Corruption and Central Banks

Dissertation

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List of Variables and Abbreviations

Latin alphabet

BI	Bank Indonesia, the Indonesian central bank
BLBI	Indonesian acronym for “Bantuan Likuiditas Bank Indonesia”; name of a liquidity program that Bank Indonesia used to support failing banks during the Asian Current Account Crisis
BoJ	Bank of Japan, the Japanese central bank
C	Social costs
C_N^{Av}	Average labor costs of production
D	Discretionary; used to denote the discretionary equilibrium
EBRD	European Bank for Reconstruction and Development
g	Profit margin
G^r	Government expenditure, real
IBRA	English acronym for “Indonesian Bank Restructuring Agency”
IMF	International Monetary Fund
INFLATION	Average inflation rate of years 1994 through 2003
JB	Jarque-Bera statistic
K	Kurtosis
k	Describes the relationship between the liquidity demand of private agents and real national income Y^r

M	Monetary stock
MoF	Ministry of Finance
M1_GROWTH	Growth rate of money (M1)
N	Number of employed private agents
$\bar{N}$	Natural number of employed private agents
n	Describes the relationship between the target value of real national income $\hat{Y}^r$ and its natural level
p	Price level
R	Rules; used to denote the rules of equilibrium
S	Skewness
T	Trick; used to denote the trick or deception equilibrium
t	Denotes time in periods
SKB	Indonesian acronym for a set of rules under which one has to register claims for the government guarantee scheme
SBI	Indonesian acronym for “Sertifikates Bank Indonesia”; these are money market certificates that Bank Indonesia uses in the conduct of monetary policy
U	Number of unemployed private agents
$\bar{U}$	Natural number of unemployed private agents
w	Nominal wage or a shock variable, which has a normal distribution with a zero mean and a variance of σ_w^2
WB	World Bank
WEF	World Economic Forum

Y^r	National income, real
$\bar{Y}^r$	Natural level of real national income
$\hat{Y}^r$	Target value of real national income, is equal to n

Greek alphabet

α	Parameter in the Phillips-Curve; describes the relationship between unemployment and inflation
β'	Marginal and average productivity of labor
κ	Preference for additional corrupt income; corruptibility of the central banker
λ	Preference for high overall employment
π	Inflation rate
π^*	Expected inflation rate, average; inflation expectation
$\hat{\pi}$	Target value of the inflation rate
$\tilde{\pi}$	Average inflation rate
σ_w^2	Variance of the stochastic supply side shock

Zusammenfassung (German Summary)

Diese Arbeit widmet sich der Analyse korrupter Strukturen in Zentralbanken und deren Auswirkungen auf die Geldpolitik. Die wirtschaftswissenschaftliche Theorie unterstellt grundsätzlich in der Modellierung des Verhaltens von Zentralbanken, dass Zentralbanken sich in ihren Entscheidungen an dem wohlverstandenen Zielen der Gesellschaft orientieren. Im Rahmen dieser Modelle haben die Entscheidungen von Zentralbankern negative Folgen für die Gesellschaft, gerade weil die Entscheidungsträger versuchen, durch ihre Entscheidungen die Lage der Gesellschaft zu verbessern. Das wohlwollende Verhalten des Zentralbankers führt in diesen Modellen zu Wohlfahrtseinbußen der Gesellschaft.

Betrachtet man Zentralbankverhalten in der Realität, muss man erkennen, dass die Annahme eines benevolenten Verhaltens nicht immer gegeben sein muss. Fallstudien aus so unterschiedlichen Ländern wie Zaire (demokratisch Kongo), Indonesien, Brasilien und Japan werden im Rahmen dieser Arbeit präsentiert. Sie sollen darlegen, dass korruptes Verhalten in einer Zentralbank nicht nur denkbar ist, sondern auch tatsächliche Relevanz hat. Eine Fallstudie aus Indonesien bildet den Ausgangspunkt der Analyse.

Die Arbeit beginnt mit einer Beschreibung eines Skandals, der im Anschluss an die südostasiatische Finanzkrise Indonesien im Atem hielt. Bedingt durch Schließungen und Übernahmen von Banken durch die staatlichen Regulierungsbehörde mussten verschiedene Interbank-Geldmarktgeschäfte abgewickelt werden. Im Rahmen dieser Abwicklungen kam es zu einer Reihe von Unregelmäßigkeiten und Korruptionsfällen. Von diesen wird der „Bank Bali“- Fall vorgestellt. Basierend auf die Fallbeschreibung werden Umstände identifiziert, die der Korruption in diesem Fall der Bankenregulierung und Bankenkontrolle Vorschub geleistet haben.

Nach dieser ersten Annäherung an das Problem korrupter Transaktionen von Zentralbanker wird ein erstes Modell eines korrupten Zentralbankers entwickelt. Dieses Modell basiert auf der Modellierung

zeitinkonsistenten Verhaltens der Zentralbank. Eine nominale Rigidität des Geldlohnsatzes ermöglicht es der Zentralbank; temporär realwirtschaftliche Effekte durch Veränderung der Geldmengenwachstumsrate zu erreichen. In dieses Modell wird neben den traditionellen Zielen der Preisniveaustabilität und der Stabilisierung der Beschäftigung das Seigniorageaufkommen als zusätzliches Ziel berücksichtigt. Dieses Modell beschreibt auch eine Situation, in der die politische Führung eines Landes selbst die Rolle des Zentralbankers übernimmt und der Gouverneur der Bank lediglich die Aufgabe hat die beschlossene Politik zu implementieren. Diese Einmischung in die Entscheidungen der Zentralbank resultiert in einem zusätzlichen Inflationsbias.

Das zweite Modell untersucht, wie sich Verkäufe von Insiderinformationen durch Zentralbankangestellte auswirken. Der Modellrahmen ähnelt bis auf den korrupten Anreiz des Zentralbankers und den stochastischen Angebotsschocks dem ersten Modell. In diesem Modell ist sowohl eine prozyklische als auch eine antizyklische Reaktion des Zentralbankers auf die Angebotsschocks möglich. Wie er auf die Schocks reagiert hängt von der Präferenz des Zentralbankers für das Ziel der Preisniveaustabilität ab.

Eine empirische Studie bildet den Abschluss dieser Arbeit. Für eine große Stichprobe von 80 Ländern und eine kleinere von 23 Transformationsländern wird untersucht, inwieweit Korruption in Zentralbanken sich auf die durchschnittliche Inflationsrate auswirkt. Die empirischen Ergebnisse bestätigen teilweise die in dieser Arbeit entwickelten Modelle. Länder scheinen eine höhere durchschnittliche Inflationsrate aufzuweisen, wenn ihr Bankensystem korrupter ist. Das korrupte Bankensystem erlaubt es der Zentralbank eher im Rahmen ihrer Funktion der Bankenaufsicht und Bankenregulierung korrupte Nebeneinnahmen zu erlangen, indem sie die Geschäftsbanken zwingen (oder es ihnen ermöglichen), übermäßig Kredite zu vergeben. Diese erhöhte Kreditvergabe der Geschäftsbanken führt zu einer vermehrten Geldschöpfung und zu steigenden Inflationsraten. Dieses Ergebnis ist jedoch vorsichtig zu

interpretieren, da es – zumindest in der Analyse der großen Stichprobe – durch die Aufnahme zusätzlicher erklärender Variablen seinen Einfluss und seine Signifikanz verliert. Die Untersuchung für die kleinere Stichprobe von 23 Transformationsländern zeigt, dass auch hier ein vermehrtes Maß an Korruption innerhalb der Zentralbank mit höheren Inflationsraten in Verbindung steht.

I. Introduction: Why Study Corruption in Central Banks?

Central banks are viewed by the general public as reputable institutions, a perception bolstered by economic theory and modeling. By extension, central bankers are thought of as benevolent, as decent men and women attempting to maximize societal welfare through their decisions. Yet, cases of central bank corruption abound. *Corruption within the central bank?* This seems almost sacrilegious! However, consider, for example, the recent scandal involving the German Bundesbank's (now former) President Ernst Welteke.

A German commercial and investment bank, Dresdner Bank, invited Welteke to the prestigious Hotel Adlon in Berlin to celebrate the New Year and the establishment of the Euro as the single circulated currency in the Euro Area. Welteke not only accepted this invitation, but he enlarged it to include his wife, their young child, and Welteke's grownup son as a babysitter for the child, all staying at the Hotel Adlon at the expense of Dresdner Bank. As the scandal broke, Mr. Welteke excused this behavior by explaining that he always expects anybody inviting him on a business trip to cover expenses. However, it was soon discovered that Mr. Welteke might have accepted a benefit in money's worth, which might have influenced his dealings. This incident started a media investigation into Mr. Welteke's behavior. Several other lavish and suspicious invitations came to light. It was discovered, for instance, that the German carmaker BMW had invited (and paid for) Mr. Welteke to attend the Formula 1 car race in Monte Carlo in 2003. Perhaps not coincidentally, one of BMW's branches is a commercial bank that engages in the leasing and financing of cars. As a result of these discoveries, the Minister of Finance Eichel stated that for Mr. Welteke to stay in his current position would be unacceptable (Associated Press, April 16, 2004).

Mr. Welteke's acceptance of gifts and invitations from companies and banks that his government body is meant to supervise created possible future conflicts of interest, but due to the gray area of the law in regard to these matters, Mr. Welteke was not charged with corruption. Nor is Mr. Weltete's story unique. Consider the case of German Bundesbanker Erwin Blumenthal, who worked for some time in Zaire as the vice-governor of the

Banque du Zaire. Zaire needed to re-negotiate its foreign liabilities. Stabilization attempts prior to 1978 of the World Bank, the International Monetary Fund, and the Paris Club countries did not bear the expected results. The two Bretton Woods institutions decided to send their own experts to Zaire to take over key-positions in the central bank and the ministry of finance Callaghy (1984: 199-200). Blumenthal was sent to Zaire as a representative of the International Monetary Fund in 1979, where he discovered a case of extreme corruption. In Mobutu's Zaire there was no clear dividing line between the state budget and President Mobutu's personal property. Blumenthal was repeatedly forced to disburse funds from the central bank's currency reserves for the president's entirely private purposes. Another example is the former Peruvian President Fujimori who appears to have embezzled gold from the reserves of the Peruvian Central Bank, Casa de la Moneda, and transferred it to Japan. These two cases will serve as the starting point for the model of a corrupt central banker.

These cases are examples of "pure" corruption in central banks and are proof that such exists. However, there are other behaviors that are not so clear cut but are just as clearly closely related to corruption, for example, Mr. Welteke's case of taking advantage of invitations freely offered, behavior that is not criminal, but is certainly questionable. Only a few studies address corruption and similar, but not necessarily criminal, behavior of central bank employees and governors, even though corruption in the central bank is obviously possible. By the very nature of their position, central bankers possess a treasure trove of information. Knowledge of possible intervention prices in the foreign exchange market, future interest rates, or the details of new tender offers the central bank intends to make is very valuable information to investment bankers and commercial bankers. Knowing in advance what the central bank will decide enables these other bankers to place sure bets on officially "unexpected" moves of the central bank.

Furthermore, it is not only the information central bankers possess that makes them vulnerable to corruption. Klitgaard (1988) identifies conditions that favor corruption in any institution. He suggests that corruption is endemic and flourishes in institutions that are vested with a monopoly position, have the freedom to make discretionary decisions, and are subject to only weak

accountability. Central banks fulfill all three conditions: (1) central banks are usually the only institutions that provide their respective economies with high-powered money; (2) they have some discretionary freedom in the choice of instruments they use; and (3) even for the central banks that are perceived to be somewhat transparent, secrecy about their decisions and their inner structures abounds. In fact, central banks themselves are critical of this lack of transparency. The Federal Reserve Bank of St. Louis devoted a large part of its annual conference in 2001 to issues of central bank transparency (see Federal Reserve Bank St. Louis 2002). In a statement at this conference, Alan Greenspan stressed the need for transparency:

> *financial markets work more efficiently when their participants do not have to waste effort inferring the stance of monetary policy from diffuse signals* …" (Greenspan 2002: 5)

A higher degree of transparency in central bank dealings makes it easier to identify the bank's political stance and lowers information costs for players in the financial markets. Increased transparency also makes corrupt dealing within the central banker more difficult because there will be a better chance of the central banker being caught, and thus he or she will be less likely to engage in such behavior.

It is not the aim of this inquiry into corruption at central banks to stigmatize an institution that is generally held in well-merited regard. So, why study corruption in central banks at all? As the initial collection of cases and the analysis of Klitgaard (1988: 75) showed, there does exist the possibility that central bankers might become corruptible and engage in deals that surely will benefit themselves but not necessarily the society they are expected to serve. Therefore, the present analysis will conduct thought experiments in the form of theoretical models that are rooted in actual corruption cases at different central banks. These models are used to illustrate the effects a corruptible central banker has on monetary policy. The results from these thought experiments will be used to point out the adverse effects of corruption in a central bank. Two empirical investigations will

illustrate that there are indeed discernable effects of central bank corruption on monetary policy.

The analysis presented here consists of empirical and theoretical elements. The empirical analysis and the theoretical models are intertwined because the modeling takes actual corruption cases as a starting point. Chapter II. A Corruption Case in the Central Bank of Indonesia, is a case study of a corruption case. This case study provides details of the actual case and the surrounding conditions of the Indonesian economy that favored the corrupt deal.

After this empirical qualitative review of an actual case, the first model of a self-seeking and malicious central banker is given in Chapter III. Central Banks in a Corrupt Environment: How Corruption Drives Inflation. Chapter IV introduces a second model of a corrupt central banker, one who sells inside information.

Chapter V reports the results of empirical research. It has already been shown by previous empirical research that corruption in general seems to increase the inflation rate. My model of the corrupt central banker provides a new explanation of this effect. Formerly, it was the general conclusion that due to the bigger share of the underground economy in more corrupt societies, the state needs higher seigniorage revenue to generate the necessary income to cover government expenditure. These two theories, that is, that corruption leads to a higher rate of inflation and/or higher seigniorage, will be tested for a cross-section of 80 countries. Chapter VI concludes.

II. A Corruption Case in the Central Bank of Indonesia

II.1. Introduction

The illicit nature of corrupt deals limits research on corrupt behavior by central bankers to press accounts of corruption cases. However, the list of stories that can be obtained from traditional newspaper sources and, more recently, from the Internet is astonishingly long and covers a wide range of such cases. In this chapter, a case of central bank corruption in Indonesia will be illustrated of the basis of media reports and the results of audits.

Indonesia has been the setting for several high-profile corruption cases. These cases usually involved members of the Soeharto clan or persons with well-established ties to this family. Soeharto acted as Indonesia's president from 1968 to 1998. Despite the fact that Soeharto was removed from office in the aftermath of the "Asian Current Account Crisis," corruption continued. The crisis itself offered ample opportunity to engage in corrupt dealing. This chapter describes one such case in detail. This case was special because it involved several high-ranking members of Soeharto's Golkar Party and the Indonesian central bank, Bank Indonesia. As described below, it also came at a very sensitive time for Indonesia. The case is also a good one for analysis because it was well covered in the Indonesian and international media and because the auditing firm PriceWaterhouseCoopers conducted a forensic audit of the case in August/September 1999. Before presenting the actual case, a few details on the impact of the financial crisis and the pre-crisis state of the Indonesian commercial banking sector are given. These facts highlight the impact of the crisis and why this case dubbed the "Bank Bali Scandal" after the private bank that is at the core of the scandal can be viewed as representative of central bank corruption.

II.2. The Indonesian Situation: The Crisis Unfolds

The Bank Bali scandal and the BLBI[1] liquidity program graft occurred in 1998 after the resignation of Soeharto and his fifth "New Order" government. Both scandals are deeply rooted in the time of the Soeharto reign and must be

interpreted in relation to the Asian Current Account Crisis. As stated by a World Bank (2003) report on Indonesia, the commercial bank system of Indonesia and especially the state-owned commercial banks were an integral part of the New Order's rent-collection system. The credit portfolios of Indonesian state-owned commercial banks were full of questionable loans to cronies and members of the Soeharto clan. Before the 1988 deregulation of the Indonesian banking market, the common lending policy of the state-owned banks usually allowed for large commissions to be shared by the bank officials and others. Loans were often decided on by members of the Golkar Party, not by bankers. The bankers were given large commissions in exchange for going along with economically and legally unjustified loans.

The first blow to the state-owned commercial banks came in 1988 when Indonesia deregulated the banking system. This reform lowered the barriers of entry to the Indonesian commercial banking market and increased the number of private commercial banks from 63 in 1988 to 165 in 1997. Furthermore, it required only a very low threshold of US $6 million to set up a commercial bank. As a direct consequence, the market share of state-owned banks dropped considerably from 1988 to 1997 (World Bank 2003: 60). A further contributing factor to the weakening of the Indonesian commercial banks was the way the newly founded private commercial banks went about making loans. These new private commercial banks typically had granted large-volume loans to their owners and politically important persons. Bank Indonesia, was not allowed to exercise any independent control over the decisions and supervision of the banking sector. Instead, the Indonesian Ministry of Finance played an active role in the management and the regulation of the state-owned banks and private commercial banks.[2] Before the crisis broke in 1997, the private banks sought protection from the Bank Indonesia and the Ministry of Finance by maintaining close connections to politically important persons, and one obvious way to ensure these intimate

[1] BLBI stands for Bantuan Likuiditas Bank Indonesia. This program supplied liquidity support to Indonesian banks during the Current Account Crisis.

[2] Bank Indonesia was only granted political independence from the Ministry of Finance through a presidential decree in February 1998 as part of the reforms the International Monetary Fund imposed on Indonesia (see International Monetary Fund, June 24 1998: Appendix).

ties was by providing these politically important persons with favors, such as loans.

> *Banks tended to grant credit without due regard to the purpose of the loan, or the borrower's viability and capacity to generate the cash flow, particularly since the borrower was often either politically important or related to the owner of the bank.* (World Bank 2003: 60)

As a consequence, the banking sector was burdened with bad loans. The weak exposure regulations and almost nonexistent capital requirements resulted in the Indonesian commercial banks standing on a very fragile foundation.

> *These distortions led to a growing share of non-performing loans on the banks' balance sheets* … (World Bank 2003: 60)

The Asian Current Account Crisis provided the Indonesian banking sector with several problems. The Asian Current Account Crisis started in July 1997. Within three months it developed into a worldwide threat to economic stability. For the most part, the crisis caught the countries in the region unaware. Pre-crisis, the countries had enjoyed an unprecedented economic success. Southeast Asia experienced a steady inflow of foreign capital. It was confidently believed that the Asian countries were immune to the sort of economic collapse that had occurred three years earlier in Mexico—the "tequila" crisis. However, in 1997 there was a reassessment of the risk associated with investments in these countries. Among analysts the notion started to spread that the "Asian Miracle" might be oversold and they began to question the soundness of the Asian model economies. This new speculation on the actual shape of economies such as Malaysia and South Korea resulted in a reversal of capital flows to these and other previously "miracle" economies. For the year 1997, the International Financial Statistics of the IMF reported a foreign direct investment worth US $4.7 billion for Indonesia. In 1998, there was an *outflow* of US $2.4 billion from the

Indonesian economy, a development that fundamentally changed the foreign exchange market.

The first country to consider a new foreign exchange regime was Malaysia. The Ringgit became pressured to devaluate as the demand for foreign currencies in Malaysia increased. The Malaysian central bank, Bank Negara Malaysia, used 12% of its foreign exchange reserves in order to maintain the Ringgit's fixed peg to the U.S. dollar, but on July 2, 1997 it caved in and floated the Ringgit. The Filipino central bank faced a similar situation a few days later. It quickly decided to float the national currency. The very same day, July 11, 1997, the Indonesian central bank, Bank Indonesia, widened the exchange rate band from 8% to 12% (see Stern 2004: 2).

Prior to the crisis, when the exchange rate band was widened, private agents reacted by increasing the inflow of capital into Indonesia and thus the Rupiah gained in value. This time the reaction was the contrary: the Rupiah weakened in value against the U.S. dollar (see Stern 2004: 2). This was an indication of the problems Indonesia was facing. Before the Asian Current Account Crisis, Bank Indonesia had achieved quite a reputation for being able to keep the exchange rate of the Rupiah against the dollar at the target level and there had been a longstanding commitment to a crawling peg. Now, however, along with the increasing exchange rate band, Bank Indonesia intervened on the foreign exchange market and sold US $1.5 billion on the spot and forward markets. These interventions did not help. By August 13, the Rupiah was trading against the top of the intervention band.

This relatively high exchange rate against the U.S. dollar led to severe problems for Indonesian companies. During Bank Indonesia's period of very successful exchange rate stabilization, they had incurred a large degree of foreign denominated debt. These loans were used to expand their business in Indonesia. Thus, the return on these investments was mainly paid in Rupiah, which needed to be exchanged into U.S. dollars. Now, however, the companies realized that the exchange rate was not in their favor and they thus sought to cover their positions and acquire U.S. dollars, which, of course, simply exacerbated the devaluation trend. The situation culminated in Bank Indonesia abandoning its longstanding commitment to the crawling peg on

August 14, 1997. On that day, the Indonesian foreign exchange market opened with the Rupiah at 2650 Rp./US$; it closed at 2800 Rp./US$. Devaluation continued to gather momentum and on August 19 the Rupiah traded at 3000 Rp/US$, regarded as the crossing of an important threshold. In reaction, Bank Indonesia tightened the liquidity supply considerably. As a result there was a general increase in the interest rates. The Sertifikates Bank Indonesia (SBI)[3] one-month rate rose from 12% to 30%. Furthermore, the state-owned enterprises were obliged to withdraw their deposits from commercial banks and deposit them with the central bank (Stern 2004: 4). This led to a further liquidity contraction in the commercial bank sector. The increased drain of liquidity from the banks increased the interest rates and contributed to the stabilization of the Rupiah.

The high interest rates and the restricted liquidity situation in the commercial bank sector began to take its toll on the entire Indonesian economy. Although the Rupiah regained a portion of its former value and dropped to 2700 Rp/US$, there was increasing pressure on the government to reverse the monetary policy. This pressure originated in part from weaker banks because by the end of August a number of commercial banks were not able to meet the required 5% reserve minimum. As more companies defaulted on their national and international debt, rumors began to circulate about the soundness of private banks. By September 1997 the Bank Danamon and the Bank Dagang Nasional Indonesia (BDNI), two of the largest private commercial banks in Indonesia, had 50% of their U.S. dollar denominated deposits withdrawn by their customers (Stern 2004: 8). This problem prompted Bank Indonesia to accommodate the failing banks' liquidity problem with the help of the BLBI program.

These events were followed by a chaotic period of contradictory policy decisions and announcements. In September, Bank Indonesia reversed its policy stance. Instead of restricting the liquidity of the banking sector and driving interest rates up, the central bank gave in to pressure from the failing banking sector and injected new liquidity into the market. Additionally, the country's international reputation suffered several setbacks. First, the Indonesian government declared that it was terminating several economically

[3] The Sertifikates Bank Indonesia is a money market certificate offered by Bank Indonesia. It

questionable infrastructure projects, a position that was designed to generate confidence in Indonesia's ability to take the necessary policy measures to cope with the situation at hand. However, any confidence thus gained was shattered the same month when President Soeharto announced that several of his pet projects would be continued. International analysts interpreted this as a further sign of indecisiveness on the part of the Indonesian government and as a sign of the influence enjoyed by private banks. These events led to a further loss in confidence in the Indonesian currency. The Rupiah quickly depreciated by a higher margin than any other currency affected by the crisis.

This alarming new development led to a request for international assistance and at the beginning of November 1997 two lines of assistance were prepared for Indonesia. The first assistance package, valued at US $23 billion, was pledged by the International Monetary Fund (IMF), the World Bank (WB), and the Asian Development Bank (ADB). The second line of assistance was granted by the United States, Japan, Malaysia, Australia, and Singapore. The amount of this package was never disclosed and is still unknown but it is widely believed that it was worth some US $15 billion (Stern 2004: 6).[4] This assistance from the IMF and the other international donors did not come without conditions. Among other things, the IMF ordered Indonesia to:

- achieve a public sector surplus of 1% of GDP,
- change its policy of administered prices for electricity and oil and of numerous monopolies,
- close 16 banks as a first step,
- commit to closing additional banks in the future and to merge state-owned banks, and
- improve regulation of the financial sector (Stern 2004: 24).

is one of the tools Bank Indonesia used in its conduct of monetary policy.

[4] A document from the U.S. embassy in Jakarta does not provide details on the amounts pledged in the secondary package by the United States, Japan, Singapore, Malaysia, and Australia. It does specify that the IMF contribution to the first package was a stand-by loan of US $10 billion, while the World Bank and the Asian Development Bank contributed US $4.5 billion and US $3.5 billion, respectively. See United States Embassy, Jakarta (2001).

The IMF-administered closing of 16 banks has often been cited as one pivotal reason for the emergence of a bank run. This argument overlooks the fact that Indonesian depositors were already withdrawing their funds from private banks and either exchanging them for U.S. dollars or transferring them to state-owned banks. This process had started even before conclusion of negotiations for the IMF emergency package. The depositors suspected continued instability of the private banks. The Rupiah continued to slide downward in value. Before Christmas 1997, Sjahril Sabirin, who was at World Bank, Washington, returned to Jakarta to become the managing director of Bank Indonesia, a position bestowed on him by President Soeharto. On February 17, 1998, Sabirin officially replaced the previous governor of Bank Indonesia, Mr. Sudradjad Djiwandono (Asia Times, February 21, 2003).

II.3. The Bank Bali Matter

The aftermath of the Asian Current Account Crisis for Indonesia was bad enough, but the financial sector's ensuing stabilization and restructuring attempts were smeared by several high-profile scandals involving the embezzlement of state money meant to stabilize the failing commercial banking sector. The first corruption scandal of this period to become public and that involved Bank Indonesia's prudential supervision function was the Bank Bali scandal in 1999. The scandal concerned irregularities in the reimbursement of interbank claims in the wake of the Asian financial crisis. Implicated in the scandal were President Habibie's election campaign team (*Tim Sukses*) and highly placed Indonesian state institutions, including among others the Indonesian central bank and the newly founded Indonesian Bank Restructuring Agency (IBRA).

