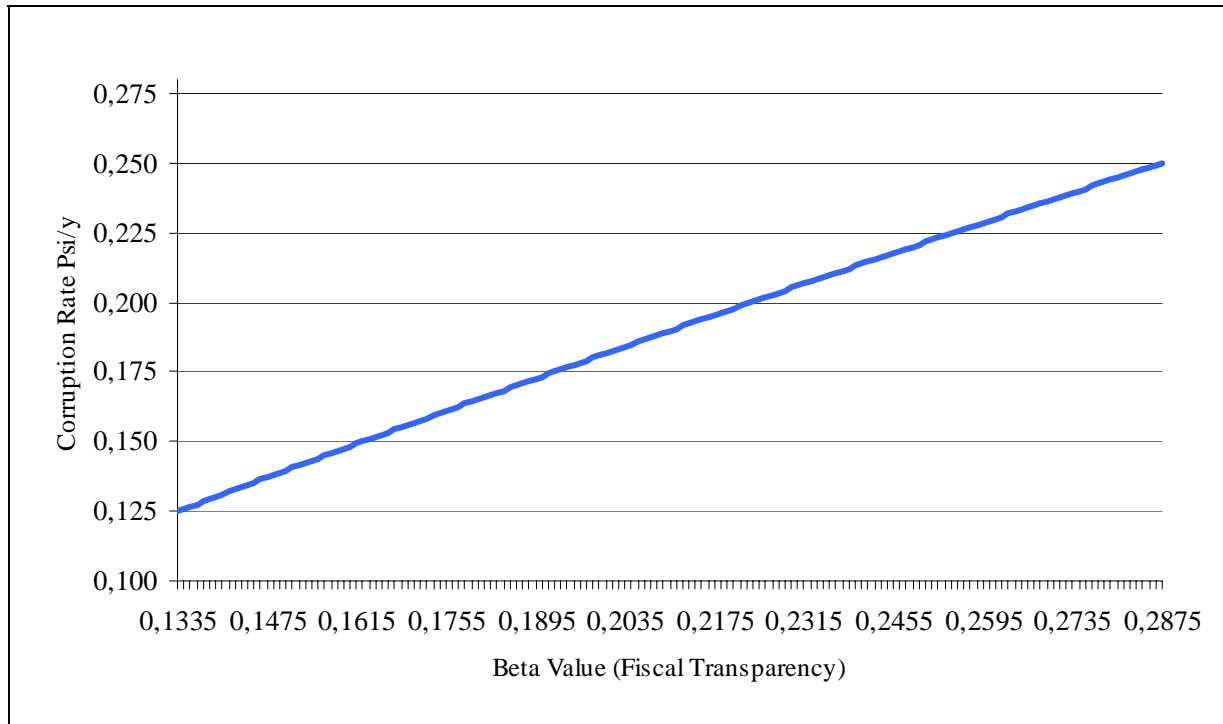
In the following simulation the β -value increased (equivalent to a decrease in fiscal transparency) from 0.1335 to 0.2875.

Figure 12 depicts the development of the corruption rate $\frac{\psi_t}{y_t}$ in the balanced growth equilibrium in case of an increase of the β -value. Starting with the corruption rate $\frac{\psi_t}{y_t}=0.125$ for an β -value of 0.1335 as an reference (see table 1, line 20) simulation of the model shows that for a decrease of fiscal transparency