II.3.1. How the Scandal Broke and its Political Reverberations

The "Bali-Gate" scandal became public in July 1999. The whistleblower was an independent management consultant and banking law expert, Mr. Pradjoto,[5] who was linked to the opposition party of Mrs. Megawatti. Mr. Pradjoto learned about the scandal in a dramatic fashion. In the early morning hours of July 8, 1999, an anonymous person delivered a package to

[5] Like many Indonesians Mr. Pradjoto only uses a single name.

Mr. Pradjoto's office. Documents in the package described in detail a "Cessie" agreement between the management of Bank Bali and two private companies, PT Era Giat Prima and PT Persada Harum Lestari. Cessie agreements are a type of Dutch contract common in Indonesia, in which the title to a claim is transferred by way of an assignment (Cessie). The debtor must be notified of the ceding and must register the claim on its books.

In this agreement, Bank Bali agreed to cede certain claims on other banks that had been taken over by the government to Era Giat Prima and Persada Harum Lestari in return for a 60% discount on the value of the outstanding debt (Wall Street Journal, September 21, 1999). What is puzzling about this deal is that the Indonesian government, under its former president Soeharto, had issued a guarantee scheme in January 1998. This guarantee promised that

> *all the obligations for repayment by commercial depositor's banks to their debtors and creditors will be met.* …. (Republic of Indonesia 1998a)

The decree further stipulated that the guarantee could be invoked for all commercial banks established under Indonesian law (Article 2.1) and stated that the guarantee is valid regardless of whether the obligations are denominated in Indonesian or international currency units (Article 2.2). The repayment of foreign denominated liabilities would be made in Rupiah on the basis of the market exchange rate on the date of payment (Article 2.3). In a second decree (Republic of Indonesia 1998b), Soeharto ordered the formation of a new government body, the Indonesian Bank Restructuring Agency (IBRA).

This new body had two tasks. First, it was to help recapitalize Indonesian commercial banks. Second, it was to settle all outstanding interbank claims. To accomplish these objectives, the IBRA was given the power to seize control of commercial banks and close them. On March 6, 1998, further details of the claim submission procedure were published. This document, which was jointly drafted by IBRA and Bank Indonesia, became known as the "March 1998 SKB." However, the rules and regulations

applicable to the settlement of claims under the government guarantee scheme, as set forth in the March 1998 SKB, were at times inconsistent with Ministry of Finance regulations. For example, the SKB rules stated that the *debtor* must file the claim with IBRA, whereas the Ministry of Finance regulations ordered the *creditor* of a claim to lodge an appeal. Another example of this inconsistency involves claim-filing deadlines. To be valid, the SKB rules require a claim to be filed with IBRA within a three-day period prior to the maturity date of the obligation; Ministry of Finance regulations, on the other hand, say nothing specific about deadlines (PriceWaterhouseCoopers 1999: 41 – 43). These inconsistencies had important and devastating consequences.

With this background in mind, it should now be obvious that due to the government guarantee scheme, Bank Bali did not need to worry about reclaiming debt from commercial banks that the government had closed in the wake of the Current Account Crisis—those obligations were guaranteed to be paid. Yet, Bank Bali made a deal under which it would receive only 60% of the debt owed to it. Why? Consider the two private companies involved in the deal: PT Era Giat Prima and PT Persada Harum Lestari, each owned by businessmen who were well connected to then President Habibie and, as it turns out, well connected with each other, too. Era Giat Prima was owned by Mr. Setya Novanto, Secretary Treasurer of the ruling Golkar Party (Asia Times, August 12, 1999). PT Persada Harum Lestari was partially owned by Mr. Djoko Tjandra, who also served as its president (PriceWaterhouseCoopers 1999, Flow of Funds Analysis) and was Mr. Novanto partner in Era Giat Prima (Asia Times, January 16, 2004). Investigations into the scandal by the auditors of PriceWaterhouseCoopers in August/September 1999 soon revealed that a portion of the funds from the so-called fee or commission ended up in the reelection campaign coffers of President Habibie.

The Bali-Gate scandal could not have come at a worse time for the Indonesian economy. The accounting discrepancies were discovered in a due diligence audit of Bank Bali by Standard Chartered Bank. The London-based Standard Chartered Bank was assessing a possible takeover of 20% of Bank Bali's stocks, an event that, should it occur, was viewed as an

important step in Indonesia's recovery from the crisis. Standard Chartered pulled out of the proposed deal because of the scandal and the campaign launched against Bank Bali by the Indonesian media (BBC December 16, 1999). Moreover, on May 14, 1999, the government of Indonesia had signed a new letter of intent with the International Monetary Fund, spelling out the policy measures Indonesia would have to implement to receive continued assistance from the IMF. Indonesia's settlement of interbank claims was one of the IMF's top priorities, and in the letter of intent, Jakarta promised that all interbank claims would be settled by May 28 (PriceWaterhouseCoopers 1999: 63).

The current election campaign, the need for further international assistance post-crisis, and the Bali-Gate scandal all subjected Indonesia to international scrutiny. International lenders pressured the Indonesian government for an independent audit of the case. Hubert Neiss, IMF Director for Asia Pacific, stated:

> "*An unsatisfactory solution* [to Bank Bali] *would be a disaster scenario."* (Asiaweek, September 3, 1999a)

To apply pressure on the Indonesian Government

> *… the IMF had privately threatened to stop its loan program*. (Asiaweek, September 3, 1999a)

In mid-August 1999, Bank Indonesia responded to the controversy by freezing accounts identified as linked to the scandal. IBRA hired PriceWaterhouseCoopers for an independent audit and senior Golkar Party leader A. A. Baramuli announced that:

> *the money will be returned to the bank "as a gesture of good faith" by Messrs Novanto and Tjandra.* (Express India, August, 17 1999)

Bali-Gate did not die an easy death: it dragged its way through the courts and tainted Indonesian politics. The parties involved soon started

“stabbing each other in the back” and publicly discrediting each other. Rudy Ramli, president of Bank Bali, wrote a letter to the opposition leader Mrs. Megawatti in which he implicated key Golkar Party members in the scandal. President Habibie’s reelection team (*Tim Sukses*) retaliated by allegedly forging a statement from Mr. Ramli. This statement claimed that Ramli had been abducted by an unnamed member of the opposition party and forced to provide details of the scandal. Strangely enough, the statement was signed “Rudi” instead of “Rudy,” which is the correct spelling of Mr. Ramli’s first name (Scoop, September 24, 1999).

The aftermath of the scandal in the courts led to the acquittal of Tjandra and Novanto, and the conviction, in March 2002, of one key player, Bank Indonesia Governor S. Sabirin, which was overturned later that year in a second trial (BBC, April 4, 2003). Even though it was overturned, this conviction implies that Bank Indonesia had a key role in the scandal and I will explain the central bank’s role in detail below, relying on the report of the PriceWaterhouseCoopers auditors.

II.3.2. The Problems of Bank Bali

Bank Bali began to feel the impact of the crisis in 1997 and 1998. It was having difficulty meeting the running requirements mandated by Bank Indonesia and IBRA. The bank, and especially Rudy Ramli, whose family controlled the bank at that time, was desperate to recover interbank claims. To secure the survival of the bank, Ramli needed US $320 million, or at least 20% of this amount, by July 22, 1999 in order to qualify for a bailout. If Ramli was unable to meet this requirement, IBRA would seize control of his bank (Asiaweek, September 3, 1999b).

Bank Bali had several claims on certain other banks that IBRA had taken over and subsequently closed down or merged with other banks. The details of these claims are set out in Table II.1.

Table II.1: Claims of Bank Bali Against Failed Banks in 1998

Parties	Date of Agreement	Date of Maturity	Value of the Deal
	01.12.1997	**03.03.1998**	**US $20 Mil.**
Bank Bali and Bank	10.12.1997	12.03.1998	US $10 Mil.
Dagang Nasional	**11.12.1997**	**16.03.1998**	**US $15 Mil.**
Indonesia	03.12.1997	05.06.1998	US $40 Mil.
	10.12.1997	**12.06.1998**	**US $5 Mil.**
Bank Bali and Bank Tiara	**22.12.1997**	**04.03.1998**	**US $10 Mil.**

Source: PriceWaterhouseCoopers (1999: 43).

Recouping this money or at least part of it would help secure the bank for Ramli and his family. However, due to mistakes made by Bank Bali's debtors, none of these claims were eligible for the government guarantee scheme. How this happened has to do with the inconsistencies, mentioned above, between the SKB rules and the Ministry of Finance regulations.

Bank Bali notified IBRA of the interbank claims. However, because IBRA and Bank Indonesia applied the SKB rules, which require the *debtor* to register the claims, Bank Bali's notification did not constitute a proper registration of the claims. And, unfortunately, the debtor banks failed to comply with the rules and did not register the claims either. However, even if the claims had been registered by the proper party, the claim-filing time limit was not met. The SKB rules specify that registration must be accomplished within a three-day period prior to the maturity date of the obligation. Bank Bali' debtors never made the filing deadline for their interbank liabilities to Bank Bali. As one example, Bank Bali had a swap agreement with Bank Dagang Nasional Indonesia that was set to mature on March 12, 1998. On March 16, Bank Dagang Nasional Indonesia informed IBRA in a letter that it would default on the payment to Bank Bali (PriceWaterhouseCoopers 1999: 43–44). In this case, even though Bank Dagang Nasional Indonesia *was* the proper party to file the claim, due to its late filing, Bank Bali was not eligible for the government guarantee scheme. In short, all the interbank claims of Bank Bali, as detailed in Table II.1, failed to qualify for the government

guarantee because they were either too late or filed by the wrong party. And because Bank Dagang Nasional Indonesia and the other debtors, PT Bank Tiara and PT Bank Umum Nasional, were in bad financial shape, there was no hope that Rudy Ramli and Bank Bali could recoup the necessary funds.

Further complicating the process for lodging a claim under the guarantee scheme was the divided nature of responsibility between IBRA and Bank Indonesia. IBRA had begun its existence with a tremendous workload and thus the responsibilities and duties in administering the government guarantee scheme were shared between Bank Indonesia and IBRA. IBRA had the final decision on the reimbursement of claims, but Bank Indonesia had responsibility for registering and verifying the claims. This verification could be performed offsite, in which case the Banking Regulation and Development Division of Bank Indonesia would check the claims and the supporting documentation submitted by the claimants. Onsite verification was also possible. A team from Bank Indonesia would visit both the creditor bank and the debtor bank and check the claims for validity. This shared responsibility of IBRA and Bank Indonesia made monitoring and enforcing the government guarantee scheme problematic.

> *Interviews with senior staff from both* [the Indonesian Bank Restructuring Agency] *and* [Bank Indonesia] *highlight the lack of clear distinction which entity was ultimately responsible for authorizing the claims under the* [government guarantee scheme] …. (PriceWaterhouseCoopers 1999: 46)

This situation was ripe for corruption and fraud. Both institutions refused to take credit for decisions. IBRA referred to the necessity of verification from Bank Indonesia. Bank Indonesia stressed that only IBRA had the power to make a reimbursement decision and that its verification function was a mere technicality. The closure of several banks and IBRA's concentration on bank recapitalization produced a large backlog of unprocessed interbank claims (PriceWaterhouseCoopers 1999: 46-7).

In October 1998, Bank Indonesia notified Bank Bali and Bank Dagang that the claims filed by them under the guarantee scheme would not be

processed. This was only one of such notifications Bank Bali received that month. On October 21, Bank Bali wrote a letter to the IBRA chairman, Glenn Yusuf, and asked for help in the recouping its interbank claims. Bank Bali also sent several letters to Bank Indonesia, complaining about the decision not to process the claims. Bank Indonesia and IBRA did not respond. On October 28, in yet another attempt to resolve the issue, two senior staff members of Bank Bali made an unscheduled visit to Bank Indonesia. During this impromptu meeting, the central bank informed Bank Bali that it was not eligible under the guarantee scheme because of administrative problems arising from actions, or failures to act, by the debtor banks (PriceWaterhouseCoopers 1999: 51).

II.3.3. The Bank Bali Deal

Bank Bali's situation seemed to take a turn for the better, as will be explained below, with the advent of Mr. Pande Lubis as a second chairman of IBRA. Minister of Finance Bambang Subianto offered Mr. Lubis the position in October 1998 and Mr. Lubis began work in December 1998. The relationship between Pande Lubis and the other chairman, Mr. Glenn Yusuf, was tense. Yusuf had not been asked for his opinion on hiring Mr. Lubis and had not been permitted to interview him. In an interview with the PriceWaterhouseCoopers auditors, Mr. Pradjoto, the Bali-Gate whistleblower, alleged that Pande Lubis was a close friend of A. A. Baramuli, a chairman of the Supreme Advisory Council,[6] and that Baramuli tried to have Lubis replace Mr. Yusuf (see PriceWaterhouseCoopers 1999: 53).

On January 11, 1999, Mr. Ramli signed the now infamous Cessie agreements with Mr. Setya Novanto from Era Giat Prima and with the company Persada Harum Lestari. The claims on Bank Dagang Nasional Indonesia and Bank Umum Nasional, totaling 798 billion Rupiah, were swapped by Era Giat Prima for valuable securities worth 798 billion. From this amount the commission for the brokers was to be deducted. Persada Harum Lestari took over the 38 billion Rupiah claims on Bank Tiara under the same conditions. As is mandatory in these Cessie deals, the debtors were

[6] The Supreme Advisory council is comprised of 45 members, who are appointed by the president of Indonesia. Its task is to respond to any questions from the president concerning affairs of state.

informed of the swap agreement concerning their debt. Because it received legal advice that the deal was illegal, Bank Tiara refused to accept the assignment of its debt to Persada Harum Lestari.

> *The* [Persada Harum Lestari] *agreement was explicitly rejected by* [Bank Tiara]*, who apparently obtained legal advice that it was invalid. …* (PriceWaterhouseCoopers 1999: 55)

After the deal and details on the "commission" became public, Mr. Setya Novanto is cited in a newspaper report as claiming that the fee was indeed normal and saying:

> *Such things happen all the time in Indonesia* …. (Wall Street Journal, September 21, 1999)

If his money problems and those of his bank were so acute, why would Mr. Rudy Ramli engage in a deal to recoup interbank claims that were guaranteed by the Indonesian government? And furthermore, why would he agree to a 60% discount on the value of the claims, especially since Era Giat Prima did not make any payment in the swap agreement to take over the interbank claims (PriceWaterhouseCoopers 1999: 55)? Era Giat Prima took over the debt titles from Bank Bali but nether fulfilled its part of the swap agreement. For the time being, Bank Bali seemed to be in a very desperate position, because it held interbank claims that were eligible for repayment under the Government Guarantee Scheme if only the rules of the filing process had been adhered by the debtor banks, which are now controlled by IBRA.

February 1999 saw a reversal of attitude toward Bank Bali's claims, thanks to the active involvement of Mr. Pande Lubis, now second chairman of IBRA. Remember that up to this point, Bank Bali was unable to recoup its claims under the guarantee scheme because of errors made in the registration process by Bank Bali's debtors. At the beginning of February, Mr. Dragono Lisan of Bank Indonesia's Regulation and Banking Development

Division, the division responsible for both onsite and offsite verification of claims, met with officials from Bank Bali and again informed that due to administrative problems Bank Bali's claims were not qualified for reimbursement. However, later that month, Mr. Lubis saw to it that all files related to Bank Bali's claims were entrusted to him (PriceWaterhouseCoopers 1999: 31).

Media reports and the PriceWaterhouseCoopers report suggest that a secret meeting took place in Jakarta's Mulia Hotel (PriceWaterhouseCoopers 1999: 30). According to Bank Bali Vice President Mr. Soetjahja, the meeting was attended by Bank Bali's director Rudy Ramli, Mr. Setya Novanto (deputy treasurer of the Golkar Party and owner of Era Giat Prima), Mr. A. A. Baramuli (chairman of the Supreme Advisory Council), Mr. Tanri Abeng (Minister of Privatization of State Enterprises), Mr. Syrahil Sabirin (Governor of Bank Indonesia), and Mr. Pande Lubis (chairman of IBRA). Pande Lubis and Governor Sabirin denied taking part in the meeting. All denied Soetjahja's testimony (Tempo Online Magazine, June 11, 2000).

On February 12, Bank Bali again wrote to Pande Lubis to ask for help in settling its outstanding interbank claims with Bank Dagang Nasional Indonesia, Bank Tiara, and Bank Umum Nasional. On February 14, Mr. Lubis arranged a meeting between IBRA, Bank Indonesia, and Bank Bali to again discuss a possible settlement of the interbank claims. Mr. Lubis insisted that Mr. Lisan and his team attend this meeting. Mr. Lisan reemphasized that Bank Indonesia did not see any reason to change its stand on these claims, stressing that under the rules set out by the March 1998 SKB, the claims were not eligible for the government guarantee scheme. However, Lubis continued to lobby Bank Indonesia for a settlement of Bank Bali's claims in the meeting, but to no avail. Lubis then wrote a letter to Bank Indonesia requesting an "onsite" verification of Bank Bali's claims. Bank Indonesia performed the onsite verification reluctantly, only because IBRA—or, more precisely, Mr. Lubis—had made the request (PriceWaterhouseCoopers 1999: 58–59). The onsite verification took place at Bank Bali on February 19. The examination revealed that the deals between Bank Bali and Bank Dagang Nasional Indonesia and Bank Tiara were valid and genuine, common banking transactions and — in principle — eligible under the government

guarantee scheme (PriceWaterhouseCoopers 1999: 59 – 60). The transactions between Bank Bali and Bank Umum Nasional, however, did not fulfill the requirements of the scheme and were not eligible. These results were confirmed by onsite checks at the debtor banks, which were begun on March 4, 1999.

From March 1999 on, Mr. Ramli tried to get out of the Cessie agreements. On March 9, he approached Mr. Edwards, managing director of the World Bank's program for banking sector reform (see World Bank, August 20, 1999). Mr. Ramli asked Mr. Edwards to block the release of Bank Bali's claims, which he ceded to Era Giat Prima. One can only speculate about Mr. Ramli's motivation. His request for Mr. Edwards to try to block the release probably stems from two reasons: (1) so far Era Giat Prima did not fulfill its part of the swap agreement, and (2) the results from the onsite verification showed that in principle the claims are eligible under the Government Guarantee Scheme. Ramli possibly wanted to use Bank Indonesia's onsite verification of at least some of the claims as leverage to renegotiate his deals with the swap partners. Edwards asked Ramli whether he had been approached by third parties offering to help with the interbank claims and Mr. Ramli responded in the affirmative. Neither the identity of the third party nor the size of the fee for the help was discussed by Edwards and Ramli (World Bank, August 20, 1999). The PriceWaterhouseCoopers auditors' investigation uncovered other similar Cessie agreements (PriceWaterhouseCoopers 1999: 14).

After hearing from the central bank that most of Bank Bali's claims were verified and appeared to be substantial, Lubis instructed the Bank Liability Division of IBRA to process Bank Bali's claims on March 24, 1999 (see PriceWaterhouseCoopers 1999: 33). The order was given to the head of the division, Mr. Sunyoto. Lubis told his staff he wanted to use the Bank Bali case as an illustration of the loopholes in the SKB rules (PriceWaterhouseCoopers 1999: 61). Lubis pressed for a fast two-day verification of the Bank Dagang Nasional Indonesia claims. As a result of this verification, the Bank Liability Division of IBRA circulated an internal memorandum, hand drafted by Pande Lubis, reaffirming the eligibility of the Bank Bali claims and recommending reimbursement, excluding past due

interest. The memorandum suggested two possible ways of settling Bank Bali's claims: (1) a new set of SKB rules, closing the loopholes through which Bank Bali had slipped, could be drafted and issued jointly by IBRA and Bank Indonesia; or (2) an exception letter could be applied for from the Minister of Finance, Bambang Subianto. The memorandum favored the second solution. The draft memorandum was given to a subordinate in the division to prepare in final form.

However, Bank Liabilities staff did not appreciate Pande Lubis's interference and wrote their own recommendations in the memorandum. Lubis was not fooled so easily though, and he reworked the Bank Liabilities staff memorandum, changing two key recommendations:

1. He stated that reimbursement approval did not necessarily have to be at the minister level; and that
2. Bank Bali should also receive past due interest (PriceWaterhouseCoopers 1999: 62).

This memo was forwarded to Glenn Yusuf and finally approved on April 16, 1999. Previous to this, on March 29, Era Giat Prima issued a power of attorney to Bank Bali to collect debt from Bank Dagang Nasional Indonesia. On April 22, IBRA sent a note to the Ministry of Finance requesting a power of attorney so as to settle Bank Bali's interbank claims.

Bank Bali's Rudy Ramli still tried to renegotiate the swap agreement or try to cancel it. On May 25, to this end he met with an official from the Ministry of Finance, Mr. Manimaren, a meeting that was arranged by Bambang Subianto. Mr. Manimaren later claimed to have no memory of what the meeting was about. On May 26, Ramli and Djoko Tjandra met with Minister Manimaren at his house. The minister, during an interview with the PriceWaterhouseCoopers auditors, was also unable to remember any details of this meeting except that he was assured by the others that every thing was OK. Previous to the meeting at the minister's home, there were, allegedly, two other meetings.[7] The first one, which allegedly occurred at 12:30 p.m., was between Mr. Ramli, Mr. Manimaren, and Mr. Siregar, a Golkar Party

member, during which Mr. Manimaren informed Rudy Ramli that President Habibie needed only 300 billion Rupiah (PriceWaterhouseCoopers 1999: 35). At this meeting Ramli did not succeed in canceling the Cessie agreement with Mr. Djoko Tjandra. At 6 p.m. of the same day, Ramli met Mr. Tjandra in the Mulia Hotel, where they were joined by Messrs. Baramuli, Tanri Abeng, and Mr. Manimaren. At this meeting Ramli was supposedly informed that Minister Bambang Subianto would make the transaction harder. Finally, around 7 p.m. that day, Mr. Ramli met the minister at the minister's house (PriceWaterhouseCoopers 1999: 35). On May 31, the Ministry of Finance issued IBRA with the power of attorney to pay out the money to Bank Bali.

On June 1, 1999, Lubis telephoned Erman Munzir, head of the Regulation and Banking Development Division of Bank Indonesia, to inform the central bank that IBRA would make payments under the government guarantee scheme to Bank Bali. Mr. Munzir advised his staff to be of assistance to Mr. Lubis. Letters requesting payment of 905 billion Rupiah to Bank Bali were prepared by Lubis and his staff. At 7 p.m., Pande Lubis met with Mr. Munzir and was taken by Mr. Dragono Lisan to the accounting department where Lubis intended to deliver another letter ordering the payment of 905 billion Rupiah into Bank Bali's account at Bank Indonesia. While Lubis was on his way to the accounting department, Mr. Munzir prepared a memorandum for the bank's governor advising that these advance payments should not be made as the claims had not been verified. This memorandum, once delivered, garnered Governor Sabirin's immediate attention:

> *the Governor concurred with Mr. Erman Munzir's recommendations and wrote endorsements on the two letters.* (PriceWaterhouseCoopers 1999: 66)

Why he concurred with Mr. Munzir's views and but wrote endorsements on the two letters for the accounting department is yet unclear. This ambivalent reaction of the governor may be seen as a sign of his involvement. The letters were then hand carried to Mr. Lubis in the

[7] PriceWaterhouseCoopers was not able to confirm these meetings. The only confirmation of

accounting department. After some small technical problems had been corrected, the letters were accepted and payment was arranged.

On June 2, Mr. Rusli Suryadi, a director at Bank Bali, was notified of a 900 billion Rupiah discrepancy in the balance of one of Bank Bali's accounts belonging to a bank's money dealer. Several hours later, Mr. Suryadi was informed that the missing money was the settlement of the interbank claims against Bank Dagang Nasional Indonesia and that the money did not belong to Bank Bali because of the Cessie agreement with Era Giat Prima. On June 1, Bank Bali transferred 546 billion Rupiah to its Era Giat Prima clearing account. Subsequently, the money was paid to Era Giat Prima and Djoko Tjandra. On June 3, Bank Bali transferred 120 billion Rupiah to Era Giat Prima's account at another Indonesian bank (PriceWaterhouseCoopers 1999: 71). After that, the money was subdivided and spread among several persons and companies. On the September 13, 1999, an investigation into the dealings of Setya Novanto was ordered (BusinessWeek Online, September 13, 1999).

There is some indication that these Cessie agreements were used in other situations as well. The witness Pradjoto claimed that Mr. Pande Lubis approached other troubled banks with similar propositions. According to Pradjoto, on July 30, Mr. Pande Lubis met with the director and the commissioner Bank International Indonesia, promising to settle their claims in one week, provided they went through a mediation program. Lubis informed Bank International Indonesia that this process

> *was for the sake of BJ Habibie. He also stated that Mr. Glenn Yusuf was not to be informed. Mr. Pande Lubis requested* [Bank International Indonesia] *to sign a cessie agreement.* (PriceWaterhouseCoopers 1999: 53)

The ensuing prosecution of the case was to a large extent a political process. The Golkar Party lost the elections. Several key participants in the scandal, including Pande Lubis, were acquitted (Asia Times, July 10, 2001). Djoko Tjandra was freed due to a technicality. The new Indonesian

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the meetings comes from media reports.

government used the case as grounds for removing Sjahril Sabirin from his position as governor at Bank Indonesia and placed him under detention for half a year (BBC, December 6, 2000). Sabirin was found guilty by Central Jakarta District Court's Judge Subardi and in March 2002 was sentenced to three years in jail. The judge commented that there was sufficient "valid and convincing evidence" of "on going corruption" (Financial Times, March 14, 2002). He accused Sabirin of either enriching himself or others (Yahoo Finance, March 13, 2002). Mr. Sabirin appealed the verdict. Several media sources expressed surprise over Mr. Sabirin's sentence of imprisonment, commenting that in Indonesia the elites usually avoid such a sentence by paying (www.geocities.com, March 21, 2002). In August 2003, the appeal court overturned the verdict against Sabirin (BBC, April 4, 2003).

II.4. Bank Bali Scandal—A Case of Central Bank Corruption?

Does the Bank Bali scandal qualify as an instance of central bank corruption? Certainly, the Indonesian courts did not seem sure of it. Of the three key-actors, two, Mr. Djoko Tjandra and Mr. Pande Lubis, were not found guilty at all. Banker Sabirin was prosecuted and held in detention by the new government, which was trying to oust him from his job. Sabirin's first trial ended with a guilty verdict; his second trial result in the initial sentence being overturned.

However, by looking at the facts that can be gleaned from international media coverage of the scandal and the PriceWaterhouseCoopers audit (1999), it seems plausible that the present case is indeed a case of corruption in the central bank.

The scandal implicated individuals at different levels of Bank Indonesia's hierarchy. The most prominent figure implicated was the bank's governor S. Sabirin. His involvement in the scandal is suggested by three important pieces of information.

[8] The Supreme Advisory council is comprised of 45 members, who are appointed by the president of Indonesia. Its task is to respond to any questions from the president concerning affairs of state.
Source: http://reference.allrefer.com/country-guide-study/indonesia/indonesia131.html

[9] PriceWaterhouseCoopers was not able to confirm these meetings. The only confirmation of the meetings comes from media reports.

First, Rudy Ramli's statement placed Sabirin at the crucial meeting of February 11, 1999 in the Mulia Hotel. It was immediately after this meeting that Bank Indonesia reevaluated Bank Bali's. Governor Sabirin claimed that he did not attend this meeting. However, Mr. Firman Soetjahja, Vice-President of Bank Bali, corroborated Ramli's testimony that Sabrin had indeed attended (Tempo Online Magazine, June 11, 2000).

Second, Sabirin's involvement in the disbursement of funds to Bank Bali on June 1, 1999 implicates him (PriceWaterhouseCoopers 1999: 119–21). As the reader will remember, Pande Lubis went to Bank Indonesia late in the afternoon of June 1. All the pieces of the deal were falling into place and Pande Lubis was there to see the transaction through. To this end, he had prepared two letters for Sabirin. These letters, which requested the payment of Bank Bali's claims, were hand carried to Mr. Sabirin's personal office by a staff member from the Regulation and Banking Development Division along with a memo for Sabirin by the division's head Mr. Erman Munzir. Sabirin gave his immediate attention to these documents. He endorsed the two letters by writing:

> *please action after coordination with Mrs. Miranda Goeltom.* (PriceWaterhouseCoopers 1999: 36)

Third, the PriceWaterhouseCoopers auditors claimed that Bank Indonesia, of which Sabirin was the top officer, withheld important from them.

> *For example* [Bank Indonesia] *has yet to provide* [PriceWaterhouseCoopers] *with the entire access to its working papers which prevents* [PriceWaterhouseCoopers] *from assessing fully the scope of their work. Moreover,* [PriceWaterhouseCoopers] *cannot verify completely the accuracy of the work for which we do not have access to the working papers because private bank access has been denied in several cases.* (PriceWaterhouseCoopers 1999: 120)

Sabirin threatened legal action over these accusations, but chose not to press charges. The auditing team was able to track about 70% of the funds disbursed to Era Giat Prima given these restrictions (Far Eastern Economic Review, December 23, 1999).

Two other Bank Indonesia staff members might also have been involved in the corrupt deal. The director of the Regulation and Banking Development Division, Mr. Erman Munzir, and his Deputy Director Mr. Dragono Lisan were responsible for Bank Indonesia's unprecedented reevaluation of Bank Bali's claims. After Mr. Pande Lubis lobbied them at a string of meetings in February 1999, the two arranged onsite verification of the claims at the creditor bank and debtor banks. On March 22, Messrs Munzir and Lisan wrote a letter of verification for the claims in which they stressed the validity of the claims on Bank Tiara and Bank Dagang Nasional Indonesia. Regarding the Bank Tiara claims, it transpires that Mr. Munzir and Mr. Lisan knew or should have known of the existence of a Cessie agreement between Bank Bali and PT Persada Harum Lestari (PriceWaterhouseCoopers 1999, 120–21) and yet the verified Bank Bali's claims. IBRA management has repeatedly stated that funds would not have been disbursed to Bank Bali under the guarantee scheme if IBRA had known about the Cessie agreements (PriceWaterhouseCoopers 1999: 56).

II.5. Circumstances Favoring Corruption

As detailed above, shared responsibility for the guarantee scheme between IBRA and Bank Indonesia led to confusion by commercial banks about *where* to file the claims. Adding to this uncertainty were the inconsistencies between the SKB rules, allegedly followed by IBRA and Bank Indonesia, and the Ministry of Finance regulations, most particularly regarding *who* should file the claim—debtor (SKB rules) or creditor (Ministry of Finance regulations)—and *when* (within three days of the obligation's maturity under the SKB rules vs. no particular time specified by the Ministry of Finance regulations). Given this chaotic climate, it is not too surprising that Bank Bali found itself in such dire straits. It was also a climate very conducive to the growth of corruption.

Uncertainty about rules and regulations has been identified in the literature as a contributing factor to corruption or, at least, as creating an

environment favorable to corrupt dealing. The Bank Bali case involved two different sets of rules for the registration of interbank claims, resulting in confusion as to which set of rules was applicable and, when a bank chose the wrong set of rules and thus forfeited its right to reimbursement of claims under the government guarantee scheme, a situation in which desperate bankers were vulnerable to approaches from so-called brokers who offered to help recoup the funds. Several empirical studies illustrate how an uncertain situation, that is, confusing rules, can lead to corruption. In a cross-section study of 26 African countries, Lambsdorff and Cornelius (2000) point to the fact that corruption is positively correlated with the degree to which "government regulation[s] are vague and lax." Vague and lax regulations, Lambsdorff and Cornelius argue, provide decisionmakers with discretionary leeway in application and enforcement. Corrupt officials can deliberately use the confusion over rules to put applicants in desperate positions and thus increase these applicants' their willingness to pay bribes. A similar argument is developed by Gatti (1999). She reports on the impact of highly diversified trade tariff menus in comparison to uniform trade rates. She finds, in a sample of 34 countries, that there is a positive association between the standard deviation of the trade tariffs and the level of corruption. However, endogeneity may make these results may be questionable as it is not clear whether the corruption was produced by the differentiated tariff systems giving corrupt officials too much discretionary power or whether the tariff system was tailored to the needs of already corrupt officials. Gatti reports that in her cross-section of countries the results survived tests for endogeneity, in which she employed the Gini-coefficient and terms of trade shocks as instrument variables.

Another element in the Bank Bali scandal climate of corruption was that there was a large backlog of claims waiting to be dealt with by IBRA. Given the long period between filing claims and receiving information on their status, desperate banks facing closure due to liquidity problems were on the lookout for a faster solution. Financial brokers such as Era Giat Prima took advantage of this situation, offering to help in the collection of debt via swap agreements.

A lack of transparency in the banking sector further contributed to the case. Bank Bali was a failing bank in 1999 and had been for much of 1998. Because it had failed to meet Bank Indonesia's capital requirements, Bank Bali came under partial supervision by IBRA and its management lost some autonomy. Perhaps because no one knew, or wanted to know, who was truly in charge, lines of communication became muddled or possibly deliberately obscured and the Cessie agreements were not reported to IBRA, Bank Bali's shareholders, the securities regulators, or its auditors (World Bank 2003: 62–63). Furthermore, the central bank failed to properly supervise the banking sector. Bank Indonesia refused to take credit for its decisions and portrayed itself as a mere fiscal agent.

All these factors—uncertainty about rules, length of time for claim settlement, and lack of bank transparency—contributed to the climate that made Bali-Gate possible.

Although I have concentrated on this one case, Bank Bali was not the only bank involved in scandal during this period of Indonesia's history. The year 2003 saw the jailing of the former director of bank supervision at Bank Indonesia, Mr. Heru Supraptomo. He was sentenced to three years' imprisonment. Mr. Supraptomo is connected to the so-called BLBI scandal. BLBI is an acronym for the name of a liquidity support program initiated by Bank Indonesia in aid of failing banks at the height of the crisis. Bank Indonesia lent out 144.5 trillion Rupiah (roughly US $16.3 billion) as emergency loans (BBC April 4, 2003) to not fewer than 43 banks, although Bank Dagang Nasional Indonesia, Bank Central Asia, Bank Danamon and Bank Umum Nasional received two-thirds of the total BLBI funds. These four private commercial banks allegedly enjoyed close relationships with President Soeharto (World Bank 2003: 61). An investigative audit of the BLBI scheme by the Indonesian National Audit Agency reported that of the 144.5 trillion Rupiah loaned, approximately 96% of the funds are lost and cannot be recovered; 59% was misused to provide loans without sufficient collateral. The audit found out that only 35 trillion Rupiah were actually accounted for (World Bank 2003: 61). The audit report concluded that most of the misappropriation was due to criminal offenses and corruption (Asia Times:

February 21, 2003), and recommended a criminal investigation of Bank Indonesia staff.

The Indonesian corruption examples are, of course, directly connected with the Asian Financial Crisis. The crisis and its aftermath facilitated the corrupt dealing engaged in by Indonesian commercial banks. However, a crisis is not always necessary for corruption to alter and influence monetary policy, as will be shown for countries as diverse as Brazil and Japan. In the next chapter, I will address the effects of central bank corruption on the inflation rate.

III. Central Banks in a Corrupt Environment: How Corruption Drives Inflation

III.1. Introduction

Economic theory on central bank behavior normally posits that the central bank and its employees toil for the common good of society. If problems arise due to the central bank's course of action, these do not stem from a lack of commitment to the common goals but from the central bank's desire to further these goals in the interest of society. In a critique of monetary policy decisions during the Great Depression (1929–1942) and the Great Inflation (1965–1984), Meltzer (2002) points out that these events and developments

> *were not caused by willful, evil men and women. They did not persist because of malevolent central bankers wanted to harm their countries and the world. I am persuaded that errors of judgment and mistaken theories or interpretations had a large role in causing the policy mistakes to be made and perpetuating them once they were made.*

This statement reflects a common assumption in theoretical models. Economic theory perceives central bankers as the pursuers of the common good on behalf of society. In reality, this assumption is usually only true for central banks in developed countries where the banks and their policies are under scrutiny from the press and the government. However, even with this scrutiny and despite the recent commitment to transparency on the part of central banks, there is still a considerable amount of secrecy surrounding the central bank and its decisions. Greenspan (2002: 5) points out:

> *The undeniable, though regrettable, fact is that the most efficient policy making is done out-side the glare of the press. But that notion and others have been used too often in the past to justify a level of secrecy that turned out to be an unnecessary constraint in our obligation to be transparent in conducting the public's business.*

Klitgaard (1988: 75) identifies circumstances that favor corruption: monopoly power, discretionary decision making by bureaucrats, and weak or nonexistent accountability on the part of these decisionmakers. It is easy to see that all three conditions could exist in a central bank. When one adds Mr. Greenspan's statement from above to Klitgaard's conditions for corruptibility, one arrives at the theoretical possibility that a central bank may in fact not be benevolent—the central banker very well might use his or her position to further the banker's own end.

Hellman et al. (2000) offer support for this idea. They report on a survey of businesspeople in the transition counties of Azerbaijan, Kyrgyzstan, Moldova, Russia, Slovakia, and Ukraine. In the survey, respondents assessed the impact of the central bank's mishandling of funds on the business environment. Hellman et al. report that over one-third of the respondents reported suffering onerous effects stemming from the central bank's mishandling of funds. These effects, the respondents claim, result in considerable obstacles to development of their businesses. Several other surveys have included questions concerning businesspeople's perception of the central bank. I use one of these, the Business Environment and Enterprise Performance Survey (BEEPS; 2002) of the World Bank and the European Bank for Reconstruction and Development, in my empirical investigation into the consequences of corruption in 26 transition countries (see Chapter V).

Corruption in the central bank could result in a realignment of monetary policy. One way of seeing how corruption drives monetary policy is to look at the inflation rate, which has been the focus of several theoretical studies. Braun and DiTella (2000) point to a positive relationship between corruption and inflation, arguing that inflation increases corruption. According to Braun and DiTella, inflationary processes make it easier for corrupt agents to obfuscate a corrupt transaction because the principals are less able to check the information from their agents. Although the Braun and DiTella study does not directly relate to central banks, Al-Marhubbi (2000) does make such a connection. Al-Marhubbi found that corruption increases when the amount of a nation's GDP that can be attributed to the unofficial economy

increases. This argument becomes compelling when one takes into account that cumbersome regulation forces formerly legitimate business to go underground or to pay bribes (Johnson, Kaufmann, and Zoido-Lobaton 1998: 391). To compensate for the loss in tax revenue due to business going underground, the state turns to seigniorage revenue. Interestingly, a larger underground economy also increases money demand because its medium of exchange is usually strictly cash. These factors suggest that the government will find it easier to finance its expenditure by inflation rather than income tax. In a similar spirit, Huang and Wei (2003) develop a model in which an honest central bank acts in a corrupt surrounding. In their model, corruption leads to a deterioration of tax revenue and thereby increases the government's need for additional income, one source of which, Huang and Wei argue, is inflation tax revenue. Huang and Wei's model shows how corruption in the government can influence central bank policy but does not explicitly deal with corruption in the central bank itself. This situation is addressed by Lambsdorff and Schinke (2002), who show how corruption within the central bank changes monetary policy. In this approach, where central bank officers "leak" bank decisions, leading to illegal gains, it becomes obvious that the central banker is not always altruistically devoted to publicly approved goals. As a result of this sort of corrupt transaction, the inflation rate is likely to increase.

These theoretical considerations and the empirical evidence illustrate that central banks can indeed be corrupt and that their officers and staff are probably not immune from corruption, either. However, I believe that the corrupt central banker is the exception, rather than the rule. Even in highly corrupt countries, we tend to find central banks with a relatively good reputation among local experts. For example, Mozambique rates a poor 2.8 in the 2005 TI-Corruption Perceptions Index, but in personal correspondence local experts stated that the central bank is reputable and honest. Its head of banking supervision, Antonio Siba-Siba Macuacua, courageously attempted to investigate a bank lending fraud in August 2001 and was killed as a result of his endeavors (BBC, May 25, 2003). Central bankers in many countries are principle-oriented individuals who are not easily involved in corruption.

However, central bankers, no matter how honest and principled, do not live in a vacuum. They can be subjected to pressure from many angles,

pressure that may force them onto the slippery slope of corruption. These pressures could be related to partisan politics, with its related implications for central bank policy, or from profit-seeking private banks that will not hesitate to offer a bribe, perhaps cleverly disguised, for information on future central bank decisions. Seemingly small corrupt acts by the central bankers themselves, however, can shape actual central bank policy. The small, beginning acts will eventually be just the tip of the iceberg. My argument in this chapter is that acts of individual corruption can have nationwide consequences.

The analysis of the effects of corruption in the central bank is organized as follows. Section III.2 introduces the underlying, general natural rate model and discusses the basic macroeconomic model. Section III.3 describes actual corrupt incidents at central banks derived from media reports. These actual incidents are the basis for the model of the corrupt central banker. Section III.4 shows the natural rate model in action. The equilibria are derived and the social implications of the inflationary bias are highlighted. Section III.5 uses the modified version of the model to deal with welfare implications of corruption in the sphere of the central bank. The modified model illustrates how acts of extortion by a central banker can result in higher realized inflation rates. Section III.6, An Extension of the Model: The Corrupt Central Banker Revisited, discusses an extension of the model that allows the identification of different types of central bankers. Section III.7. Conclusions and Policy Recommendations, concludes the analysis.

III.2. The Basic Macroeconomic Model

The aim of this section is the derivation of a natural rate model with rational inflation expectations of private agents. The model contains a nominal rigidity, which allows monetary policy to have short-term real effects on employment and, thus, income. The model assesses the welfare effects on society of different monetary policy regimes by means of a social objective function. The basic model is taken from Jarchow (2003) and modified to suit the needs of the present analysis. Traditionally, the natural rate model consists of three functions: a macroeconomic demand function, a macroeconomic supply function, and a cost function to represent the

incentives of the central banker and the public. These three functions, as well as the social objective function, are explained in detail below.

The demand function assumes that increases in the real monetary stock, $\left(\frac{M_t}{p_t}\right)$, or the real government expenditure, G^r, raise the real national income, Y^r. However, in my model, the influence of real government expenditure is omitted because it is not the aim of the present analysis to review the effects of government expenditure on the economy. It is the effects of corrupt central bankers on monetary policy and the resulting welfare effects that are at the heart of my inquiry. Therefore, the real national income of an economy as seen from its demand side is:

(III.1) $$Y^r = Y^r\left(\tfrac{M}{p}\right), \quad \frac{d\ Y_d^r}{d\ \left(M/p\right)} > 0.$$

This demand function (III.1) ignores several effects of inflation on the demand side of the economy. The model does not take into account the influence of inflation on private investments and consumption. Also not taken into account is the fact that the expectation of inflation has a negative influence on the demand for real cash balances as inflation devalues cash holdings. Private agents will try to protect themselves from this loss of purchasing power and start to economize their real cash holdings in situations of inflation. In the extreme case of hyperinflation, private agents might trade their national currency for foreign currencies or exchange their cash holdings for gold or other goods perceived to be more price and/or value stable.

To derive a dynamic model in which the central bank controls the growth rate of the monetary stock, the aggregate demand function must be rewritten as:

(III.2) $$k_t Y_t^r = \frac{M_t}{p_t}.$$

The factor *k* is the reciprocal value of the income velocity of money. In the present dynamic model, the demand function should show how the real national income as seen from the demand side of the economy changed between two consecutive periods, *t* and *t*-1. Assuming a constant value for *k*, this change in the real national income is given by:

(III.3) $$k\left(Y_t^r - Y_{t-1}^r\right) = \frac{M_t}{p_t} - \frac{M_{t-1}}{p_{t-1}},$$

$$\Leftrightarrow \quad k\left(Y_t^r - Y_{t-1}^r\right) = \frac{M_t \cdot p_{t-1} - M_{t-1} \cdot p_t}{p_t \cdot p_{t-1}}.$$

Using the definition of the inflation rate yields:

$$\Leftrightarrow \quad k\left(Y_t^r - Y_{t-1}^r\right) = \frac{M_t \cdot p_{t-1} - M_{t-1} \cdot p_t}{p_t \cdot p_{t-1}}.$$

Adding and subtracting $p_{t-1}M_{t-1}$ yields:

$$\Leftrightarrow \quad \frac{p_{t-1} \cdot M_t - p_t \cdot M_{t-1} - p_{t-1} \cdot M_{t-1} + p_{t-1} \cdot M_{t-1}}{p_t \cdot p_{t-1}} = \left(Y_t^r - Y_{t-1}^r\right) \cdot k,$$

$$\Leftrightarrow \quad \frac{p_{t-1} \cdot \Delta M - M_{t-1}\Delta p}{p_t \cdot p_{t-1}} = \left(Y_t^r - Y_{t-1}^r\right) \cdot k.$$

Applying the definition of the inflation rate $p_t = p_{t-1}(1+\pi)$ and rewriting the fraction yields:

$$\Leftrightarrow \quad \frac{\Delta M}{p_t} - \frac{M_{t-1}}{p_t}\pi = \left(Y_t^r - Y_{t-1}^r\right) \cdot k,$$

$$\Leftrightarrow \quad \frac{\Delta M \cdot M_{t-1}}{(1+\pi) \cdot p_{t-1} \cdot M_{t-1}} - \frac{M_{t-1}}{(1+\pi)p_{t-1}}\pi = \left(Y_t^r - Y_{t-1}^r\right) \cdot k,$$

$$\Leftrightarrow \quad \frac{m}{(1+\pi)} \cdot \frac{M_{t-1}}{p_{t-1}} - \frac{M_{t-1}}{p_{t-1}} \cdot \frac{\pi}{(1+\pi)} = \left(Y_t^r - Y_{t-1}^r\right) \cdot k.$$

Setting the real national income level for the period *t*-1 equal to 1 yields:

$$k = \frac{M_{t-1}}{p_{t-1}}.$$

Substituting for the real monetary stock of period *t*-1:

$$\Leftrightarrow \quad \frac{m-\pi}{(1+\pi)} = Y_t^r - 1.$$

Assuming that the inflation rate stays within reasonable limits and thus eliminating the possibility of hyperinflation simplifies the demand function in the following way:

$$\Leftrightarrow \quad Y_t^r = 1 + \frac{m-\pi}{1+\pi},$$

(III.4) $$\Leftrightarrow \quad Y_t^r = 1 + m - \pi.$$

Equation (III.4) is the demand function of the present model. Usually, natural rate models use a logarithmic approach for the demand function. The present model deviates from this standard procedure because the logarithmic approach presented difficulties in the derivation of the central banker's corrupt income. However, the simple linear relationship of my model produces results that are not significantly different from the results produced by the demand function normally used in natural rate models. The real national income of the period *t* still depends on the income of the previous period *t*-1, which is standardized to the value 1 and the difference between the growth rate of the money supply, *m*, and the inflation rate, π. It is important to note that the present demand function (III.4) has the same properties as the traditional version — it is downward sloping in a π / Y^r – diagram. An increased growth rate of the monetary stock shifts the curve to the right because for a given constant inflation rate the increased growth rate of the money supply stimulates demand and brings about an increased level of real national income.

The labor market behavior of private agents and firms is at the core of the macroeconomic supply function. Private agents offer labor units to the firm via a trade union, which negotiates the nominal wage *w*. In wage negotiations, the trade union's stance will depend on the prevailing employment situation and the expected inflation rate. Trade unions are able to raise the nominal wage if the actual unemployment rate is lower than the natural unemployment rate. Furthermore, the unions want to stabilize the real wages, and thus they take into consideration the expected inflation rate. Therefore, a linear Phillips curve determines the growth rate of the nominal wage, $\left(\frac{\Delta w}{w}\right)$. This curve is augmented by the private agents' inflation expectation, π^*:

(III.6) $$\frac{\Delta w}{w} = \pi^* + \alpha\left(\bar{U} - U\right), \qquad \alpha > 0$$

where $\bar{U}$ denotes natural unemployment level and *U* the actual unemployment level. Natural unemployment is a factor of this model because jobless benefit systems and income taxation distort private agents' labor market decisions (Persson and Tabellini 1990: 9). Natural unemployment is a

structural type of unemployment. The rate of unemployment is the difference between all the members of a society who are fit enough for work, *W* (workforce), and those who are actually working, *N*:

$$U = \frac{W - N}{W}.$$

Wage negotiations proceed as follows. If the actual level of unemployment exceeds the natural level $\bar{U}$, then the wage growth rate is negative in order to lower the unemployment level. If the actual unemployment rate is lower than its natural value, then the nominal wage growth rate is positive. By taking the inflation rate—or, at least, expectations about the inflation rate—into account, unions try to achieve a wage that will compensate the workers for the real purchasing power that will be lost due to future rates of inflation.

Firms sell their products at a price derived in the following fashion. Because the major production factor in this economy is labor, firms calculate the price of their products at the average labor cost C_N^{Av} plus a profit margin *g*:

(III.7) $$p = (1+g)\cdot C_N^{Av}.$$

The average labor costs in this economy are:

$$C_N^{Av} = \frac{N \cdot w}{Y^r},$$

where *N* is the amount of labor units used in the production process and Y^r is the production output measured by the national income. Therefore, one can transform Equation (III.7) into:

(III.7´) $$p = (1+g)\frac{N \cdot w}{Y^r}.$$

Assuming that the profit margin *g* and the average work productivity are constant, then the inflation rate (the growth rate of prices) equals the growth rate of the nominal wage *w*:

(III.8) $$\frac{\Delta p}{p} = \pi = \frac{\Delta w}{w}.$$

Substituting for the growth rate of the nominal wage, $\left(\frac{\Delta w}{w}\right)$, (see Equation (III.8)) for the unemployment variable, *U*, in Equation (III.6), one can

derive a special Phillips curve augmented by the inflation expectation of private agents:

(III.9) $$\pi_t = \pi_t^* + \alpha\left(\frac{N_t - \bar{N}}{W_t}\right).$$

The assumption of constant, average labor productivity gives rise to an implicit specification for the type of production function for this model:

$Y_t^r = \beta' \cdot N_t$, β' is constant and positive.

Substituting for the labor input *N* and setting $\left(\beta = \frac{1}{\beta' \cdot W}\right)$ in Equation (III.9) yields the so-called price function or supply function of the present model:

(III.10) $$\pi_t = \pi_t^* + \theta \cdot \left(Y_t^r - \bar{Y}^r\right),$$

$$\Leftrightarrow \quad Y_t^r = \frac{\pi_t - \pi_t^*}{\theta} + \bar{Y}^r,$$

where $\alpha\beta = \theta$.

The price function shows a positive influence of the real income Y_t^r on the inflation rate for given values of the expected inflation rate π_t^* and the value of the natural level of real income $\bar{Y}^r$, which is consistent with natural level of employment. It is positive sloping in a Y^r/π diagram. The private agents' inflation expectations are rational.

The social objective function used in my model is similar to those used in most of the research concerned with optimal monetary policy in a natural rate framework (see, e.g., Barro and Gordon 1983a; Rogoff 1985; Kydland and Prescott 1977). The function assumes that inflation rate or income deviations from target values $\left(\hat{\pi}, \hat{Y}^r\right)$ result in costs to society. Deviations from the inflation target are termed inflation costs. These costs can manifest as so-called shoe leather costs, menu cost of inflation, cost of adjusting the tax system when the income taxes are not indexed, and costs stemming from unexpected inflation (see Feldstein 1999; Mulligan and Sala-i-Martin 1997).

The usual response to this type of cost is a call for a reduction in inflation to a level close to zero; however, there are other points of view in disagreement. Some theories posit that moderate inflation can be welfare

enhancing for society. Phelps (1973) and Mulligan and Sala-i-Martin (1997) point out that the socially optimal target value of the inflation rate may be positive. This will create a positive inflation tax revenue or seigniorage income and this additional income may allow the state to refrain from levying other, more distorting taxes. These authors show, however, that the decision for (see Phelps 1973) or against (see Friedman 1969) inflation tax revenue depends crucially on the theoretical assumptions underlying the model. On theoretical grounds alone it cannot be determined whether no seigniorage revenue at all (Friedman 1969) or some revenue (Phelps 1973) is optimal. The question must be answered empirically (see Mulligan and Sala-i-Martin 1997).