(increase of the β -value) the equilibrium corruption rate doubles from

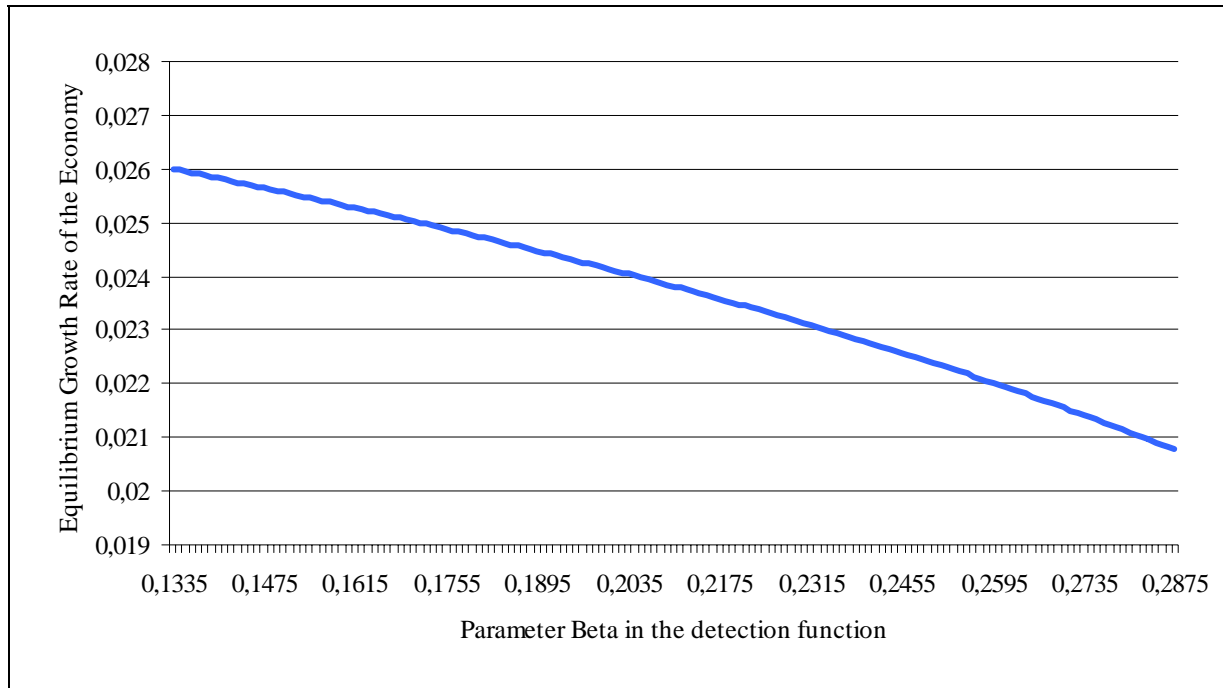
$$\frac{\psi_t}{y_t} = 0.125 \text{ to } \frac{\psi_t}{y_t} = 0.250.$$

Abbildung 12: Development of the equilibrium corruption rate in case of decreasing fiscal transparency (increase of the β -value)



Even without a theoretical model it is common sense that corruption leads to sub-optimal growth rates as it is always associated with some kind of resource misallocation. This assertion is being confirmed by the results of the simulation analysis. Figure 13 displays that the equilibrium growth rate γ declines from 0.026 to 0.0207 in case of an increase of the β -value from 0.1335 to 0.2875.

Abbildung 13: Development of the equilibrium growth rate in case of decreasing fiscal transparency (increase of the β -value)



If we compare the resulting equilibrium growth rate of $\gamma=0.026$ for a β -value of 0.1335 (see table 1, line 1) and $\gamma=0.0207$ for a β -value of 0.2875, respectively, with the growth rate of 0.031 under the perfect competition scenario, it becomes clear that a decrease in fiscal transparency substantially decreases the equilibrium growth rate of the economy.

This result suggests that there is a significant efficiency loss in case of intransparency, measured in terms of growth. However, the “clean economy” with no corruption might be an unrealistic benchmark, as there is some kind of corruption in every economy. In case of several market distortions the corrupt equilibrium might therefore be interpreted as a second best equilibrium.

6 Conclusions

This paper started with the task to provide some possible definitions of fiscal transparency found in the literature. As could be seen in the first section these definitions are quite heterogeneous and as a matter of fact they mostly refer to the topics related to corruption.

In section 3 some stylized facts showed that the level of fiscal transparency at least partly determines the risk to invest in a country as perceived by the financial markets (credit ratings), the level of FDI-inflows, the level of corruption, and the level of economic development. While the financial market transmission mechanism was not subject of this paper, the link between fiscal transparency and the level of corruption and the magnitude of economic growth, respectively, was modeled in a simple neoclassical framework of endogenous growth. Corruption was modeled here as the monopoly rents available for the public agent when he provides less of the public good at a higher price compared to the competitive equilibrium.

It could be shown that for lower transparency in the fiscal area (leading to a higher probability of corruption being detected), the total level of corruption measured as share of corruption to output $\frac{\psi_t}{y_t}$ decreases. In this context less transparent countries also face lower growth rates and vice versa. This main result can be seen as one further theoretical underpinning in favor of politics improving fiscal transparency. However, one central weakness of this paper is the fact that the level of transparency is only modelled exogenously. It will be important to endogenize the transparency parameter, e.g. to model the level of fiscal transparency explicitly as a polit-economic process. This view is shared by Ellis and Fender (2003, p.2) and their criticism of Barreto's model: "[T]here is an agent that represents the government, but this agent is constrained by the detection probabilities and punishments set by an agent that is not modelled." To endogenize the level of fiscal transparency is an important task for further research.

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