Not meeting the income target causes unemployment costs. The societal costs of unemployment arise if the real national income is below its socially optimal level of $\hat{Y}^r$. Unemployment means that not all the resources (workers) are being used in the production process, leading to an actual national income lower than its potential level. This in turn decreases the state's tax revenue, in states with income taxation, and increases the amount society will have to spend on unemployment benefits. The target value of the national income is:

$$\hat{Y}^r = n \cdot \bar{Y}^r, \quad n > 1,$$

Recalling $\left(\bar{Y}^r = 1\right)$, the socially optimal value simplifies to *n*. The value of *n* is greater than 1. This assumption is necessary to create an incentive for policymakers not to settle for long-term employment $\left(\bar{Y}^r = 1\right)$ - the natural rate of employment; policymakers must want a rate of employment higher than the natural rate. This is also a sound economic assumption. Theoretically, the natural employment level, and the corresponding national income, is the result of individual profit- or utility-maximizing behavior on the part of private firms and agents. In the real world, however, usually there are labor market distortions cause by, for example, income taxation or unemployment benefits. From the viewpoint of society, the employment levels realized in these economies are suboptimal because the relative price for leisure is lower than its optimal level (Barro and Gordon

1983a: 593). Therefore, Equation (III.11) sums up the costs to society from inflation and unemployment:

$$C = \left(\pi - \hat{\pi}\right)^2 + \lambda\left(Y^r - n\right)^2, \quad \lambda > 0, \tag{III.11}$$

where λ denotes society's preference for employment-creating policies relative to the inflation target, whose weight is set to 1. If the value for λ is rather high, then the absence of price stability is not very harmful to society, whereas not reaching the employment (national income) goal results in considerable social cost.

Substituting for the real national income with the help of the supply function changes the social objective function. It is the condition under which the central bank minimizes social costs. Assuming that society prefers price stability simplifies the algebra. Therefore, the desired inflation rate $\hat{\pi}$ is set to 0:

$$C = \pi^2 + \lambda\left(\frac{\pi_t - \pi_t^*}{\theta} - (n-1)\right)^2. \tag{III.12}$$

With the demand function (III.5), the supply function (III.10), and the social objective function (III.12), a standard version of the natural rate model of the time inconsistency of monetary policy is complete. The following section illustrates how corrupt incentives might affect a central banker's decision-making process.

III.3. Corruption and Seigniorage

Over the years 2001–2005, I screened reports on corruption at central banks. The cases encompass diverse incidents. Very often, the behavior induced policy distortions. One apparent distortion, albeit rare, arises with central banks that just print money and embezzle it for their own private purposes, or those of politicians they depend on. Corrupt income for the central banker (or those politicians who control his or her activities) would directly increase the money supply. This is exactly what happened in the 1920s in Portugal when Alves Reis faked documents that entitled him to order the printing and receipt of banknotes from the central bank's authorized London-based printing firm. Although he told his business collaborators that a payment of $850,000 in bribes had been made to the Governor and other officials at the Bank of Portugal, there was in reality no such payment and no actual malfeasance by

the central bank. However, there certainly were serious loopholes in the central bank's oversight system. So although there was no actual corruption at the central bank, the case of Alves Reis can be regarded a type of corruption with respect to central bank transactions (Bloom 1966).

In 1979, Erwin Blumenthal, who served as an IMF representative in Zaire and was the central bank's vice-governor there, came up against another case of corruption (Blumenthal 1982). In Zaire at the time, there was no clear dividing line between the state budget and President Mobutu's personal account. The president and his cronies largely regarded the central bank as their personal property. Blumenthal was repeatedly forced to disburse central bank funds for the purely private purposes of the president and his cronies. At one point, Blumenthal refused to make a payment and was threatened by a group of soldiers with submachine guns. In a similar vein, President Fujimori in Peru embezzled gold reserves from the central bank and transferred them to Japan.[10] Seigniorage revenue can cover a loss in a central bank's net equity. Doing so enables the central bank to avert bankruptcy and the resulting unstable monetary system.

The common theme of these last two examples is that there seemed to be no dividing line between the private budget of the head of state and that of the state itself. President Mobuto and President Fujimori each treated the central bank as their private property. They used their power over central bank officials to extort money from the bank. When leaders treat the central bank as private property, they will seek to maximize their income from seigniorage. The relevance of seigniorage to the credibility of a central bank's commitments was mentioned by Barro and Gordon (1983a: 602–03); however, they did not provide a formal analysis of the issue.

Central bankers are often in a position where they might be tempted by, or threatened to engage in, corruption. What welfare effects does corruption within a central bank have on society? The simplest example would involve bank employees simply stealing a part of the bank's seigniorage revenue. (Seigniorage consists of the resources obtained by the central bank when issuing currency units.) Unfortunately, the real-world occurrences of corruption are never this straightforward. Still, this idea proves

[10] See BBC (May 2, 2001) and *Financial Times* (May 4, 2001).

useful. The cases of Mobuto and Fujimori can be used to illustrate. By embezzling reserves and gold from the central bank, they increased bank's dependency on seigniorage revenue, which it needed to compensate the sustained losses. The more currency units the bank issues, the more revenue it makes. If the political leadership views the central bank as its property, it will naturally seek to maximize the income it might get from seigniorage or increase the central bank's dependency on the revenue therefrom. The central banker becomes the puppet of his masters.

The present model also allows for subtler forms of self-seeking. Niskanen (1975), for example, has been prominent in arguing that the bureaucracy has a strong position vis-à-vis Congress and uses its power to advance its own bureaucratic goals. Increasing the bureaucratic agency's budget by putting pressure on Congress is an example of more subtle self-seeking—and one that could apply to central banks.

It is possible for central bankers to profit from *decreasing* the money supply. For example, they might sell inside information on market operations that reduce the monetary stock. However, an increasing money supply is a better source of corrupt income. If high officials, either of the government or the bank, consider all central bank income to be their personal property, they have a direct interest in maximizing seigniorage. Even if it is lower-level officials or staff who are involved in corrupt dealing, increasing the seigniorage revenue is likely for two reasons. First, a bigger cake means bigger slices for everyone. Second, as advanced by Wintrobe and Breton (1986), low-level bureaucrats can supplement their income by unofficial earnings only by colluding with colleagues because cheating superiors requires mutual trust and cooperation among the subordinates, a situation equally true of corrupt agreements, which are arduous to seal and enforce: denunciation by a disaffected (or excluded) colleague is a constant threat (Lambsdorff 2002). Trust is essential to a successful corrupt operation. For example, say a central banker is taking side payments for decreasing the money supply. He is thus lowering the potential income of corrupt colleagues and is decreasing his own income from seigniorage. Trust begins to break down and the risk of denunciation increases. This example illustrates why

corruptly increasing the money supply better serves to assure loyalty among subordinates.

Let us assume a simple relationship between the bribe received by the central banker (*B*) and the increasing monetary stock:

$$B = \Delta M = M_t - M_{t-1}.$$

The weight κ is introduced. It will serve to measure the central banker's preference for additional corrupt income. It enters the central banker's objective function to show how he values the bribe payment in relation to the social costs that will occur due to his policy decisions (see Equation (III.12)). For simplicity, any risk premiums the central banker might request are ignored. In this model, the central bank is assumed to be either sufficiently independent or involved in interactions so complex that it is almost impossible for supervisors to know about, much less control, all the deals between the central bank and private sector. If the weight κ is set to 0, bribe payments do not influence the central banker at all. He is incorruptible.

Corrupt income is not the only justification for including this additional term into the objective function of the central bank's employees. Legal incentives, such as bonuses based on a share of inflation tax revenue generated, can be modeled in a similar way. Even nonmonetary incentives, such as better working conditions or a luxurious new bank building paid for by seigniorage revenue, can change the objective function in the same way as a bribe payment or a bonus system.

Because the central banker does not suffer from money illusion, the real bribe will be introduced into the social objective function. The growth rate of the monetary stock is the central bank's primary policy tool in the natural rate framework. The demand function determines the growth rate endogenously. To determine the bribe term as a function of the central bank's policy tool, the real change in the money supply between the period *t* and period *t*-1 needs to be related to the growth rate of the money supply *m*:

(III.13) $$B^r = \kappa \frac{M_t - M_{t-1}}{p_t},$$

$$\Leftrightarrow \quad B^r = \kappa \frac{M_t - M_{t-1}}{M_{t-1}} \frac{M_{t-1}}{p_t} = \kappa m \frac{M_{t-1}}{p_t} \quad .$$

Using the definition of the inflation rate $p_t = (1+\pi)\cdot p_{t-1}$ yields:

$$\Leftrightarrow \qquad B^r = \frac{\kappa m}{1+\pi}\frac{M_{t-1}}{p_{t-1}}.$$

The amount of the real bribe payment received by the central banker can now be determined with the help of the demand function (III.4) and the supply function (III.10). Substituting for the growth rate of the monetary stock *m* and using the supply function yields:

$$\Leftrightarrow \qquad B^r = \frac{\kappa M_{t-1}}{(1+\pi)p_{t-1}}\left(\left(Y_t^r - 1\right)(1+\pi)+\pi\right),$$

$$\Leftrightarrow \qquad B^r = \frac{\kappa M_{t-1}}{p_{t-1}}\left(Y_t^r - 1 + \frac{\pi}{1+\pi}\right).$$

Because the real national income for the period *t*-1 was set equal to 1, *k* substitutes for the real monetary stock of this period:

$$\Leftrightarrow \qquad B^r = \kappa k\left(Y_t^r - 1 + \frac{\pi}{1+\pi}\right).$$

Inserting the supply function and assuming that the inflation rate π stays within reasonable limits, one can approximate $\frac{\pi}{1+\pi} \approx \pi$:

(III.13') $$B^r = \kappa k\left(\frac{\pi - \pi^*}{\theta} + \pi\right).$$

Inserting the real bribe into the objective function of the general public yields:

(III.14) $$C = \pi^2 + \lambda\left(\frac{\pi - \pi^*}{\theta} - (n-1)\right)^2 - \kappa k\left(\frac{\pi - \pi^*}{\theta} + \pi\right).$$

For the sake of simplicity, the corrupt incentive enters the standard model of time inconsistent monetary policy in the way stated above. The central bank employee (e.g., the Governor) weighs the positive benefit to him of the corrupt income against the overall effects that the new monetary policy and its consequences for inflation and unemployment will have on him. For example, a rise in the unemployment rate might affect him negatively in that society tends to become more unstable when a high unemployment rate prevails for some time; thus, he might not feel safe driving his new Mercedes. The negative effects of inflation on his personal welfare would be the same as for all members of society, that is, his money will buy less and less.

The objective function of the corrupt central banker now depicts this incentive to gain additional corrupt income. Because this extra income lowers the damaging effects inflation will have on the central banker personally, the real bribe term B^r is subtracted from the social objective function (III.12). The objective function (III.14) is written here with the exponent $(\kappa \geq 0)$. The present objective function can encompass the incentives of the corrupt as well as the incorruptible central banker from the basic underlying model. If κ is set to equal 0, Equation (III.14) simplifies to the relevant objective function for an incorruptible central banker (see Equation (III.12)). The exponent $(\kappa = 0)$ points to the situation of an incorruptible central banker. When corruption is prevalent within the central bank, it will have the exponent $(\kappa > 0)$.

Walsh (1995) uses a similar approach to derive a wage contract for central bankers that will overcome the inflationary bias in monetary policy and still allow the central bank discretion in its response to stochastic shocks from the supply side of the economy. He analyzes an incentive scheme for central bankers that makes their wages dependent on the bank's performance. The scheme can take the form of a direct income-increasing payment to the central banker or be an increase in the central bank's budget, which the central bank may use to enhance working conditions for its employees. Walsh (1995) implemented this incentive scheme into his model by changing the standard objective function (similar to Equation (III.12)) into a utility function. This utility function depends on the government's direct payment to the central banker; the usual cost function is then subtracted from this direct payment.

III.4. Monetary Policy of an Incorruptible Central Bank

The following deliberations on the standard model of time inconsistent monetary policy follow the well-trodden paths of Kydland and Prescott (1977) and other authors such as Barro and Gordon (1983a) or Rogoff (1985). The starting point of this welfare analysis is a state of price stability. This price stability equilibrium is necessary to provide an incentive for the politically active central bank to defect from its announced policies. The economy is in a stationary equilibrium. The real national income is equal to its natural level

$\bar{Y}^r = 1$. The central bank announces that it wants to continue the price stable policy in the next period. Price stability then demands that the growth rate of the quantity of money is equal to zero. If the public and, especially, the trade unions find credible, it will be the foundation for wage negotiations in the next period. If private agents believe in the central bank's anti-inflation policy, they set their expectations accordingly:

$$\pi_t^* = 0 .$$

If the central bank sticks to its policy announcement, the real national income can only equal its natural level $\left(Y^r = \bar{Y}^r = 1\right)$. Substituting for the inflation rate $\left(\pi = 0\right)$ and the realized real income level $\left(Y^r = 1\right)$ in the cost function allows assessing the social costs that arise in this situation:

(III.15) $$C^R = 0^2 + \lambda\left(1 - n\right)^2 = \lambda\left(n - 1\right)^2 .$$

However, the price stability equilibrium announced by the bank may not reflect its true intent. But if it can persuade the trade unions to believe that the price-stability policy will be followed (even when it intends *not* to), the deception can be used to lower social costs as compared to the situation characterized by Equation (III.15) and an inflation rate of zero. In the literature, this equilibrium is often called the "deception solution." To differentiate better between the discretionary policy equilibrium and the deception equilibrium the present paper speaks of a *trick* the central bank is pulling on society. *Trick* and *deception* will henceforth be used synonymously. The letter *T* stands for the trick equilibrium. A discretionary policy equilibrium is denoted by the letter *D*.

In this model, private agents are assumed to behave rationally: they are aware of the model the central bank uses to optimize its strategy. The difference between the trick and the discretionary policy equilibriums is as follows. In the trick equilibrium, agents possess complete information but are deceived by the central bank regarding future monetary policy. In the discretionary policy equilibrium, agents use their knowledge to prevent the central bank from deceiving them. They realize that the central bank will cheat them and thus they force the central bank to set an inflation rate that will fulfill their expectations.

Substituting for the real national income, one obtains an objective function, which only depends on the expected inflation rate and the actual realized inflation rate. The cost minimum of this function is given by the first derivative under the condition that private agents expect the inflation rate will equal zero $\left(\pi^* = 0\right)$:

(III.16) $$C^{\kappa=0} = \pi_t^2 + \lambda\left(\frac{\pi_t}{\theta} - (n-1)\right)^2,$$

$$\frac{\partial\ C^{\kappa=0}}{\partial\ \pi_t} = 2\pi_t + 2\frac{\lambda}{\theta}\left(\frac{\pi_t}{\theta} - (n-1)\right) = 0,$$

(III.17) $$\pi_t = \frac{\lambda\theta(n-1)}{\theta^2+\lambda}.$$

The corresponding costs that occur in the case of surprise inflation can be established by first looking at the real national income of that period:

$$Y_t^r = \frac{\pi_t}{\theta} + 1,$$

$$\Leftrightarrow \quad Y_t^r = \frac{\lambda(n-1) + \theta^2 + \lambda}{\theta^2+\lambda},$$

$$\Leftrightarrow \quad Y_t^r = \frac{\lambda n + \theta^2}{\theta^2+\lambda}.$$

Substituting the real national income and the inflation rate of the trick solution one obtains:

$$C_T = \pi^2 + \lambda\left(Y_t^r - n\right)^2 = \left(\frac{\lambda\theta(n-1)}{\theta^2+\lambda}\right)^2 + \lambda\left(\frac{\lambda n + \theta^2}{\theta^2+\lambda} - n\right)^2,$$

$$\Leftrightarrow \quad C_T = \left(\frac{\lambda\theta(n-1)}{\theta^2+\lambda}\right)^2 + \lambda\left(\frac{\lambda n + \theta^2 - n\theta^2 - \lambda n}{\theta^2+\lambda}\right)^2,$$

$$\Leftrightarrow \quad C_T = \left(\frac{\lambda\theta(n-1)}{\theta^2+\lambda}\right)^2 + \lambda\left(-\theta^2\frac{n-1}{\theta^2+\lambda}\right)^2,$$

$$\Leftrightarrow \quad C_T = \frac{\lambda^2\theta^2(n-1)^2}{\left(\theta^2+\lambda\right)^2} + \frac{\lambda\theta^4(n-1)^2}{\left(\theta^2+\lambda\right)^2},$$

$$\Leftrightarrow \quad C_T = \frac{\lambda\theta^2(n-1)^2}{\left(\theta^2+\lambda\right)^2}\left(\lambda+\theta^2\right),$$

$$\Leftrightarrow \qquad C_T = \frac{\theta^2}{\theta^2 + \lambda} \lambda (n-1)^2 .$$

The social costs of the trick equilibrium initially are lower than the costs caused by the initial price stability equilibrium. However, after the end of the first period, the costs will rise again. Private agents will realize their mistake and will adjust their expected inflation rate. The economy will head toward a long-run equilibrium with a higher inflation rate and a national income at its natural level. The higher inflation rate is a direct result of the central bank's decision to defect from its original announcement of a monetary policy aiming price stability, which defection was undertaken so as to lower the social costs of inflation and unemployment. To maintain the initial equilibrium, it is imperative for the central bank to convince private agents that it will pursue price stability. Once it has achieved this goal, the central bank alters its policy; but because private agents are not yet aware of this sea change, the bank can achieve a temporary increase in the employment rate by allowing the monetary stock to expand. The increased employment—albeit at the cost of a positive inflation rate—lowers the central bank's cost below the level of the initial equilibrium. An unbound central bank will use the trick solution to its own advantage.

Of course, in a rational expectations model, because private agents use the social objective function to predict the course of monetary policy, they are fully aware of the central bank's strategy and are not fooled by its announcements regarding price stability. This knowledge is then implemented in wage negotiations. The necessary condition for the trick equilibrium is an expected inflation rate π_t^* that is equal to zero. However, in the rational expectations model, private agents will not fulfill this condition because they put no trust in the central bank's policy announcements implying a continuation of its price-stable policy. For simplicity's sake, let us assume that private agents do not err in their predictions that form the basis of their rational expectations:

(III.18) $\qquad \pi_t^* = \pi_t$.

Due to the rational expectations assumption and symmetrical information conditions between private agents and the central bank, private agents form their inflation expectations as follows.

- First, they minimize the social objective function for a given value π_t^*

$$\frac{\partial\ C^{\kappa=0}}{\partial\ \pi_t} = 2\pi_t + 2\frac{\lambda}{\theta}\left(\frac{\pi_t - \pi_t^*}{\theta} - (n-1)\right) = 0,$$

$$\Leftrightarrow \qquad \theta^2\pi_t + \lambda\left(\pi_t - \pi_t^* - \theta(n-1)\right) = 0.$$

- Then the definition (III.18) is applied:

$$\theta^2\pi_t + \lambda\left(\pi_t - \pi_t - \theta(n-1)\right) = 0,$$

(III.19)$$\Leftrightarrow \qquad \pi_D^{\kappa=0} = \frac{\lambda(n-1)}{\theta}.$$

The inflation rate is higher than in the trick equilibrium or the initial price stability equilibrium in the discretionary policy equilibrium. The new equilibrium is stationary because the inflation rate $\pi_D^{\kappa=0}$ is exactly what private agents expected. The real national income stands at its natural level $\left(\overline{Y}^r = 1\right)$. This type of equilibrium results in the highest (so far) social costs. They equal:

(III.20) $$C\left(\pi_D^{\kappa=0}\right) = \left(\frac{\lambda(n-1)}{\theta}\right)^2 + \lambda(1-n)^2,$$

$$\Leftrightarrow \qquad C\left(\pi_D^{\kappa=0}\right) = \frac{\lambda^2(n-1)^2}{\theta^2} + \lambda(n-1)^2,$$

$$\Leftrightarrow \qquad C\left(\pi_D^{\kappa=0}\right) = \frac{\lambda}{\theta^2}\left(\theta^2 + \lambda\right)(n-1)^2.$$

Private agents' rational reaction to the central bank's use of surprise inflation to lower social costs is at the core of the monetary policy debate. If a central bank wants to create higher employment by printing money, rational

private agents will anticipate this behavior and respond appropriately during wage negotiations. The necessary condition for the trick equilibrium, that is, that the private agents are deceived into believing that inflation will be zero, will not be fulfilled.

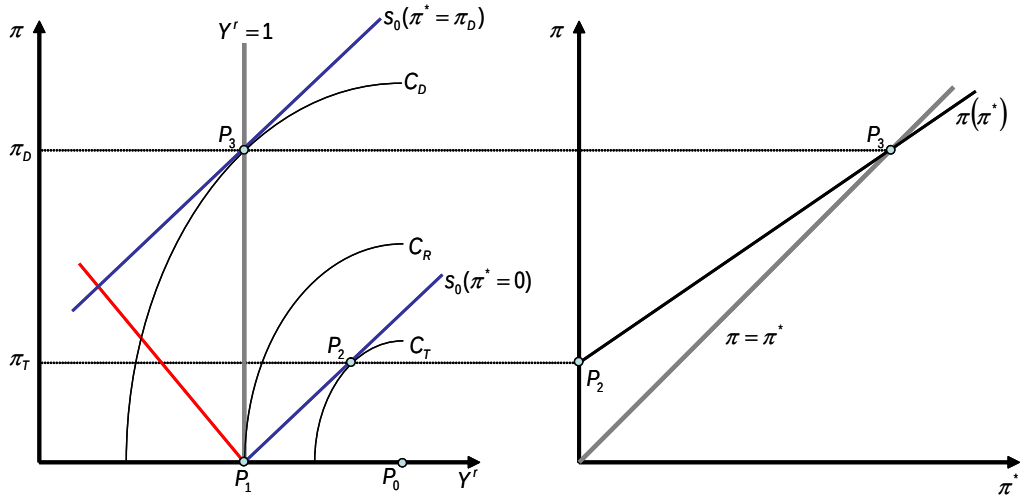


Figure III.1: Standard Model of the Time Inconsistent Monetary Policy.

Author's presentation, similar to Jarchow (2003: 282).

The problem of time inconsistency can be presented with the help of a $Y^r/\pi-$ diagram and a π^*/π diagram, as shown in Figure III.1. The left diagram depicts the incentives of the central bank and the public by society's objective function. The objective functions are presented as iso-cost ellipses, which center on the point P_0. The further these ellipses are away from their origin, the higher are the costs incurred. The initial price-stable equilibrium is depicted by the point P_1 in the $Y^r/\pi-$ diagram. This graphical presentation makes it clear why an inflation expectation of zero is the necessary condition for the trick equilibrium, denoted by point P_2. This point is marked by the minimum social costs because it is the tangential point of the relevant supply function $s_0\left(\pi^*=0\right)$ and the iso-cost ellipse C_T. Under the given expected inflation rate of zero, the best equilibrium in this one-shot game is point P_2. The social costs are minimized $\left(C_R > C_T\right)$.

In Figure III.1, the discretionary equilibrium is denoted by the equilibrium P_3. The necessary condition for the trick solution does not

materialize because the private agents are aware of the incentives that guide the central bank's policy. To protect themselves from the resulting lowered real wage, private agents take into consideration the bank's incentives and use the central banker's reaction function to determine the expected inflation rate. This inflation rate determines the set of possible equilibria, one of which the central banker must choose. These equilibria are all situated on the supply function, $s_1\left(\pi^* = \pi_D\right)$. Under this condition, the central bank must determine what growth rate of the monetary stock will minimize the costs that will be incurred. This strategy is given by the discretionary equilibrium P_3. The expectations of the private agents are fulfilled ($\pi_D = \pi^*$) and, under the given condition, the central banker chose the inflation rate that lowered the social costs.

The incentives of the central banker are summed up by the central banker's reaction function. This function allows determining the central banker's reaction to differing inflation expectations of private agents involved in wage negotiations. The reaction function $\pi\left(\pi^*\right)$ and the condition for a long-run stationary equilibrium $\left(\pi = \pi^*\right)$ are depicted in the $\pi^* / \pi -$diagram. A stationary equilibrium only occurs when the two lines intersect. This is the case for the discretionary equilibrium P_3.

As can be seen from the graphical presentation, the central bank's optimal behavior changes over time. At first, it is socially optimal for the central banker to make the private agents believe that the anti-inflationary monetary policy, which they have become accustomed to, will continue. Once this expectation of price stability is fixed and reflected in labor contracts that cannot be changed for this period, it is optimal for the central bank to defect from this policy. Now it is possible for the central bank to lower social costs from $C^{\kappa=0}(0)$ to $C^{\kappa=0}\left(\pi_T^{\kappa=0}\right)$. It will seize that opportunity and increase the growth rate of the monetary stock to stimulate economic activity and thereby employment.

In summary, changes in a central bank's optimal behavior are at the core of the term time inconsistency of optimal strategies, a situation introduced in the literature by Kydland and Prescott (1977). The incentive to

inflate is taken into account by private agents, who then force the central bank to raise the growth rate of the money supply even higher than the bank would have done by way of the trick equilibrium; the economy ends up in high-inflation equilibrium with the inflation rate $\pi_D^{\kappa=0}$.

III.5. Corrupt Monetary Policy

This section focuses on the case of a corrupt central banker. The following analysis is similar to the one conducted for the incorruptible central banker in the previous section. At the beginning of the analysis, the economy is in a stationary equilibrium and is in a state of price stability. In this model, if the central bank decides to follow a price stable path of monetary policy, the growth rate of the monetary stock *m* is equal to zero and there is no seigniorage income (see Equation (III.14)). In this equilibrium, the real national income and the inflation rate do not differ, regardless of whether the central banker is corrupt. The social costs of this equilibrium are the same as in the case of an incorruptible central bank, although the cost function of the corrupt central banker includes the bribe term.

If the central bank announces that it will continue this price-stable monetary policy in the next period, it will not seem credible to the private agents. To show that it is (at least temporarily) optimal for the central banker to increase the growth rate of the monetary stock *m* and thereby the inflation rate, the augmented social cost function of the central banker (III.14) is minimized to derive the inflation rate trick equilibrium for a corrupt central banker $\pi_T^{\kappa>0}$. The necessary condition for the trick equilibrium is that private agents believe the bank's announcement that it is aiming for price stability $\left(\pi_t^* = 0\right)$.

The initial step in finding the trick solution is the taking of the first derivative. This derivative can be transformed into the central banker's reaction function:

$$\frac{dC}{d\pi} = 2\pi + \frac{2\lambda}{\theta}\left(\frac{\pi - \pi^*}{\theta} - (n-1)\right) - \kappa k \frac{1+\theta}{\theta},$$

$$\Leftrightarrow \qquad \left(2\theta^2 + 2\lambda\right)\pi = 2\lambda\pi^* + 2\lambda\theta(n-1) + \kappa\theta k(1+\theta),$$

(III.21)$\Leftrightarrow$ $$\pi = \frac{2\lambda}{2\theta^2 + 2\lambda}\pi^* + \frac{2\lambda\theta(n-1) + \kappa\theta k(1+\theta)}{2\theta^2 + 2\lambda}.$$

Equation (III.21) is the central banker's reaction function to private inflation expectations. This reaction function contains the trick solution and the discretionary policy equilibrium. As stated previously, a necessary condition for the trick solution is an expected inflation rate of zero. Setting the variable π^* equal to zero yields the trick solution:

(III.22) $$\pi_T = \frac{2\lambda\theta(n-1) + \kappa\theta k(1+\theta)}{2\theta^2 + 2\lambda}.$$

This is the inflation rate that the central banker will set in cases where private agents can be tricked into believing that the price-stable initial equilibrium is the central bank's long-time commitment. If private agents believe that the realized inflation rate will be zero, it creates a situation ripe for exploitation by the central banker. Corruption (κ) increases the realized inflation rate in the trick equilibrium (see Equation III.22). The additional corrupt incentive induces the central banker to increase the growth rate of the monetary stock. The influence of corrupt deals on the central banker's decision is captured by the weight κ. If the central banker becomes more interested in the proceeds from corrupt deals, the weight κ increases. The influence of the bribe term is positive on the inflation rate in the trick equilibrium. Therefore, the inflation rate in this equilibrium increases in κ.

What is the corrupt, or opportunistic, central banker's rationale for raising the inflation rate? There are several factors that influence the corrupt central banker's objective function. While increasing the growth rate of the monetary stock will increase the real national income and therefore help meet the employment target, the high inflation rate clearly increases costs as the social costs of inflation soar. However, this is offset for the banker because he obtains additional income through bribery. Seeing that he has a very good chance of obtaining substantial employment gains by causing an unexpected drop in real wages due to higher inflation rates and that he also has some increased revenue from seigniorage, he chooses this option and therefore favors high inflation policies.

This additional corruption term leads to more mistrust in the central bank and its announcements. The traditional inflation bias introduced by

Kydland and Prescott (1977) is complemented with an additional corruption-induced inflation bias. Rational agents mistrust the central bank because they are fully aware that its actions are guided by the central banker's personal interests. This awareness allows them to avoid the central banker's obvious trap and they will estimate the central banker's strategy from his objective function. Setting the expected inflation rate π^* equal to π yields:

$$\pi = \frac{2\lambda}{2\theta^2 + 2\lambda}\pi + \frac{2\lambda\theta(n-1) + \kappa\theta k(1+\theta)}{2\theta^2 + 2\lambda},$$

$$\Leftrightarrow \qquad \pi\left(\frac{2\theta^2}{2\theta^2 + 2\lambda}\right) = \frac{2\lambda\theta(n-1) + \kappa\theta k(1+\theta)}{2\theta^2 + 2\lambda},$$

(III.23) $$\pi_D = \frac{2\lambda(n-1) + \kappa k(1+\theta)}{2\theta}.$$

Rationality in this context does signify that the private agents completely understand the incentives under which the central banker optimizes his strategy. This implies that the central banker cannot credibly commit to a course of action other than the one projected by the inflation rate of Equation (III.23).

Corruption or more precisely the central banker's preference for additional corrupt income strictly increases in κ. In this situation, a stronger preference for additional income from corrupt deals increases the inflation rate in the discretionary equilibrium. As shown by the studies on time inconsistency of optimal plans, a central bank that claims it is trying to serve the public by causing surprise inflation is not credible (cf. Section III.4). Private agents see through this claimed benevolence and force the central bank to fulfill their expectations. Thus, because the private agents are not deceived as to the bank's intentions, surprise inflation is not possible.

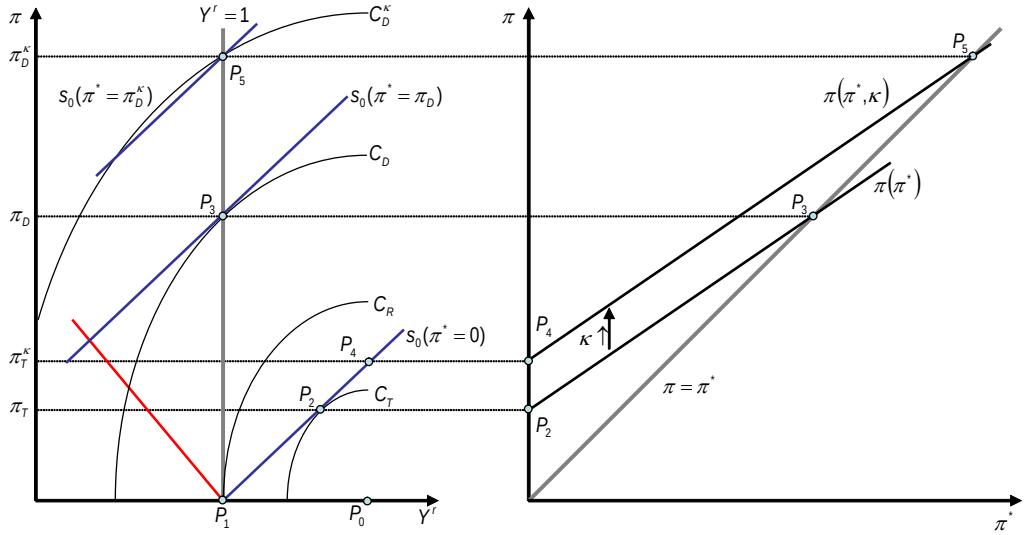


Figure III.2: Corruption in the Central Bank.

What impact does the corrupt central banker's decision have on the welfare of private agents? This question can be answered with the help of the two diagrams shown in Figure III.2. One diagram shows the demand and supply function and the public's objective function; the other is a graphical presentation of the central banker's reaction function and the geometrical location of all stationary equilibria, the $\pi = \pi^*$ – line. The necessary and sufficient condition for a stationary equilibrium is that the private agents' expectations are correct and they thus do not have to adjust their plans to correct planning mistakes. Although the fact that the corrupt incentive increases the inflation rate has already been discussed, the reaction function of the central banker must be scrutinized in further detail. The central banker's reaction function enables one to deduct the trick solution for the incorruptible as well as the corrupt central banker:

$$\pi = \underbrace{\frac{2\lambda}{2\theta^2 + 2\lambda}}_{\text{Slope}} \pi^* + \underbrace{\frac{2\lambda\theta(n-1) + \kappa\theta k(1+\theta)}{2\theta^2 + 2\lambda}}_{\text{Intercept}}. \tag{III.21}$$

The slope of the central banker's reaction function is not changed by inclusion of the corrupt incentive in the π^* / π – diagram. The income stemming from corrupt deals increases the inflation rate in both the trick and the discretionary equilibria because the reaction function's intercept

increases in κ. This shifts the reaction function upward and away from the diagram's origin. Combining the two diagrams yields important insight into the social costs stemming from corruption in the central bank.

The $Y^r / \pi -$ diagram is a graphical representation of the private agents' objective function. The social costs of the different equilibria are given by the iso-cost ellipses, which center on point P_0. This point denotes society's "point of bliss", which is when its demands for high employment and price stability are fully met. The costs to society at this point are zero. The further the iso-cost ellipses are away from the point of bliss, the higher are the corresponding social costs. Introducing the corrupt preference into the central banker's objective function shifts the central banker's reaction function upward in the $\pi^* / \pi -$ diagram.

Again, the corruption-free equilibria are given by the points P_2 and P_3, where P_2 denotes the trick solution and P_3 the discretionary equilibrium. The point P_1 indicates the initial price stability equilibrium. In the $Y^r / \pi -$ diagram, the tangential points of the relevant supply function and the relevant iso-cost line characterize the trick and the discretionary equilibria. Until this point, the graph shows the same results as did the analysis of the corruption-free situation. These findings are included for reference when analyzing the welfare costs due to corruption in the central bank.

If the corrupt incentive is added, which means the central banker is suddenly interested in additional income, the inflation rates increase beyond the values obtained in the corruption-free situation. The diagrams make it obvious that corruption in the central bank increases social costs.

The corrupt incentive causes an upward shift in the central banker's reaction function that reflects this change in the $\pi^* / \pi -$ diagram. This influence causes both inflation rates to be higher than in the corruption-free situation $\left(\pi_D < \pi_D^\kappa, \pi_T < \pi_T^\kappa\right)$. The intercept of the reaction function gives the inflation rate in the trick equilibrium P_4. It stands at the value of π_D^κ. The slope of the reaction function is not affected by the inclusion of the additional corrupt incentive. The discretionary equilibrium lies at the intersection of the line of stationary equilibria, the $\pi = \pi^* -$ line, and the corrupt central banker's

reaction function $\pi(\pi^*,\kappa)$. Because the slope of the reaction function is positive but smaller than 1, the location of the equilibrium for the corruption laden situation is shifted away from P_3, the discretionary equilibrium without corruption.

The second diagram (left-hand side of Figure III.2) enables one to assess the welfare implications of corrupt monetary policy. As in the $\pi^*/\pi-$ diagram, there exists a line of stationary equilibria. This is the ($Y^r=1$)-line. All stationary equilibria on this line mean that private agents do not have to reconsider their strategy, or, in other words, if the actual inflation rate meets the private agents' expectations, the resulting real national income reflects the natural rate. The equilibria are therefore stationary. If the corrupt preference weight κ takes on positive values, the inflation rate increases. The discretionary equilibrium is shifted upward on this line if the central banker is generating corrupt revenue, because the corruptibility of the central banker introduced an additional inflationary bias (see Equation III.23). The stronger the central banker's preference for additional income, the further outward the equilibrium is shifted. Because the social cost ellipses only reflect the costs of society, the corrupt central banker's trick solution and discretionary solution are no longer tangential points. The supply function, which gives the set of possible real income and inflation rate combinations for the given inflation expectation of $\left(\pi^*=\pi_D^\kappa\right)$, intersects the iso-cost ellipse at the point P_5.

The social costs increase because the location of the corrupt discretionary equilibrium P_5 is shifted further away from the point of bliss P_0 as compared to P_3, the corruption-free discretionary solution (see Figure III.2). An increased corrupt preference on the part of the central banker has onerous effects on society because society does not benefit from the revenue realized from corrupt dealing, but it does have to bear the costs of the resulting increased inflation rate.

III.6. An Extension of the Model: The Corrupt Central Banker Revisited

The central banker's additional income from corruption is modeled along the lines of the seigniorage. Normally, seigniorage models take for granted that real money demand decreases with inflation, resulting in a Laffer-curve effect for seigniorage revenue, which is a common assumption. As in Easterly, Mauro, and Schmidt-Hebbel (1995) or Mulligan and Sala-i-Martin (1997), economists normally assume that inflation tax revenue has properties similar to other tax revenue functions and thus assume a kind of Laffer-curve. To achieve a Laffer-curve for seigniorage revenue, money demand needs to decrease with higher inflation rates. This assumption can be supported if certain money demand functions are used in the model and, indeed, a money demand that decreases with higher inflation rates can be introduced into the present model. Doing so will yield interesting insights into the behavior of central bankers. Therefore, it is assumed that the money demand decreases with the rising inflation expectations of private agents. In the underlying model of Sections III.4, and III.5, demand in the goods market is a positive function of real money balances:

$$\frac{M_t}{p_t} = k_t \cdot Y^r .$$

To introduce a reduction in money demand caused by increased inflation expectations, π^*, into the present model, the parameter *k,* which relates the money demand to the real national income, must decrease in π^*:

(III.22) $$\frac{M_t}{p_t} = Y_t^r \cdot k\left(\pi^*\right), \qquad \frac{dk}{d\pi^*} < 0 .$$

How does this function work in the real world? Very often, countries with high inflation rates experience the phenomena of currency substitution. To protect themselves from the ongoing devaluation of the national currency, local residents start to keep their money in more stable, foreign currency units. However, this currency substitution must be a mutual affair: buyers and sellers must both consent to the use of one international currency as a substitute for the undesired local currency.

In the basic natural rate model, which includes the unmodified version of the corrupt central banker presented in Section III.4, the inflation

expectation always increased the inflation rate. Including a negative influence of the expected inflation rate on money demand changes this result. This negative dependency can bring about the situation that high, expected inflation rates have a disciplinary effect on the central banker. Utilizing Equation (III.22) and taking the derivative for π^*, I determine conditions for the effect of inflation expectations lowering realized levels of inflation:

$$\frac{d\pi}{d\pi^*} = \frac{2\lambda}{2\theta^2 + 2\lambda} + \frac{\kappa\theta(1+\theta)}{2\theta^2 + 2\lambda} k'_{\pi^*} < 0 \,,^{11}$$

$$\Leftrightarrow \qquad 2\lambda + \kappa\theta(1+\theta) k'_{\pi^*} < 0 \,,$$

$$\text{(III.23)} \Leftrightarrow \qquad \lambda < -\frac{\kappa\theta}{2}(1+\theta) k'_{\pi^*} \,.$$

What is the meaning of this constraint? A high level of mistrust from private agents as measured by high expected inflation rates forces the central banker to set lower inflation rates and, therefore, lower growth rates of monetary stock. The inflation-reducing effect of the inflation expectations will occur in the case of a central banker who has a low preference for the employment target. Using the expression coined by Rogoff (1985), one can say that a rather conservative central banker can bring about this inflation-reducing effect.

This use of mistrust to tame a corrupt and conservative central banker contradicts a common belief in the theory of monetary policy. Generally, economists regard trust in the institution of the central bank as one pillar of social capital. If the public realizes that the central banker is using his or her role as head of the central bank to further the banker's own goals, the public begins to mistrust the central bank. This mistrust according to the (International Monetary Fund 2000) might be predominately bad. The public has to have trust in the institutions of the central bank and its ability to conduct monetary policy. However, trust in the central bank is not an absolute value; trusting the wrong people or institution is not necessarily welfare enhancing. In the framework of the models on time inconsistent monetary policy, this trust exists only if the central bank publicly communicates the anti-inflation convictions of its staff or if it is bound by a rule to a predictable policy path.

The result given by constraint (III.23) turns this result around. The conservative and corrupt central banker is not trustworthy in the eyes of the public. Rational private agents understand the banker's self-centered basis for monetary policy, and a high expected inflation rate signifies their mistrust. In the modified version of the model, such mistrust can have a positive impact—the conservative and corrupt central banker is forced to set lower inflation rates. Although, ceteris paribus, the corrupt central banker has an incentive to raise the growth rate of the monetary stock and subsequently the inflation rate, inflation costs start to have an impact on the banker. The temporary employment stimulation from surprise inflation is of little solace because the central banker is only marginally interested in the employment rate.

The taming effect of mistrust does not apply to central bankers who care little about inflation. Following Guzzo and Velasco (1999), the so-called populist central banker is primarily interested in the creation of jobs. I add that if he or she is corruptible, the banker is also interested in the revenue to be generated from corruption. In the context of the present model, the weight λ must be larger than the constraint (III.23). Raising the employment level beyond its natural level will help the banker reach his or her goals.

III.7. Conclusions and Policy Recommendations

An inflation bias may arise not only when the public distrusts the central bank commitments but also when its benevolence comes under suspicion. The theoretical model of the corrupt central banker shows that corruption in the central bank can lead to distorted policy decisions. Influential powers outside the central bank might hinder it in performing its duties. As central bankers are offered more corrupt deals from the outside, and as the outside influence of corrupt political leadership forces the central bank to fulfill its demands, inflation rates increase. The credibility of anti-inflationary announcements is undermined by corruption among central bankers and by these outside influences. Even when rejecting the standard assumptions that the desired level of income is above its natural rate and that central bankers are tempted

[11] k'_{π^*} denotes the first derivative of the function $k(\pi^*)$ for the expected inflation rate, π^*.

by short-term employment gains, as is done by Blinder (1997: 13), an inflation bias can occur due to the nonbenevolence of the central bank.

The results derived from this model suggest a variety of policy recommendations. It appears that governments may face an uncomfortable choice between honest populists and corrupt central bankers. Low values for κ and λ are desirable from a theoretical point of view. Although an applicant for the job at central bank should be conservative and incorruptible, this combination is not necessarily available. In this situation, the government faces the dilemma of either choosing an honest populist who places a high value on employment, that is, his personal weight λ is high, which will result in a large inflation bias, or choosing a conservative who is known to be corruptible.

Huang and Wei (2003) argue that in a corrupt environment a populist is preferred because he or she is more likely to optimize seigniorage. But what happens when income from seigniorage is not passed on to the public but instead embezzled?

The same uncomfortable choice might arise for a constituency confronted in general elections with deciding between an honest populist and a corrupt conservative politician who will be able to exploit the central bank. It is straightforward that reducing corruption by lowering κ for both actors is always preferable. However, choosing between conservatism and honesty is a more arduous decision. Whether a populist performs better than a corrupt conservative largely depends on the parameter values of the model. Social welfare is described by the cost function—alas, this time without the corrupt income term. The employment term can be omitted because rational actors prevent equilibrium employment levels from reacting to the policymaker choices. Therefore, society ‘s choice will crucially depend on the level of discretionary inflation. A populist will be preferred if:

(III.24) $$2\lambda_p (n-1) + \kappa_p k (1+\theta) < 2\lambda_c (n-1) + \kappa_c k (1+\theta),$$

with subindices denoting the populist and the conservative actor. Rearranging yields:

(III.25) $$2(\lambda_p - \lambda_c)(n-1) < k(1+\theta)(\kappa_c - \kappa_p)$$

High values for θ or *k* imply that the society is better off with a populist. This results from the corrupt incentive created by high values of these parameters. A large value for the parameter *k* implies a large monetary stock and ample opportunity for a corrupt actor to increase his or her own lot—at the expense of raising the inflation bias. The central banker (or politician) is tempted to deviate from his or her public duties. Society prefers an honest banker (or politician) who can better resist these temptations, even if he or she is a populist. Large values for θ denote large increases in inflation as production increases or, vice versa, little possibility of raising production by deviating from announced inflation levels. A populist thus loses interest in raising inflation and is less threatening to society. In contrast, a corrupt conservative central banker retains his incentive. A large value of θ therefore distracts a corrupt actor from social goals, making populists preferable.

In contrast, societies with low money demand and little price flexibility will prefer a corrupt central banker to an honest populist. Societies with rigid prices and wages, for example, due to price and wage controls, may not be overly concerned about corruption among their leadership due to the fact that corruption rarely arises when there is little to be gained from it. Thus, in such a society, honesty is not so important.

Another implication of my results relates to central bank independence. Economists tend to trust central banks, at least more than they do elected governments, and believe that insulating central banks from political interference is helpful in fighting inflation. Even those who are critical with regard to the effectiveness of independence relate this more to the failure of achieving actual independence, rather than to intrinsic problems with the concept. Keefer and Stasavage (2002), for example, argue that independence fails to bring about favorable effects where governments can terminate independence at will. Even central bank accountability is sometimes looked upon with skepticism because it may be in conflict with central bank independence. But both independence and accountability may be inadequate safeguards where nonbenevolence of the central bank becomes an issue. Although providing central banks with a high level of independence will insulate them from troublesome political interference, such independence could also allow them the leeway to carry out self-seeking

transactions. Therefore, some checks and balances on central bank behavior could help to contain corruption and thus lower the inflation bias.

The secrecy that often surrounds central bank operations equally deserves scrutiny, especially if the secrecy is conducive to making deals that benefit only the central bank. This type of secrecy will result in public distrust of the institution, and thus, as modeled above, in the upward revision of inflation expectations. Concise codes of conduct and substantial legal sanctions for their violation are required to make central banks less willing to take the risks of malfeasance. This will require recognition of vulnerable areas and activities and an identification of conflicts of interest.

IV. Insider Trading Among Central Bankers: Should One Condone Corruption Among Central Bankers?

IV.1. Introduction

Corruption can influence monetary policy. As seen in the previous model, central bankers may start to serve their own ends and exploit their positions or, alternatively, become servants of the political leadership. The present chapter will further explore this influence of corruption or self-seeking on central bank decisions. The model will include stochastic shocks, which have an impact on monetary policy. These stochastic shocks enter the model from the supply side. This model will enable the central banker to gain from contractive monetary policy as well by devising a modified corrupt incentive that will provide the central banker with a payoff if he or she decides to lower the monetary stock.

This chapter is organized as follows. Two natural rate models, which incorporate stochastic supply side shocks, illustrate the policy decisions of a central banker who faces stochastic shocks. The first analysis centers on a corruption-free environment and derives the usual equilibria. Next, the modified corrupt incentive for central bankers is developed. This model is based on media reports of an actual corruption case in Bank of Japan in 1998 and a second case from the Brazilian central bank, cases that involve the selling of inside information by the central bank's staff. The model augments the known social objective function of capturing the effects stochastic supply shocks can have on monetary policy in a corrupt environment. The analysis will center on the derivation of the so-called discretionary equilibrium. After analysis of the economics of this equilibrium and an explanation of the central banker's motives, some policy-oriented conclusions are offered.

IV.2. A Basic Model of Stochastic Supply Shocks in a Natural Rate Model

The model used for this analysis is taken from the textbook presentation by Jarchow (2003). A similar model without the stochastic supply shocks is

employed by Lambsdorff and Schinke (2002). The model includes a macroeconomic supply function and demand function. The policy objectives of society (or the central bank) enter the model in form of a cost function, which relates the prevalent employment and inflation situation in the economy to the social costs that they cause. In the first period, private agents and their trade unions form their inflation expectations. The inflation rate as expected by trade unions and labor suppliers enters the wage negotiations between private agents and companies. This inflation expectation is fixed in the wage contract for the consecutive period, in this way bringing a nominal rigidity to the model. The companies determine their supply prices by markup pricing on the basis of average labor costs (see Equation (III.7) on page 38); they simply rollover the effects of an increased nominal wage into the prices. The companies accept the proposed nominal wage rate because they are not affected by any changes due to the markup pricing. This situation has been set out previously in Chapter *III*. Here, the supply function in Chapter *III* (Equation (III.10) on page 39] is changed by including a stochastic shock variable w. The stochastic variable has a normal distribution with a mean of zero and the variance, σ_w^2:

$$w \sim N\left(0; \sigma_w^2\right).$$

With the inclusion of the stochastic shock variable, the supply function is:

(IV.1) $$\pi_t = \pi_t^* + \theta\left(Y_t^r - \bar{Y}^r\right) + w,$$

(IV.1`) $\Leftrightarrow$ $$Y_t^r = \frac{\pi_t - \pi_t^*}{\theta} + \bar{Y}^r - \frac{w}{\theta}.$$

The supply function is positively sloped in a Y^r / π diagram. The shock variable w shifts the supply function in the diagram. If the value for w is negative, the shock expands the real national income. A positive value for w decreases real national income — and increases the inflation rate. An example of a positive supply shock would be a sharp rise in raw material or energy prices. This actually happened in the late 1970s and early 1980s during the first and second oil crises. OPEC increased the price of oil and as a result, production costs in oil-dependent Western economies rose dramatically, leading to a recession in several of these countries. The supply

function is shifted to the left by such a negative supply shock in the $Y^r / \pi -$ diagram. However, the supply shock does not necessarily have to be negative; expansive shocks can occur. Supply prices might fall due to the discovery of new deposits of natural resources.

The demand function of this model is the same as the analysis in Chapter III (see Equation (III.4) on page on 36):

(IV.2) $$Y_t^r = Y_{t-1}^r + \frac{m_t - \pi_t}{1+\pi_t}.$$

Equation (IV.2) shows the negative dependency of the real national income Y_t^r on the inflation rate of the same period. The function is negatively sloped in the $Y^r / \pi -$ diagram.

In deriving the demand function, the natural level of real national income was set to equal 1. This has direct implications for the supply function:

(IV.1) $$\pi_t = \pi_t^* + \theta\left(Y_t^r - 1\right) + w,$$

(IV.1`) $\Leftrightarrow$ $$Y_t^r = \frac{\pi_t - \pi_t^*}{\theta} + 1 - \frac{w}{\theta}.$$

As is common in natural rate models, the third element is the social objective function. This relates the prevalent employment and inflation situation to socially desired levels of employment and inflation $\left(\hat{Y}^r, \hat{\pi}\right)$. Deviations from these targets result in costs to society. If the target level for the inflation rate is equal to 0, which means that society prefers price stability, the objective function (see Equation (III.11)) is:

(IV.3) $$C = \pi_t^2 + \lambda\left(Y_t^r - \hat{Y}^r\right), \qquad \lambda > 0.$$

This cost function has the usual properties of a cost function used in analysis of the time inconsistency problem of monetary policy and is employed in similar variants in other papers (see Lohmann 1992; Waller 1992; Walsh 1995). The target level of real national income is assumed to exceeds the natural rate of the real income $\left(\bar{Y}^r = 1\right)$:

$$\hat{Y}^r = n, \qquad n > 1.$$

This target level assures that the central bank is motivated to use monetary policy to increase employment and thus the real national income, which it can do because of the nominal rigidity of wages and because the

central bank is able to adjust or change the growth rate of monetary stock at any time. Therefore, monetary policy has short-term effects on employment in this model.

These three functions—the supply function, the demand function, and the objective function—complete the macroeconomic natural rate model. In period ($t = 0$) the economy has achieved a stationary, price-stable equilibrium. There is no shock from the supply side of the economy $w = 0$ and the expected inflation rate equals the actual one. Real national income is equal to its natural level $\left(Y^r = \bar{Y}^r = 1\right)$. If real national income is at the natural level of 1, the inflation rate π_t equals the growth rate of the monetary stock m_t (see Equation (IV.2)).

The following analysis assumes a certain sequence of events. First, in the period $t = 0$, private agents form their inflation expectations. At this stage, they expect a shock from the supply side of the economy but they cannot be sure of the shock's type and strength. The model's rational agents take the shock into consideration and estimate its mean correctly, including this mean in their inflation expectation. This inflation expectation enters the wage negotiations and is fixed in the wage contract. After the wage contracts for period $t = 1$ are signed, the stochastic shock happens. The central bank monitors the situation and adjusts its monetary policy to cope with the shock, a manipulation that might surprise the private agents.

IV.3. Shock Treatment by an Incorruptible Central Bank

Imagine that the model economy experiences a contractive supply side shock in the next period. The central bank's reaction to this shock depends on the monetary policy regime.

If the central bank is bound by law to pursue a noninflationary monetary policy, it will be forced to set the growth rate of the monetary stock so as to guarantee price stability in the period immediately following the supply side shock. The main effect of such shocks is a lowered real national income. The price stability rule forces the central bank to adjust its growth rate of the monetary stock regardless of the consequences to the current employment situation. It will ensure that the inflation rate of the next period is equal to zero. This means for the real national income of this period:

(IV.4) $$Y_R^r = 1 - \frac{w}{\theta}.$$

The stochastic shock has a direct effect on real national income. Compared to the situation of no shocks, as in Jarchow (2003: 293–302) or the analysis laid out in Chapter III above, real national income is lowered by such a shock. The variance of the real national income is:

(IV.5) $$\text{var}\left(Y_R^r\right) = E\left[Y_R^r - E\left(Y_R^r\right)\right]^2,$$

$$\Leftrightarrow \quad \text{var}\left(Y_R^r\right) = E\left[1 - \frac{w}{\theta} - E\left(1 - \frac{w}{\theta}\right)\right]^2,$$

$$\Leftrightarrow \quad \text{var}\left(Y_R^r\right) = E\left[-\frac{w}{\theta}\right]^2,$$

$$\Leftrightarrow \quad \text{var}\left(Y_R^r\right) = \left(\frac{1}{\theta}\right)^2 E\left[w\right]^2,$$

(IV.5`) $$\Leftrightarrow \quad \text{var}\left(Y_R^r\right) = \frac{1}{\theta^2}\sigma_w^2.$$

The variance of the real national income in case of this strict price stability rule is given by Equation (IV.5`). There is a relationship between the variance of the shock variable *w* and that of the real national income in the rules equilibrium. Depending on the value of the coefficient θ, which captures the influence of real national income on the inflation rate, the real national income's variance is higher or lower than the variance of the shock variable.

For the purpose of comparing different policy regimes and their effectiveness in dealing with these supply shocks, the present analysis focuses on the mean of the social costs and on the variance of the real national income. Suppose that the central bank announces that it will pursue a price-stable monetary policy. It credibly commits itself to an inflation target of $\pi = 0$ for the next period. The social costs of the resulting price-stable equilibrium are:

(IV.6) $$E\left[C\left(Y_R^r, \pi_R = 0\right)\right] = E\left\{\pi^2 + \lambda \cdot \left[\frac{\pi - \pi^* - w}{\theta} - (n-1)\right]^2\right\},$$

$$\Leftrightarrow \quad E\left[C\left(Y_R^r, \pi_R = 0\right)\right] = E\left\{0 + \lambda \cdot \left[\frac{0 - 0 - w}{\theta} - (n-1)\right]^2\right\},$$

$$\Leftrightarrow \qquad E\left[C\left(Y_R^r, \pi_R = 0\right)\right] = \lambda \cdot E\left[\frac{-w}{\theta} - (n-1)\right]^2,$$

$$\Leftrightarrow \qquad E\left[C\left(Y_R^r, \pi_R = 0\right)\right] = \lambda \cdot \left[\frac{E\left(w^2\right)}{\theta^2} + (n-1)^2\right].$$

Because the mean of the squared shock variable *w* is equal to the variance of the shock variable, the mean of the social costs simplifies to:

(IV.7) $$E[C_R] = \lambda \cdot \left[\frac{\sigma_w^2}{\theta^2} + (n-1)^2\right].$$

The presence of the stochastic shock variable in this model increases social costs. As shown in the previous chapter, the social costs of this price stability rule equilibrium in the absence of stochastic shocks is equal to:

(III.15) $$C_R = \lambda(n-1)^2.$$[12]

This comparison between the price stability rule in a model without stochastic supply shocks and the model in this chapter shows that supply shocks directly increase the costs this policy to the public.

If the central bank has discretionary freedom regarding its policy decisions, it might use its new power to further the societal goals depicted in society's objective function (IV.3). In this case, it is important to keep in mind the time sequence of events. The players make decisions about their variables at different times, leading to some players having superior knowledge. The private agents move first. The central bank waits until the private agents' strategy is fixed and then moves.

In wage negotiations with companies, trade unions and private agents seek to keep their nominal wages constant. They form their inflation expectations π^* and include them in their wage demands. After both parties sign the contracts, the value of the inflation expectation is fixed. The next event in our time sequence is the supply shock. Only after the shock has hit will the central bank decide whether it will try to stabilize the economy.

The central bank is in a position to react to the stochastic supply shock by adjusting the growth rate of the monetary stock *m* and thus surprise the private agents because of the nominal rigidity of the wages. The central bank

[12] See Section III.4. Monetary Policy of an Incorruptible Central Bank.

and the general public share the same objective function (IV.3). The central bank will seek to minimize this function:

(IV.3') $$C = \pi^2 + \lambda\left(\frac{\pi - \pi^* - w}{\theta} - (n-1)\right)^2,$$[13]

(IV.8) $$\frac{d\ C}{d\ \pi} = 2\pi + 2\lambda\left[\frac{\pi - \pi^*}{\theta} - \frac{w}{\theta} - (n-1)\right]\frac{1}{\theta} = 0.$$

However, the central bank's behavior and its broader information base are common knowledge. The rational private agents include this information when they determine their inflation expectations. From Equation (IV.8) follows:

$$\pi + \lambda\left[\frac{\pi - \pi^*}{\theta} - \frac{w}{\theta} - (n-1)\right]\frac{1}{\theta} = 0.$$

Because Equation (IV.8) contains the stochastic shock variable *w,* the agents can optimize only their expectation of this equation—the mean:

(IV.8`) $$E(\pi) + \frac{\lambda}{\theta}E\left[\frac{\pi - \pi^*}{\theta} - \frac{w}{\theta} - (n-1)\right] = 0.$$

Equation (IV.8`) can be further simplified because the private agents` expectation of the inflation rate is equal to the expected inflation rate π^*, $\left(E(\pi) = \pi^*\right)$, the mean of the shock variable *w* is equal to zero $\left(E(w) = 0\right)$ and the mean of the constants $(n-1)$ and π^* is the value of these constants:

$$\Leftrightarrow \qquad \pi^* + \frac{\lambda}{\theta}\left[\frac{\pi^* - \pi^*}{\theta} - \frac{0}{\theta} - (n-1)\right] = 0,$$

(IV.9) $$\Leftrightarrow \qquad \pi^* = \frac{\lambda(n-1)}{\theta}.$$

In this case, private agents' expectations are the same as those set out in Chapter III when there were no stochastic supply shocks, which at first glance seems counterintuitive, but is, in fact, a highly rational and optimal reaction. To see this, one need to remember the time sequence of events. The expectation calculated in Equation (IV.9) is formed at a time when the agents do not know whether there will be a negative supply shock, a positive supply shock, or any shock at all, let alone how strong it might be. In this

situation, the private agents' only choice is to use the expected value of the shock variable *w*, which distribution they know from past experience. They realize that their best projection for the shock is the distributions mean:

$$E(w) = 0 .$$

To see how the central bank reacts to the expectations of the private sector and to the shock it has been monitoring, solution (IV.9) needs to be incorporated into Equation (IV.8'):

$$\pi + \frac{\lambda}{\theta}\left[\frac{\pi}{\theta} - \frac{\lambda(n-1)}{\theta^2} - \frac{w}{\theta} - (n-1)\right] = 0 ,$$

$$\Leftrightarrow \quad \theta^2\pi + \lambda\left[\pi - w - \frac{\lambda(n-1)}{\theta} - \theta(n-1)\right] = 0 ,$$

$$\Leftrightarrow \quad \pi(\theta^2 + \lambda) - \lambda w - \frac{\lambda^2(n-1)}{\theta} - \lambda\theta(n-1) = 0 ,$$

$$\Leftrightarrow \quad \pi(\theta^2 + \lambda) = \lambda w + \lambda(n-1)\left(\frac{\lambda}{\theta} + \theta\right),$$

$$\Leftrightarrow \quad \pi = \frac{\lambda w}{\theta^2 + \lambda} + \frac{\lambda(n-1)}{\theta^2 + \lambda} \cdot \frac{\theta^2 + \lambda}{\theta} ,$$

(IV.10)$$\Leftrightarrow \quad \pi_D = \frac{\lambda w}{\lambda + \theta^2} + \frac{\lambda}{\theta}(n-1) .$$

In the discretionary policy equilibrium, which is characterized by the inflation rate π_D, the central bank responds directly to the shock variable *w* and to the private agents` inflation expectations. In the case of a recessive supply shock (*w* > 0), the central bank raises the growth rate of the monetary stock *m* and thereby the inflation rate π_D. To evaluate this solution thoroughly it is necessary to calculate the level of the realized real national income. Inserting the private agents` expected inflation rate according to Equation (IV.9) and the inflation rate set by the central bank (IV.10) into the supply function, Equation (IV.1`), yields:

(IV.1`) $$Y_t^r = \frac{\pi_t - \pi_t^*}{\theta} + 1 - \frac{w}{\theta} ,$$

[13] The real national income in Equation (IV.3) is substituted for with the help of the supply function (IV.1').

$$\Leftrightarrow \qquad Y_D^r = \frac{1}{\theta}\left(\frac{\lambda w}{\left(\theta^2 + \lambda\right)} + \frac{\lambda\left(k-1\right)}{\theta} - \frac{\lambda\left(n-1\right)}{\theta} \right) + 1 - \frac{w}{\theta},$$

$$\Leftrightarrow \qquad Y_D^r = \frac{w}{\theta}\left(\frac{\lambda}{\left(\theta^2 + \lambda\right)} \right) + 1 - \frac{w}{\theta},$$

(IV.11)$$\Leftrightarrow \qquad Y_D^r = 1 + \frac{w}{\theta}\left(\frac{\lambda}{\theta^2 + \lambda} - 1 \right).$$

A comparison of real national income under a price stability rule

(IV.4) $$Y_R^r = 1 - \frac{w}{\theta}$$

and real national income in the case of a discretionary policy equilibrium shows that the central bank reduces the supply shock's effect on real national income and acts to stabilize the economy in the discretionary equilibrium. Furthermore, the stabilizing effect of the central bank's policy decision is highlighted by a decreased variance of the real national income as compared to the situation analyzed in the rules equilibrium. The variance of the real national income Y_D^r is:

(IV.12) $$\mathrm{var}\left(Y_D^r\right) = E\left(Y_D^r - E\left(Y_D^r\right)\right)^2,$$

$$\Leftrightarrow \qquad \mathrm{var}\left(Y_D^r\right) = E\left(\overline{Y}^r + \frac{w}{\theta}\left(\frac{\lambda}{\lambda + \theta^2} - 1 \right) - E\left(\overline{Y}^r + \frac{w}{\theta}\left(\frac{\lambda}{\lambda + \theta^2} - 1 \right) \right) \right)^2,$$

$$\Leftrightarrow \qquad \mathrm{var}\left(Y_D^r\right) = E\left(1 + \frac{w}{\theta}\left(\frac{-\theta^2}{\lambda + \theta^2} \right) - 1 - \frac{E(w)}{\theta}\left(\frac{\lambda}{\lambda + \theta^2} - 1 \right) \right)^2,$$

$$\Leftrightarrow \qquad \mathrm{var}\left(Y_D^r\right) = E\left(w\left(\frac{-\theta}{\lambda + \theta^2} \right) \right)^2,$$

$$\Leftrightarrow \qquad \mathrm{var}\left(Y_D^r\right) = \left(\frac{\theta}{\lambda + \theta^2} \right)^2 E\left(w - E(w)\right)^2,$$

(IV.12`)$$\Leftrightarrow \qquad \mathrm{var}\left(Y_D^r\right) = \sigma_w^2\left(\frac{\theta}{\lambda + \theta^2} \right)^2.$$

The central bank's stabilization policy has two positive effects on real national income: (1) it reduces the impact of recessive supply shocks and (2) it results in lower variance of real national income when compared to the variance in the case of a central bank bound by rule to price stability. As

shown in Equation (IV.5`), the variance in the case of a zero inflation policy is:

$$\text{(IV.5`)} \qquad \operatorname{var}\left(Y_R^r\right) = \left(\frac{1}{\theta}\right)^2 \sigma_w^2 = \left(\frac{\theta}{\theta^2}\right)^2 \sigma_w^2 .$$

However, this comparison of real national income and its variances under different policy regimes has focused solely on the employment target. For a thorough analysis of the effects of recessive supply shocks on the economy, the costs of the policy regimes in question must also take into account the social objective function. Because uncertainty enters this model via the inclusion of stochastic supply shocks *w*, social costs caused by policy regimes can be evaluated only by the mean of the social objective function:

$$E(C_D) = E\left(\frac{\lambda w}{\lambda+\theta^2} + \frac{\lambda}{\theta}(n-1)\right)^2 + \lambda E\left[1 + \left(\frac{-\theta}{\lambda+\theta^2}\right)w - n\right]^2 ,$$

$$\Leftrightarrow \qquad E(C_D) = \lambda^2 E\left(\frac{w}{\lambda+\theta^2} + \frac{(n-1)}{\theta}\right)^2 + \lambda(-1)^2 E\left[\frac{\theta}{\lambda+\theta^2}w + (n-1)\right]^2 ,$$

$$\text{(IV.13)}\Leftrightarrow \qquad E(C_D) = \lambda^2 E\left\{\frac{w^2}{\left(\lambda+\theta^2\right)^2} + 2\frac{w(n-1)}{\left(\lambda+\theta^2\right)\theta} + \frac{\left[(n-1)\right]^2}{\theta^2}\right\}$$

$$+ \lambda E\left\{\frac{\theta^2 w^2}{\left(\lambda+\theta^2\right)^2} + 2\frac{\theta w(n-1)}{\lambda+\theta^2} + (n-1)\right\}.$$

Using the properties of the shock variable's distribution, Equation (IV.13) can be further simplified to:

$$\Leftrightarrow \qquad E(C_D) = \frac{\lambda^2 E\left(w^2\right)}{\left(\lambda+\theta^2\right)^2} + \frac{\lambda^2(n-1)^2}{\theta^2} + \frac{\lambda\theta^2 E\left(w^2\right)}{\left(\lambda+\theta^2\right)^2} + \lambda(n-1)^2 ,$$

$$\Leftrightarrow \qquad E(C_D) = \sigma_w^2 \frac{\lambda^2+\lambda\theta^2}{\left(\lambda+\theta^2\right)^2} + (n-1)^2 \frac{\lambda^2+\lambda\theta^2}{\theta^2} ,$$

$$\text{(IV.14)}\Leftrightarrow \qquad E(C_D) = \lambda\left[\frac{\sigma_w^2}{\lambda+\theta^2} + (n-1)^2 \frac{\lambda+\theta^2}{\theta^2}\right].$$

A direct comparison of the two expected costs $E(C_D)$ and $E(C_R)$ cannot establish which regime is more costly. Society will prefer that the central bank be bound by law to a price-stable monetary policy if:

$$E(C_R) < E(C_D)$$

$$\Leftrightarrow \qquad \lambda \cdot \left[\frac{\sigma_w^2}{\theta^2} + (n-1)^2 \right] < \lambda \left[\frac{\sigma_w^2}{\lambda + \theta^2} + (n-1)^2 \frac{\lambda + \theta^2}{\theta^2} \right] \qquad \lambda > 0 \,,$$

$$\Leftrightarrow \qquad \frac{\sigma_w^2}{\theta^2} + (n-1)^2 < \frac{\sigma_w^2}{\lambda + \theta^2} + (n-1)^2 \frac{\lambda + \theta^2}{\theta^2} \,,$$

$$\Leftrightarrow \qquad \sigma_w^2 \left(\frac{1}{\theta^2} - \frac{1}{\lambda + \theta^2} \right) < (n-1)^2 \left(\frac{\lambda + \theta^2}{\theta^2} - 1 \right),$$

$$\Leftrightarrow \qquad \sigma_w^2 \frac{\lambda}{\theta^2 (\lambda + \theta^2)} < (n-1)^2 \frac{\lambda}{\theta^2} \,,$$

$$\text{(IV.15)} \Leftrightarrow \qquad \sigma_w^2 < (\lambda + \theta^2)(n-1)^2 \,.$$

Equation (IV.15) describes under what circumstances society would be better off with a binding policy rule. This rule bans the central bank from implementing policies aimed at creating employment gains. Society will find this situation preferable to a central bank endowed with discretionary freedom if the variance is not too big. The shocks are closely concentrated around the distribution's mean and the resulting impact on overall welfare is not too harsh. Under this scenario, an active central banker trying to stabilize output would bring about a worse welfare result.

If the shock variable is widely different from its mean, condition (IV.15) is not met. Large deviations in actual value of the shock variable *w* from its mean $(E(w) = 0)$ imply that the resulting change in real output will be very high. Because these changes always take the private agents by surprise, the results will always be a sharp drop (increase) in real wages in case of an expansive (recessive) shock. This general uncertainty about the employment situation and the possible devaluation of nominal wages will make society prefer that the central bank engage in active stabilization policies. The active central banker will try to cushion the effects of the shocks and thereby reduce the chance of unpredictable changes in real wages.

IV.4. Corrupt Central Banks—Some Evidence from the Media

The impact of stochastic shocks on monetary policy was analyzed in the previous section. The remainder of this chapter is dedicated to inquiring into what the impact of a corrupt central banker might be in an environment with stochastic shocks. The model has its roots in two corruption cases, which will

be presented first. The corrupt incentive of the central banker will be modeled on the basis of these cases.

The only available source of information on the first incident of corruption is the media and because this case is still being prosecuted in court, there is no actual proof that a corrupt act took place within the Brazilian central bank. Nevertheless, the information gathered from the media makes it plausible that a case of corruption did take place in the central bank in January 1998. At the time of the final revision of this analysis, a search for new material provided no new results and thus the outcome of the investigation and the subsequent trial are as yet unknown.

On February 2, 1998, the BBC News Service published a short notice on the Internet dealing with the surprise replacement of Francisco Lopes as governor of the Brazilian central bank. Mr. Lopes had held that position for only three weeks. Upon his appointment, he devalued the Brazilian currency, the Real, by 8% (BBC, February 2, 1999). Before the devaluation, Lopes gave advance notice of the new exchange rate to several private Brazilian banks, enabling them to profit from the “unexpected move” (BBC, April 14, 1999). Furthermore, a few days after the devaluation, Lopes sold dollars at favorable prices to the same banks. A Brazilian weekly news magazine quoted Salvatore Cacciola, an owner of one of the banks, as saying that he had a paid informant within the central bank. This informant would alert him to important events, such as changes of the interest rates or currency movements (BBC, April 26, 1999).

A raid on Lopes’s house by the Brazilian police revealed several documents showing that Lopes, while working as a public servant, had maintained close connections to a private consulting firm and had more than $1.5 million in a foreign bank account (BBC, April 26, 1999). One year later, in February 2000, Lopes was charged with fraud (BBC, February 3, 2000) and with maintaining a foreign bank account that he had not declared to the tax office or the central bank (BBC, January 20, 2001).

So, it appears that the central bank governor Lopes might have sold inside information to several private banks about his intended plan to devaluate the Real. Knowing in advance about this devaluation allowed these banks to “speculate” without any risk on the Real/Dollar exchange rate.

Because the Brazilian capital market is relatively small, it is assumed that the banks had to duplicate an option on the Real by means of credits, meaning that the banks would have to borrow money in Real and then exchange the loan sum into US dollars. After the announced devaluation, they changed their US dollars back into Real at the new, higher exchange rate. They repaid the loan and pocketed the difference between the loan sum and the amount of Real they got by exchanging their US dollars after the devaluation. Therefore, the money supply in the Brazilian economy rose due to the corrupt transaction. The value of the corrupt information is the amount of money the private banks “earned” in this transaction.

A second case concerning selling inside information from the Japanese central bank is equally enlightening. At the beginning of 1998, Japanese society was shocked by a major corruption scandal that involved the Bank of Japan (BoJ) and the Ministry of Finance (MOF), a scandal that led to the suicide of the BoJ’s chief director, Mr. Takayuki Kamoshida (BBC, May 2, 1998). The scandal gathered momentum on March 13, 1998, when the Tokyo police arrested Mr. Yasuyuki Yoshizawa (Japan Economic Institute, March 27, 1998), who was at that time head of the BoJ’s Capital Market Division and well connected to other important branches within the BoJ. Yoshizawa was one of the very few persons within the bank with permission to read the Tankan Report several days before its official publication. The Tankan is compiled by the Bank of Japan and contains important information on the Japanese business cycle and economy. The report is a very valuable source of information for analysts and brokers working in the Japanese stock markets (Die Presse: March 12, 1998) because it contains, among other things, details about the disposable income of Japanese households, car sales, and the development of the consumer price index.

However, Mr. Yoshizawa’s position at the center of the BoJ’s money market actions and his good connections to other important BoJ departments ensured that he had even more valuable information for someone working in the Yen business. He had inside knowledge on money market rates and tender amounts or planed exchange rate interventions by the BoJ. At dinner parties and golf outings, which were paid for by large Japanese investment

and commercial banks, Mr. Yoshizawa leaked these secrets to executives of the private banking sector and thus gave them advance knowledge of the BoJ's actions. These dinner and golf invitations from his sponsors were worth about €51,600 (Die Presse: March, 12, 1998). The sponsors included the Industrial Bank of Japan and the Sanwa Bank (Economist, March 12, 1998).

Mr. Yoshizawa was not the only person at the BoJ with such intimate ties to the private banking sector. After the scandal broke, the Bank of Japan began to investigate the behavior of some 600 of its employees, all of whom were from the management level, as was Mr. Yoshizawa (BBC, April 7, 1998). The majority of these employees were in charge of the allocation of funds to private banks (CNNfn, February 9, 1998). The chief director Kamoshida, also known as "Mr. Clean," disciplined about 100 of these employees for accepting entertainment and gifts from clients (BBC, May 2, 1998).

As shown by the need to discipline almost 100 staff members of BoJ, this information gathering by Japanese banking sector executives was systemic. Between them, the 146 largest banks in Japan had approximately 230 people employed as "BoJ handlers." It was the job of these handlers to maintain good relations with the Bank of Japan, meaning that these employees "entertained" BoJ personnel in order to obtain inside information (CNNfn, February 9, 1998). This knowledge advantage often triggered large transactions on the part of the private banks (Süddeutsche Zeitung, March 13, 1998).

Furthermore, failure to comply with demands made by the BoJ or its employees could result in severe punishment (LA Times, April 22, 1998). To punish these "uppity" banks, the BoJ would withhold liquidity or actively withdraw liquidity so that the "culpable" bank ran into problems fulfilling its capital requirements. The bank's management would then have to kowtow to BoJ in order to receive additional liquidity and beg for a bailout. This treatment was called "grilled chicken" or, in Japanese, "yakitori."

Süddeutsche Zeitung (March 13, 1998) reports one such yakitori incident. In 1991, the Tokai Bank from Nagoya sacked its vice-president after a series of scandals. Unfortunately, the vice-president was a former

employee of BoJ. In a move of alleged retaliation for firing the vice-president, BoJ, overnight, removed liquidity amounting to 100 billion Yen from the Tokai Bank, which was already struggling to meet its capital requirements.

These stories from Brazil and Japan illustrate that there are employees in the middle and higher ranks of a central bank's hierarchy who possess knowledge of value to persons in the private banking sector. In contrast to the corruption case discussed in Chapter III, corrupt dealing by these employees does not necessarily involve an increase in the money supply. Central bank employees can also profit from a restricted money supply. Prior knowledge of a tighter money supply—for instance, reflected by lowered tender amounts—is of value to private banks because they can engage in front running.

This model assumes that the central bank governor or an organized group of central bank employees (hereafter the "central banker") sells information on future money tenders. The corrupt central banker sells inside information concerning future monetary policy to the private banking sector. Like Mr. Yoshizawa in the case study, the corrupt central banker has information about the planned development of the money supply and is able to influence the decision on the money supply in this model. The size of the central bankers' bribe is related to the development of the monetary stock. If he or she keeps the money supply steady, there is no news to sell. If, however, the decision is made to lower the money supply, for instance, by reducing tender amounts, information about this decision will be as lucrative for the corrupt central banker as is information about an increased money supply.

The additional corrupt income that the central banker is trying to seize is modeled in largely the same way as the social objective function is modeled in the basic, corruption-free approach (see Equation (IV.3)). The value of the information the central banker has on offer depends on the real change of the monetary stock, $\left(\frac{M_t - M_{t-1}}{p_t}\right)$. If the incentive of additional income from corrupt inside deals were modeled in this simple form, the central banker would indulge in expansive monetary policies. Only an increase in the monetary stock would generate a positive extra income from corruption. However, the central banker does not discriminate between a supplementary

income that stems from an expansive monetary policy or from a restrictive one: the central banker is pleased to accept additional income, no matter how it has been achieved. He honors additional income regardless of its source if this incentive is squared. Either squaring the change in the monetary stock or using the absolute value of the change ensures that the central banker does not discriminate between the sources. However, the second approach renders solutions that do not easily lend themselves to economic interpretation, and so the first option was chosen for this analysis.

Winston (1979: 840–41) argues that the risk associated with corruption increases with the number of transactions, the number of people involved, the duration of the transaction, and the simplicity and standardization of the procedure. But the risk does not clearly increase with the *value* of a transaction. This suggests that large transactions are a superior base for demanding and arranging a bribe.

The weight κ measures the central banker's preference for additional income from selling inside information. In other words, it measures the extent of the central bankers' corruptibility. For κ approaching 1, the central banker will pocket the complete information rent. For κ approaching 0, the central banker is not able to take advantage of insider knowledge:

(IV.16) $$B^r = \kappa \cdot \left(\frac{M_t - M_{t-1}}{p_t} \right)^2 ,$$

$$\Leftrightarrow \quad \left(B^r\right)^2 = \left(\frac{M_t - M_{t-1}}{M_{t-1}} \frac{M_{t-1}}{p_t} \right)^2 .$$

Substituting for the growth rate of the monetary stock yields:

(IV.16`)$\Leftrightarrow$ $$\left(B^r\right)^2 = \left(m \frac{M_{t-1}}{p_t} \right)^2 .$$

The price level p_t in Equation (IV.16`) can be substituted for by applying the definition of the inflation rate:

$$\pi = \frac{p_t - p_{t-1}}{p_{t-1}},$$

$$\Leftrightarrow \quad \pi = \frac{p_t}{p_{t-1}} - 1,$$

$$\Leftrightarrow \quad p_t = (1+\pi) p_{t-1}.$$

The real bribe of the central banker changes to:

(IV.17) $$\left(B^r\right)^2 = \left(\frac{m}{(1+\pi)}\frac{M_{t-1}}{p_{t-1}}\right)^2 .$$

The growth rate of the monetary stock is given by:

(IV.2') $$m = (1+\pi)\cdot\left(Y_t^r - Y_{t-1}^r\right)+\pi .$$

Substituting for the growth rate of the monetary stock *m* and the price level p_t in Equation (IV.2') yields:

$$\Leftrightarrow \qquad \left(B^r\right)^2 = \left\{\left[(1+\pi)\cdot\left(Y_t^r - Y_{t-1}^r\right)+\pi\right]\frac{M_{t-1}}{p_{t-1}(1+\pi)}\right\}^2 ,$$

$$\Leftrightarrow \qquad \left(B^r\right)^2 = \left[\left(Y_t^r - Y_{t-1}^r + \frac{\pi}{1+\pi}\right)\frac{M_{t-1}}{p_{t-1}}\right]^2 .$$

Assuming that the inflation rate π stays within reasonable limits, the bribe term simplifies to:

$$\left(B^r\right)^2 = \left[\left(Y_t^r - Y_{t-1}^r + \pi\right)\frac{M_{t-1}}{p_{t-1}}\right]^2 .$$

Given the initial value of real national income set to 1, our demand function (III.2) implies $\frac{M_{t-1}}{p_{t-1}} = k$. Inserting this term yields:

(IV.18) $$\left(B^r\right)^2 = k^2\left(Y_t^r - Y_{t-1}^r + \pi\right)^2 .$$

Substituting for the real national income in period *t* according to Equation (IV.1) and assuming an initial equilibrium with $\left(Y_{t-1}^r = \overline{Y}^r = 1\right)$ yields:

(IV.19) $$\left(B^r\right)^2 = k^2\left(\frac{\pi - \pi^* - w}{\theta} + \pi\right)^2 .$$

In this model, the central banker's behavior is subject to three influences. Like everybody else, the central banker feels the negative effects inflation has on the purchasing power of his or her income and the negative effects of high unemployment on society's stability. These influences are captured by the social objective function, which was implemented in the underlying basic model. This function is now augmented by the corrupt income objective the central banker faces: additional income will soften the impact of high unemployment and rampant inflation for the central banker.

Therefore, the corrupt income as measured by Equation (IV.19) must be deducted from the costs arising from the other two influences. The corrupt central banker's cost function is:

$$\text{(IV.20)} \qquad K = \pi^2 + \lambda\left[\frac{\pi - \pi^* - w}{\theta} - (n-1)\right]^2 - \frac{\kappa k^2}{\theta^2}\left[\pi(1+\theta) - \pi^* - w\right]^2.$$

IV.5. Corrupt Central Bankers in a Stochastic World

Derivation of the augmented cost function (IV.20) completes the model of a corrupt central banker who sells inside information. The solution of this model follows the same rationale as for the underlying basic model discussed in Section IV.3. In this game, private agents have the first move. Again, they need to predict the future course of monetary policy and inflation under the presence of stochastic supply side shocks. Only after the private agents freeze their expectations by signing wage contracts with private companies, will the central banker decide on the optimal response under the given circumstances.

Optimization of private agents' inflation expectation takes place in the first period, $t = 0$. These rational private agents lack reliable information on the nature and the strength of the stochastic shock w, which, as far as they know, might hit the economy in the next period, $t = 1$. However, the private agents do have complete information on the incentives that influence the central banker's decisions. For their optimization, they use the augmented objective function of the corrupt central banker (IV.20). This means that private agents understand the central banker's corrupt incentive and its impact on the central bank's decisions:

$$\text{(IV.20)} \qquad K = \pi^2 + \lambda\left[\frac{\pi - \pi^* - w}{\theta} - (n-1)\right]^2 - \frac{\kappa k^2}{\theta^2}\left[\pi(1+\theta) - \pi^* - w\right]^2,$$

$$\frac{dK}{d\pi} = 2\pi + \frac{2\lambda}{\theta}\left[\frac{\pi - \pi^* - w}{\theta} - (n-1)\right] - \frac{2\kappa k^2}{\theta^2}(1+\theta)\left[\pi(1+\theta) - \pi^* - w\right] = 0,$$

$$\Leftrightarrow \qquad \pi + \frac{\lambda}{\theta}\left[\frac{\pi - \pi^* - w}{\theta} - (n-1)\right] - \frac{\kappa k^2}{\theta^2}(1+\theta)\left[\pi(1+\theta) - \pi^* - w\right] = 0.$$

Applying the mean to the first derivative of the augmented cost function (IV.20) and recalling that $E(\pi) = \pi^*$, $E(\pi^*) = \pi^*$ and $E(w) = 0$ yields:

$$\Leftrightarrow \qquad E(\pi)+\frac{\lambda}{\theta}E\left[\frac{\pi-\pi^{*}-w}{\theta}-(n-1)\right]-\frac{\kappa k^{2}}{\theta^{2}}(1+\theta)E\left[\pi(1+\theta)-\pi^{*}-w\right]=0\,,$$

$$\Leftrightarrow \qquad \pi^{*}+\frac{\lambda}{\theta}\left[\frac{\pi^{*}-\pi^{*}-E(w)}{\theta}-(n-1)\right]-\frac{\kappa k^{2}}{\theta^{2}}(1+\theta)\left[\pi^{*}(1+\theta)-\pi^{*}-E(w)\right]=0\,,$$

$$\Leftrightarrow \qquad \pi^{*}-\frac{\lambda}{\theta}(n-1)-\frac{\kappa k^{2}(1+\theta)}{\theta}\pi^{*}=0\,,$$

$$\Leftrightarrow \qquad \pi^{*}\left[\theta-\kappa k^{2}(1+\theta)\right]=\lambda(n-1),$$

$$\text{(IV.21)}\Leftrightarrow \qquad \pi^{*}=\frac{\lambda(n-1)}{\theta-\kappa k^{2}(1+\theta)}\,.$$

Let us assume, perhaps unrealistically, that the desire to strike a corrupt deal, κ , stays within reasonable limits. This implies that $\theta-\kappa k^{2}(1+\theta)>0$ —suggesting that the denominator is positive. Equation (IV.21) sets out the private agents' inflation expectations, which continue to include the usual inflation bias of the underlying, basic model, $\left(\pi^{*}=\frac{\lambda(n-1)}{\theta}\right)$. This bias stems from the central banker's preference for a rate of employment measured by the weight λ. However, in the present model, this traditional bias is aggravated if the central banker is perceived as corruptible. An increase in κ increases inflation, as can be derived from the first derivative of (IV.21):

$$\frac{d\pi^{*}}{d\kappa}=\frac{k^{2}(1+\theta)\lambda(n-1)}{\left[\theta-\kappa k^{2}(1+\theta)\right]^{2}}>0\,.$$

Due to their standard markup pricing procedures, the raised wage demands triggered by a higher expected inflation rate π^{*} do not have an effect on companies because they simply roll the higher costs into the prices charged. In the basic shock-free model discussed in Chapter III, this acts like a self-fulfilling prophecy. In the context of the present model, there is an additional factor influencing the central banker's decision: the shock variable *w*, which the private agents cannot predict.

To determine his or her optimal policy decision based on the objective function (IV.20), the central banker considers two dates (π^{*},w). Once the private agents complete wage negotiations with the companies, their inflation expectations π^{*} are fixed in the sealed wage contracts and are revealed to

the central bank. After this, the central banker receives precise information on the nature and strength of the supply side shock. The augmented cost function (IV.25) is optimized for the inflation rate π subject to the inflation expectation π^* and the shock w:

(IV.20) $$K = \pi^2 + \lambda\left[\frac{\pi - \pi^* - w}{\theta} - (n-1)\right]^2 - \frac{\kappa k^2}{\theta^2}\left[\pi(1+\theta) - \pi^* - w\right]^2,$$

$$\frac{dK}{d\pi} = 2\pi + \frac{2\lambda}{\theta}\left[\frac{\pi - \pi^* - w}{\theta} - (n-1)\right] - \frac{2\kappa k^2}{\theta^2}(1+\theta)\left[\pi(1+\theta) - \pi^* - w\right] = 0,$$

$$\Leftrightarrow \quad \pi\left[\theta^2 + \lambda - \kappa k^2(1+\theta)^2\right] = \lambda(\pi^* + w) + \lambda\theta(n-1) - \kappa k^2(1+\theta)\cdot(\pi^* + w),$$

$$\Leftrightarrow \quad \pi = \frac{\lambda\left[\pi^* + w + \theta(n-1)\right] - \kappa k^2(1+\theta)(\pi^* + w)}{\theta^2 + \lambda - \kappa k^2(1+\theta)^2},$$

$$\Leftrightarrow \quad \pi = \frac{\lambda\theta(n-1) + \pi^*\left[\lambda - \kappa k^2(1+\theta)\right] + w\left[\lambda - \kappa k^2(1+\theta)\right]}{\theta^2 + \lambda - \kappa k^2(1+\theta)^2}.$$

Inserting the inflation expectation (IV.21) yields:

(IV.22) $$\pi = \frac{\lambda(n-1)\left[\theta + \frac{\lambda - \kappa k^2(1+\theta)}{\theta - \kappa k^2(1+\theta)}\right] + w\left[\lambda - \kappa k^2(1+\theta)\right]}{\theta^2 + \lambda - \kappa k^2(1+\theta)^2}.$$

Using the private agents' inflation expectation (IV.21) further simplifies the inflation rate in the discretionary equilibrium (IV.22). From Equation (IV.21) follows:

(IV.21) $$\pi^* = \frac{\lambda(n-1)}{\theta - \kappa k^2(1+\theta)},$$

$$\Leftrightarrow \quad \lambda\theta(n-1) = \theta\pi^*\left[\theta - \kappa k^2(1+\theta)\right].$$

Using this term, Equation (IV.22) can be rewritten as:

$$\pi\left[\theta^2 + \lambda - \kappa k^2(1+\theta)^2\right] = \lambda(\pi^* + w) + \lambda\theta(n-1) - \kappa k^2(1+\theta)\cdot(\pi^* + w),$$

$$\Leftrightarrow \quad \pi\left[\theta^2 + \lambda - \kappa k^2(1+\theta)^2\right] = \lambda(\pi^* + w) + \theta\pi^*\left(\theta - \kappa k^2(1+\theta)\right) - \kappa k^2(1+\theta)\cdot(\pi^* + w),$$

$$\Leftrightarrow \quad \pi\left[\theta^2 + \lambda - \kappa k^2(1+\theta)^2\right] = \pi^*\left[\theta^2 + \lambda - \kappa k^2(1+\theta)^2\right] + \left[\lambda - \kappa k^2(1+\theta)\right]\cdot w,$$

(IV.22')$\Leftrightarrow$ $$\pi = \pi^{*} + \frac{\lambda - \kappa k^2 (1+\theta)}{\theta^2 + \lambda - \kappa k^2 (1+\theta)^2} \cdot w .$$

Equation (IV.22') shows the central banker's reaction to a given value of the shock variable *w* and the private agents' expected inflation rate, π^{*}. To ensure that this inflation rate is a true minimum of the augmented cost function, a second derivative test is necessary:

(IV.23) $$\frac{d^2 K}{d\pi^2} = 2 + \frac{2\lambda}{\theta^2} - \frac{2\kappa\gamma^2}{\theta^2}(1+\theta)^2 > 0 ,$$

$\Leftrightarrow$ $$1 + \frac{\lambda}{\theta^2} > \frac{\kappa\gamma^2}{\theta^2}(1+\theta)^2 ,$$

(IV.24)$\Leftrightarrow$ $$\frac{\theta^2 + \lambda}{\gamma^2 (1+\theta)^2} > \kappa .$$

The corrupt preference weight κ should not exceed this threshold (IV.24). In this case, Equation (IV.24) determines a minimum for the augmented cost function. If the corrupt incentive κ were to exceed this crucial value, Equation (IV.22') determines a cost maximum. Depending on the type of shock, the central banker either causes hyperinflation (positive shock) or endless deflation (negative shock). The following discussion concentrates on the cases where constraint (IV.24) is upheld.

Analysis of the underlying corruption-free model reveals that the uncorrupted central banker may attempt to stabilize the economy in the wake of supply shocks (see Section IV.3).[14] The first derivative of the time consistent solution (IV.10) for the shock variable is positive. This suggests that the central banker raises the inflation rate if the economy suffers from a contractive shock $(w > 0)$. Conservative central bankers who do not see a need to stabilize employment will refrain from changing the growth rate of the monetary stock or may even set negative growth rates. The strength of the

[14] The discretionary solution (IV.10) increases in *w*:

(IV.10) $$\pi_D = w\frac{\lambda}{\lambda + \theta^2} + \frac{\lambda(n-1)}{\theta},$$

$$\frac{d\pi_D}{dw} = \frac{\lambda}{\lambda + \theta^2}.$$

The incorruptible central banker always allows the inflation rate to increase. Even if his or her preference for the employment target, λ, is low, the banker will set an inflation rate that gradually becomes higher than that of a shock-free situation, as discussed in Chapter IV, Section IV.4. However, this does not necessarily accompany positive growth rates of the monetary stock.

banker's commitment to stabilization of real national income crucially depends on his or her commitment to the employment objective λ and on the size of the parameter θ, which captures the degree of openness of the economy.

If the additional corrupt incentive (IV.19) is added to the cost function, other reactions are possible. How will a corrupt central banker, intent on lining his or her own pockets, react to supply side shocks? Will the corrupt central banker still try to stabilize real national income or will self-interest induce him or her to behave pro-cyclically in regards to output stabilization? The terms pro-cyclical and counter-cyclical refer to the central banker's decision concerning the growth rate of the monetary stock *m*. A pro-cyclical reaction in the face of an expansive shock would be to lower the growth rate of monetary stock. A pro-cyclical reaction to a contractive supply shock would be to take action that will lower the real national income more than the impact of the shock would on its own. On the one hand, doing so will fight the inflationary tendencies built up by the supply shock; on the other hand, there will be an even greater contraction of real national income. To determine the possible reaction, the first derivative of the time consistent solution (IV.22) for the shock variable *w* is taken:

(IV.25) $$\frac{d\pi}{dw} = \frac{\lambda - \kappa k^2 (1+\theta)}{\theta^2 + \lambda - \kappa k^2 (1+\theta)^2}.$$

Judging from the derivative (IV.25), and the fact that this term might be negative, one cannot exclude possibility of pro-cyclical behavior on the part of the central banker. If a contractive shock $(w > 0)$ affects the economy, the corrupt central banker might lower the inflation rate. Because the money demand depends on the real national income, the corrupted central banker is able to bring about a change in money demand. This change in the money demand and therefore the equilibrium amount of money increases the value of the information he or she has on offer. For this pro-cyclical reaction to a given shock *w,* the derivative (IV.25) must be negative for given values of the coefficients *k*, θ and of the weights λ and κ in the central banker's objective function:

$$\frac{\lambda - \kappa k^2 (1+\theta)}{\theta^2 + \lambda - \kappa k^2 (1+\theta)^2} < 0.$$

Looking at Equation (IV.25), it is clear that there are two ways to prompt a pro-cyclical reaction to supply side shocks from the corrupt central banker. Either the denominator of the derivative (IV.25) is positive, in which case the numerator has to be negative, or if the denominator is negative, then the numerator has to be positive in order to bring about a negative derivative. To ensure that the discretionary solution gives a cost minimum, constraint (IV.24) must be met. Therefore, the denominator of (IV.25) is positive:

$$\theta^2 + \lambda - \kappa k^2 (1+\theta)^2 > 0 ,$$

$$\text{(IV.24)} \Leftrightarrow \quad \frac{\theta^2 + \lambda}{k^2 (1+\theta)^2} > \kappa .$$

Thus the case of a negative denominator in the derivative (IV.25) can be ignored. For a pro-cyclical reaction to given shocks, the numerator of the derivative has to be negative. From this requirement follows:

$$\text{(IV.26)} \qquad \kappa > \frac{\lambda}{k^2 (1+\theta)} .$$

However, disinterest in stabilizing the employment rate is not enough, alone, for a pro-cyclical reaction: the perceived corruptibility of the central banker must be high. To get a pro-cyclical reaction, the central banker needs to fulfill the constraints (IV.24) and (IV.26) simultaneously. Although the $\kappa-$value must be larger than the constraint (IV.26), at the same time it has to be lower than the value of constraint (IV.24) to ensure a cost minimum.

$$\text{(IV.27)} \qquad \frac{\lambda}{\gamma^2 (1+\theta)} < \kappa_{pro-cyclical} < \frac{\theta^2 + \lambda}{\gamma^2 (1+\theta)^2} ,$$

$$\Leftrightarrow \quad \lambda (1+\theta) < \theta^2 + \lambda ,$$

$$\text{(IV.28)} \Leftrightarrow \quad \lambda < \theta .^{15}$$

What is the economic rationale behind this behavior? In a nutshell, pro-cyclical behavior is an option only for conservative central bankers. The corrupted central banker must chart a course of action between pursuit of corrupt income from selling inside information and two other possibly

[15] Observe that the same condition results when imposing our restriction $\theta - \kappa k^2 (1+\theta) > 0$ from Equation (IV.21) jointly with $\kappa > \lambda / k^2 (1+\theta)$.

conflicting goals—price stability and a high level of employment. This is dilemma is reflected by the central banker's augmented cost function:

$$K = \underbrace{\pi^2}_{\substack{\text{Price Stability}\\ \text{Target}}} + \underbrace{\lambda\left[\frac{\pi-\pi^*-w}{\theta}-(n-1)\right]}_{\textit{Employment}\text{ Target}} - \underbrace{\frac{\kappa k^2}{\theta^2}\left[\pi(1+\theta)-\pi^*-w\right]}_{\substack{\text{Additional Income from}\\ \text{Corruption}}}. \tag{IV.20}$$

If the central banker is uninterested in the effects his or her policy will have on the employment situation, the value assigned to the weight λ is low and satisfies constraint (IV.28). This can induce the central banker to react pro-cyclically to supply shocks. In this situation, contributing to the shock could be an attractive option for the central banker under the given circumstances of (π^*,w). In the corruption-free situation, the conservative central banker $(\lambda<\theta)$ will reduce the growth rate of the monetary stock. Once corrupt, the conservative banker will continue to do so, but on a larger scale, which will result in larger changes in money demand of the private agents. The stronger change in the money demand renders the information the banker has to offer more valuable to the private banks. At the same time, the corrupt central banker has little interest in the output target due to his conservative convictions. Receiving a higher bribe from private bankers, based on the more valuable information, compensates the loss of social stability created by high unemployment. The resulting low inflation rate is an additional advantage.

This finding is supported by a simulation of the time consistent solution (IV.22). The results are illustrated in separate diagrams for two scenarios. Each scenario involves a different type of conservative banker: a "normal conservative" $(\lambda>0)$=1 and the ultra-conservative central banker $(\lambda=0)$. In the first stage of the simulation, the conservative central banker's reaction to given values of the shock variable *w* for different values for the corrupt incentive weight κ is simulated. These values fulfill constraint (IV.24). For the simulation of the time consistent solution, values for the parameters of the model were chosen that would bring about a range of $\kappa-$ values that goes from 0 to 1.

These parameters were employed to simulate how a conservative central banker—note that constraint (IV.28) is satisfied—would decide on monetary strategy in the presence of stochastic supply side shocks. The

upper diagram depicts the central banker's reaction to recessive and expansive shocks as well as to a shock-free environment. The lower diagram analyzes the impact of three different shocks (ranging from expansive to recessive) for varying values of the corrupt preference, κ. The results from this analysis are presented in the following two graphs.

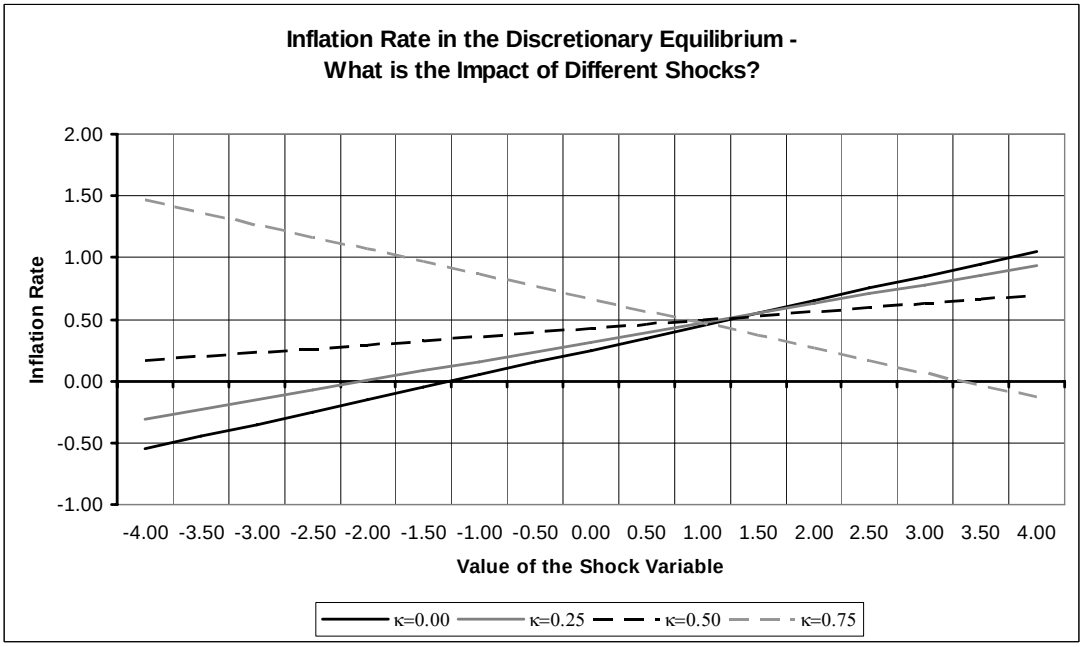
As can be seen from the time consistent solution (IV.22'), the supply shock influences the inflation rate linearly (cf. Figure IV.1). The incorruptible and conservative central banker $(\kappa = 0.00)$ always responds in the expected way. Deviations in the employment rate from the target value increase the incorruptible central banker's social costs. The banker attempts to reconcile the aims of price stability and employment stabilization according to personal preferences. However, once one allows the corrupt incentive to influence the central banker's decisions, his or her reaction becomes less oriented toward stabilizing shocks. With increasing κ, the slope of the central banker's reaction function gradually changes from negative to positive (see Figure IV.1). The conservative central banker will not try to stabilize the economy if he is highly corrupt $(\kappa = 0.75)$, because the benefits he or she is reaping, that is, a low rate of inflation and high income from bribery, more than compensate for the costs stemming a higher rate of unemployment.

Noncorrupt or mildly corrupt central bankers choose to cushion the economy from the shock by implementing counter-cyclical policies. In case of expansive shocks, they set low inflation rates; in a shock-free environment, they set a positive inflation rate.[16] Thus, a mildly corrupt central banker is not yet behaving pro-cyclically because his corrupt incentive is not strong enough. However, as the central banker becomes more corrupt, he or she becomes less interested in stabilizing real national income. The banker will allow larger output changes to increment the changes in the monetary stock. This is depicted by the still positive but less steep slope of the graph.

[16] Cf. Section IV.3. Shock Treatment by an Incorruptible Central Bank.

The simulation employed the following values:

λ	1.00	κ-range	0.00 - 1.00
k^2	0.56	n	1.50
θ	2.00		



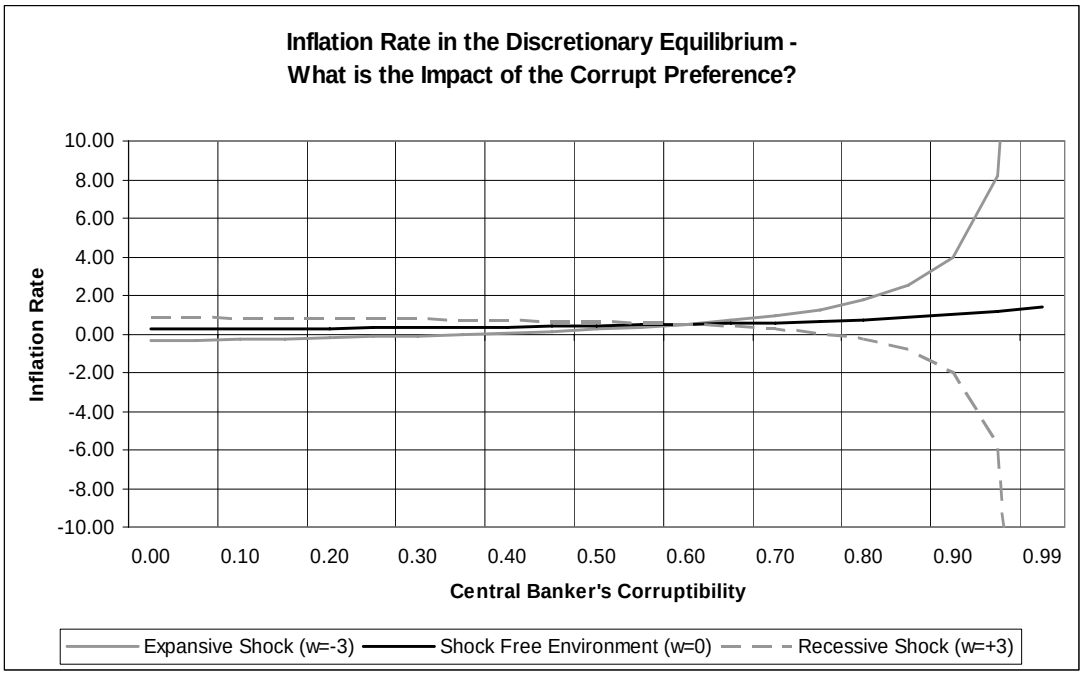


Figure IV.1: The Conservative Central Banker

The second simulation concentrates on the question of how increasing corruptibility of the central banker changes the inflation rate in the discretionary equilibrium given by Equations (IV.22) or (IV.22'). To this end, two different shocks and a shock-free environment are simulated. The shock-free environment serves as the reference situation, and illustrates that even in the absence of shocks, corruption tends to increase the inflation rate. This again supports the findings from the nonstochastic model analyzed in Chapter III, but for a different reason. In Chapter III, inflation was generated because corrupt income could be achieved only by increasing the money supply. Here, instead, the traditional inflation bias is aggravated. The standard inflation bias known since (Kydland and Prescott 1977) implies an increasing money supply. The outlook of a corrupt income further forces this increase.

In the case of shocks to the economy, the central banker's reaction changes from counter-cyclical to pro-cyclical. Although the mildly corrupt central banker still tries to soften the impact of the shocks to some extent, the highly corrupt conservative central banker reacts outright pro-cyclically. As can be seen from the simulation, the contractive shock induces the central banker to lower the inflation rate and—in the extreme case of κ reaching the end of its allowed range — to bring about a deflation. The higher the corruptibility of the conservative central banker, the less he or she will try to stabilize real national income.

This finding is further strengthened by the results of a simulation involving the ultra-conservative central banker. The traditional source of inflation bias in models of time inconsistent monetary policy has been removed by setting λ to 0. Removing the employment aim deletes a dilemma situation, under which the normal conservative central banker has to optimize his policy. The ultra-conservative central banker serves two reconcilable aims. Setting a negative growth rate of the monetary stock ensures low inflation rates and a high value of the inside information. Figure IV.2 provides the parameter values for the simulation. In the absence of any shock $(w = 0)$ that the central banker can take advantage of, the ultra-conservative central banker always sets the growth rate of the monetary

[17] Cf. Section IV.3. Shock Treatment by an Incorruptible Central Bank.

stock *m* equal to 0 and therefore maintains price stability. Even if the range exceeds the interval [0; 1], there is no change in the pro-cyclical reaction. In a shock-free environment, the central banker feels no need to change the inflation rate. Note, however, that this is because the relative importance of the corrupt income aim is lower as the "numeraire" aim of price stability because κ runs from 0 to 1.

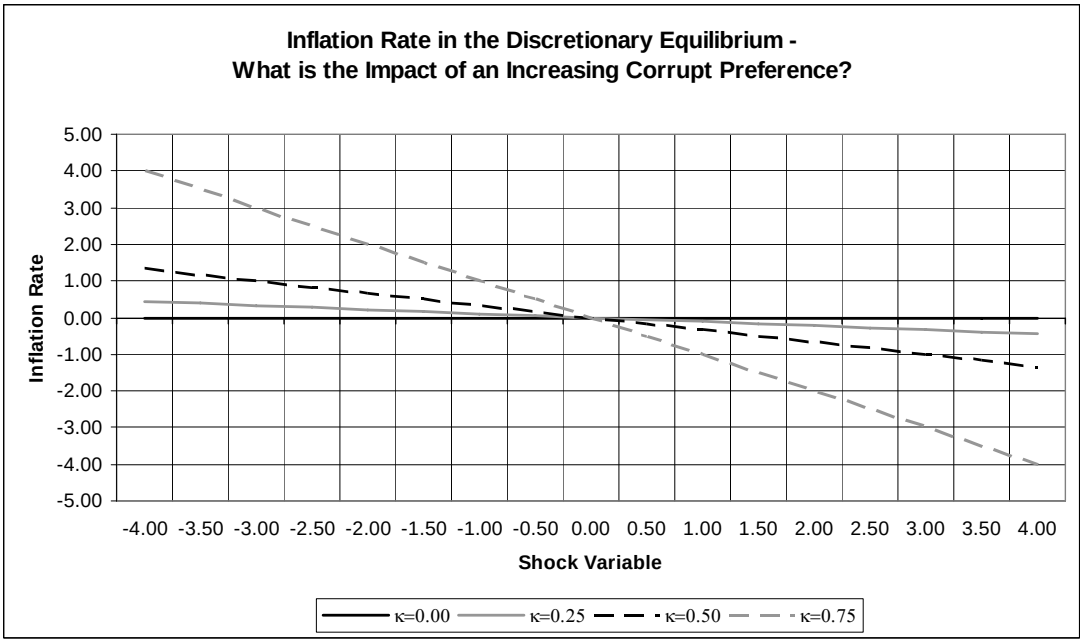
Fighting inflation and prospering from additional corrupt income are reconcilable aims. If there is a supply shock, the ultra-conservative corrupt central banker tries to take advantage of it in the only way possible, by adopting pro-cyclical monetary policy. The banker will work to control the inflationary or deflationary results of the shock. Fortuitously for the banker, this effort also means that he or she will be in possession of valuable information. Income derived from the sale of this information, however, will quite possibly begin to distort the banker's policy. The more interested in corrupt income he or she becomes, the more the banker will use policy tools to create situations that result in more information to be sold. This is depicted by the second graph of Figure IV.2. The increasing values of κ lead to higher inflation rates if the economy is subjected to an expansive shock.

These results offer striking insight into the nature of the conservative corrupt central banker. Modeling the corrupt incentive prompts a pro-cyclical reaction from the central banker. The corrupt income stems from changes in the real monetary stock $\left(M_t - M_{t-1}\right)$. By behaving pro-cyclically, the central banker increases the burdens society must bear and at the same time also increases the value of information he or she can sell.

Analyzing a completely self-serving central banker will provide further insight into the possibility of, and reasons for, pro-cyclical behavior on the part of the central banker. Suppose, the central banker is only committed to the generation of additional corrupt income by setting $\lambda = 0$ and the weight assigned to the price stability aim as well. This removes the income stability aim and the influence of the price stability aim from the objective function (IV.25).

The simulation employed the following values:

λ	0.00	κ-range	0.00 - 1.00
k^2	0.44	n	1.50
θ	2.00		



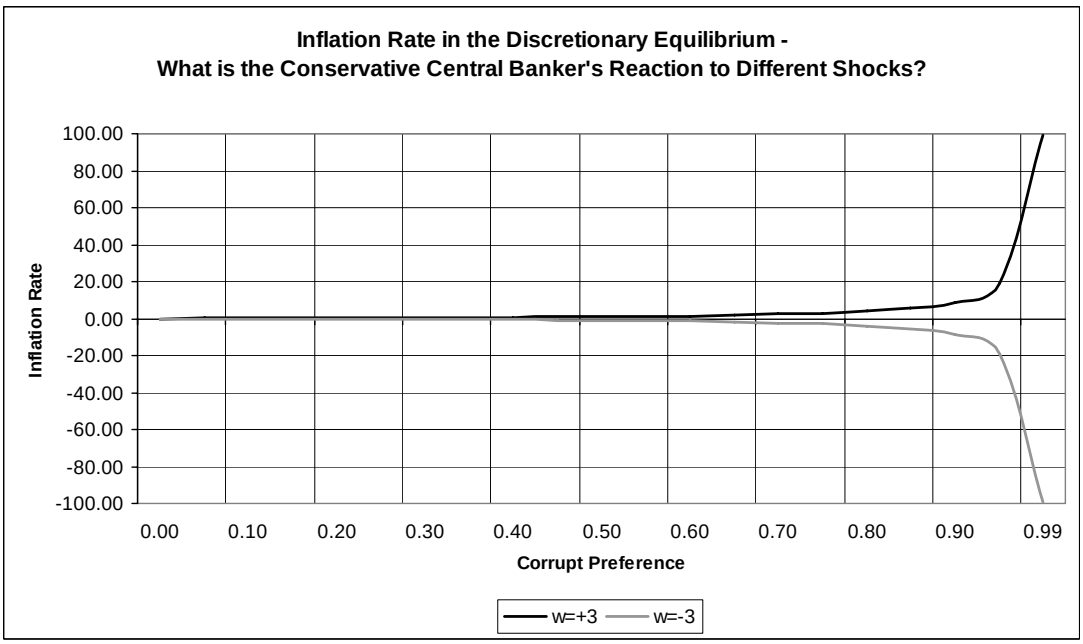


Figure IV.2: The Ultra-Conservative Central Banker

The central banker's objective function thus simplifies to:

(IV.11') $$U_S = \left(B^r\right)^2 = \frac{k^2}{\theta^2}\left[\pi(1+\theta) - \pi^* - w\right]^2 .$$

Equation (IV.11') is no longer a cost function. It now measures the central banker's utility U_S from the corrupt income he or she has accrued. To solve the model for this fully self-serving central banker, the same method outlined in Section IV.2 is used. The central banker uses the inflation expectation of the private agents π^* and the precise value of the shock variable *w* in the optimization of his or her strategy. Taking the first derivative of Equation (IV.11') for the inflation rate and applying the mean yields the inflation expectation of the private agents:

$$E\left(\frac{dU_S}{d\pi}\right) = \frac{2k^2(1+\theta)}{\theta^2} E\left[\pi(1+\theta) - \pi^* - w\right] = 0 ,$$

(IV.29) $$\pi^*(1+\theta) - \pi^* - 0 = 0 ,$$

$$\Leftrightarrow \quad \pi^* = 0 .$$

Again, private agents are handicapped due to their lack of accurate information on the impact of the shock, *w*. Thus, in their optimization, they use the best information they have, which is the shock variable's mean $\left(E(w) = 0\right)$. They fully expect that there will be a change in monetary policy if a supply side shock occurs but, due to their lack of information, they do not expect the inflation rate to change. The central banker's optimal response to shock *w* and the private agents' inflation expectation $\left(\pi^* = 0\right)$ is:

$$\pi(1+\theta) - \pi^* - w = 0 ,$$

$$\Leftrightarrow \quad \pi(1+\theta) = w ,$$

(IV.30) $$\pi = \frac{w}{1+\theta} .$$

Suppose a recessive supply side shock, $\left(w > 0\right)$, hits the economy. Figure IV.3 shows that the equilibrium characterized by the result (IV.30) lies at the intersection of the shifted supply function and a specific demand function.

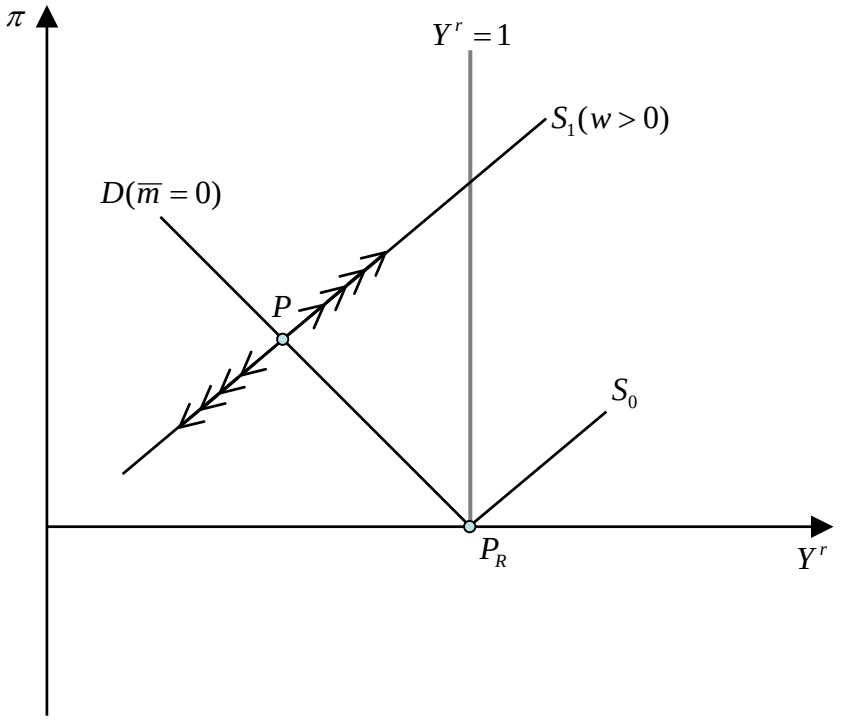


Figure IV.3: The Self-Serving Central Banker.

What are the properties of the given equilibrium? To decide whether the result (IV.30) represents a minimum or a maximum of the self-serving central banker's utility function, a second derivative test is necessary. This test shows that the solution is a minimum of the central banker's utility function:

$$\frac{d^2\left(B^r\right)^2}{d\pi^2} = \frac{2k^2(1+\theta)^2}{\theta^2} > 0.$$

Insight into the central banker's possible pro-cyclicity can be gleaned from this result. A fully self-centered and self-serving central banker will not profit from setting the inflation rate given in Equation (IV.30). Instead, setting the inflation rate either higher or lower than that projected by the minimum solution increases the corrupt central banker's utility, U_S. In Figure IV.3, this is indicated by the arrows pointing away from the location of the revenue minimum *P*. A deviation from the inflation rate $\frac{w}{1+\theta}$ in either way by the same amount will result in the same utility increase.

Per se, it cannot be determined decided which decision, increasing or decreasing the money supply, the completely self-serving central banker will take. The other interesting characteristic of this solution of a fully self-serving central banker will not change the growth rate of the monetary stock. The location of the equilibrium *P*, which is characterized by the inflation rate, $\frac{w}{1+\theta}$, can be denoted precisely in Figure IV.3. Inserting the solution (IV.30) and the private agents' inflation expectation (IV.29) into the supply function and remembering that $\overline{Y}^r = 1$, yields the resulting real national income of the equilibrium *P*:

(IV.31) $$Y_t^r = \frac{1}{\theta}\left(\frac{-w\theta}{1+\theta}\right)+1 = 1-\frac{w}{1+\theta}.$$

To derive the growth rate of the monetary stock that this central banker will set, one must substitute the real national income of the time consistent solution (IV.31) and the inflation rate (IV.30) into the growth rate of the monetary stock *m*, which is determined with the help of the demand function:

$$m = Y_t^r - 1 - \pi,$$

$$\Leftrightarrow \quad m = 1-\frac{w}{1+\theta}-1+\frac{w}{1+\theta} = 0.$$

If the fully self-serving central banker followed the policy projected by Equation (IV.30), it would result in a revenue minimum—or, more precisely, zero revenue—and a policy of no intervention. The banker would keep the initial growth rate of the monetary stock constant. Recall that the initial equilibrium is stationary and that the economy has achieved price stability—point P_R in Figure IV.3. However, a deviation from this policy will result in an increase in corrupt revenue. Only the most weak-hearted corrupt bankers would play it so safe and settle for the equilibrium set out in Equation (IV.30).

The possibility of an increase in corrupt revenue will drive more industrious central bankers away from the solution in *P*. Thus, the self-serving central banker could have either a pro-cyclical or a counter-cyclical reaction to a contractive shock. In case of a pro-cyclical reaction, the central banker sets a negative growth rate of the monetary stock and actively reduces the money supply. This policy has two effects. First, it reduces the

inflation rate and, second, it contributes to the contraction of real national income. Doing so would shift the initial demand curve $D(\overline{m}=0)$ to the left in Figure IV.3 and result in an equilibrium on the supply curve $S_1(w>0)$, which lies to the left of point *P*. If the central banker undertakes a counter-cyclical course of action in the wake of a recessive shock, he or she increases the growth rate of the monetary stock. This shifts the equilibrium to the right away from point *P* on the supply function $S_1(w>0)$.

The measure $(\lambda=\theta)$ derived in Equation (IV.28) allows a differentiation between the conservative type of central banker and the populist central banker because it also serves as a dividing line between the two political camps in the graphical presentation of the time consistent solution in a $Y^r/\pi-$ diagram. The case of $\lambda<\theta$ characterizes a conservative central banker. In Figure IV.4, the relevant equilibria of the conservative central bankers lie to the left of the $\lambda=\theta-$ line. The equilibria of populist central bankers lie to the right of this dividing line.

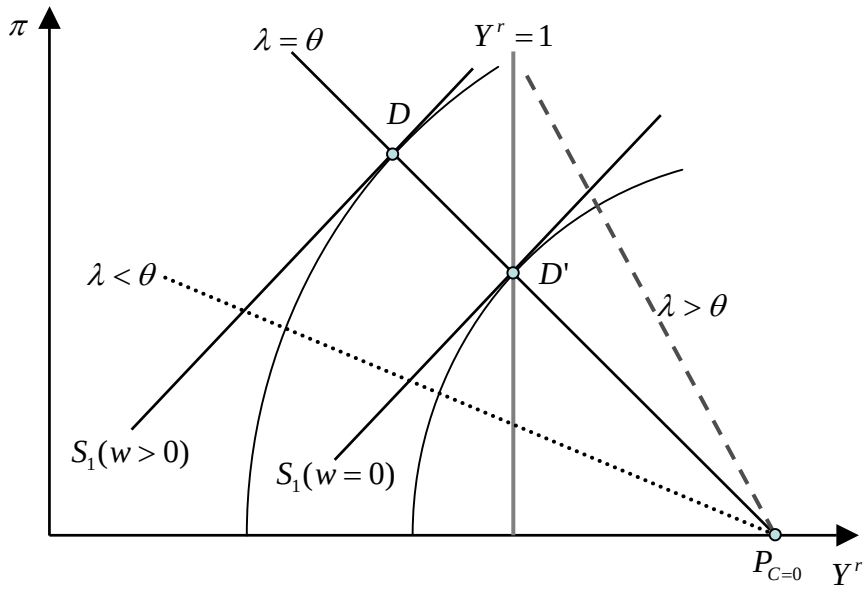


Figure IV.4: Incorruptible Conservative and Incorruptible Populist Central Bankers

Suppose, the society's value system is such that $\lambda=\theta$. If the central banker shares this view, he or she will choose not to change the growth rate of the monetary stock *m* in the wake of stochastic supply side shocks. If there

is an unexpected shock from the supply side (e.g., a sudden increase in the price of necessary raw materials), the central banker will not accommodate the economy by increasing the money supply, but instead will keep the growth rate constant. In this case, the time consistent solution in an environment with or without a supply side shock shares the same demand function, that is, the (noncorrupt) central banker sets the same growth rate of monetary stock *m* regardless of the shock. This can be shown in the following way. Setting the weight that captures the central banker's corrupt preference to 0 simplifies the time consistent solution (IV.22') to the inflation rate known from the underlying basic model (cf. Section IV.2):

(IV.10) $$\pi_D = \frac{\lambda w}{\lambda + \theta^2} + \frac{\lambda}{\theta}(n-1).$$

To derive the growth rate of the monetary stock *m* in the equilibrium *D* characterized by the inflation rate π_D, one has to determine the real national income of this solution, which is given by Equation (IV.11):

(IV.11) $$Y_D^r = 1 - w\frac{\theta}{\lambda + \theta^2}.$$

In this equilibrium, *D*, the central banker sets the following growth rate of the monetary stock:

$$m_D = Y^r - 1 + \pi_D,$$

$$m_D = 1 - w\frac{\theta}{\lambda + \theta^2} - 1 + \pi'_D + w\frac{\lambda}{\lambda + \theta^2},$$

$$m_D = \pi'_D - w\frac{\theta}{\lambda + \theta^2} + w\frac{\lambda}{\lambda + \theta^2}.$$

If $\lambda = \theta$, the growth rate of the monetary stock equals:

$$m_D = \pi'_D, \quad \text{with } \pi'_D = \frac{\lambda}{\theta}(n-1).$$

Thus, the two equilibria *D* and *D'*—the corruption-free situation with and without stochastic supply side shocks—are on the same demand curve if $\lambda = \theta$. *D* and *D'* represent cost minima of the same set of iso-cost ellipses, which are grouped concentrically around the focal point $P_{C=0}$—the point of bliss. Therefore, it follows that this demand curve also intersects with the focal point of the cost ellipses $P_{C=0}$. This is because the supply curves, $S(w>0)$ and $S(w=0)$, are parallel and *D* and *D'*, respectively, are tangential

points of the same set of concentric iso-cost-ellipses with the relevant supply function, a situation illustrated in Figure IV.5. The $\lambda = \theta -$ line intersects with the equilibria *D, D'*, and the focal point $P_{C=0}$.

Following the argument from the time consistent solution for a corruptible central banker in the model with stochastic supply side shocks, a central banker will have a pro-cyclical reaction to shocks if $\lambda < \theta$ (see constraint (IV.28)). The trick solution and the discretionary solutions for the shock-free and the shock-laden environment lie on a path originating from the center of the concentric iso-cost-ellipses. One can differentiate between paths of equilibria for conservative and populist central bankers who are not yet corrupt. The path of equilibria of a conservative central banker lies below the black $\lambda = \theta -$ line.

In Figure IV.4, the ellipses represent the social objective function of the society the central banker is supposed to serve. Let us assume that the preferences of society are such that $\lambda = \theta$. *D* and *D'* are the respective optima for the situation with or without a contractive supply side shock. Central bankers are either more conservative or more populist than the society they serve. The dividing line between conservatives and populists is presented in the figure by the path of optima—the $\lambda = \theta$-line. If society were to hire a central banker more conservative than itself, the path of optima lies beneath the $\lambda = \theta$ line. This case is depicted by the dotted $\lambda < \theta -$ line. The ellipses of a conservative central banker are compressed as compared to those of the overall society. The tangential point of the conservative incorruptible central banker's iso-cost-ellipses and the relevant supply curve is reached at a lower inflation rate. The opposite holds true for an incorruptible populist central banker. This case is presented by the intersected $\lambda > \theta -$ line. Combining the findings of Figures IV.3 and IV.4 explains the possible pro-cyclicity of a corrupt central banker.

The preference set of society, in which $\lambda = \theta$, provides the dividing line between conservative and populist central bankers. A central banker who is more conservative than the overall society will choose an equilibrium on the supply curve $S(w > 0)$ that lies to the left of the point D. The area is marked by the light-gray shade in Figure IV.5. This result holds true regardless of whether the central banker is corrupt. An optimum of a populist

central banker lies in the dark-gray area on top of the demand function, $D(m=\pi_D)$. It will lie on the shifted supply function, $S(w>0)$.

In the case of a populist central banker, the instability will induce him to increase the inflation rate to even higher values than he would without receiving a bribe. As a result from appointing this corrupt central banker, society will end up in an equilibrium, which lies to the right of equilibrium *D* in *Figure IV.5*. Form the figure it is straightforward to see that from the viewpoint of society all equilibria brought about by the populist central banker result in increased costs from not meeting society's inflation and employment objectives. For the given societal preference and the given contractive shock, the cost minimum is denoted by the equilibrium *D*. Deviation from this equilibrium results in higher costs to society. This result is only true if there is a shock. The discussion of the social costs incurred by society has to take into account that the shocks are stochastic.

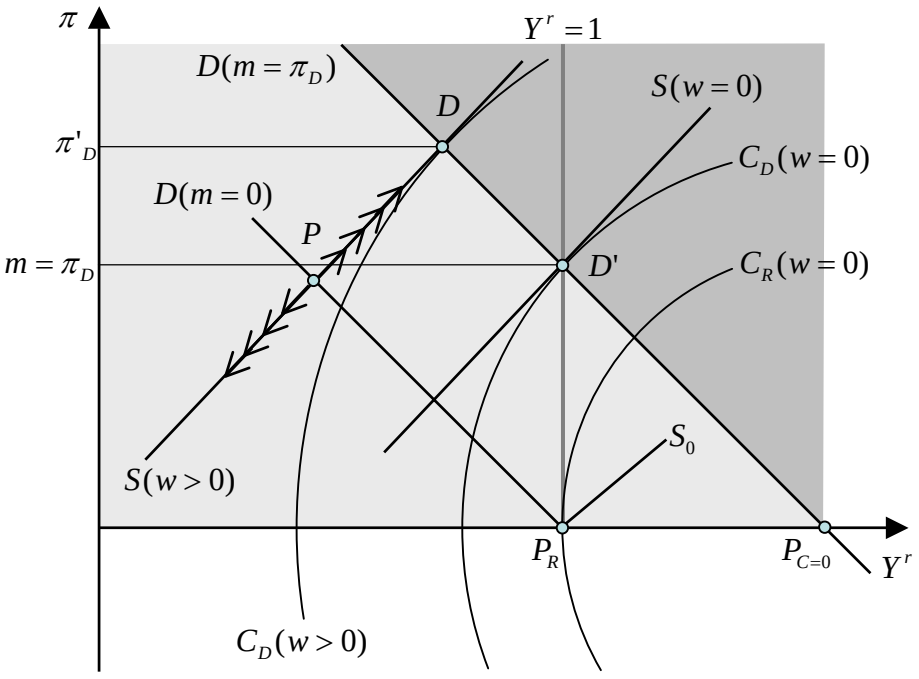


Figure IV.5: Shock Treatment by Corrupt Central Bankers.

Why do both noncorrupt and corrupt populist bankers react this way? Populist central bankers put a high priority on high employment rates and see

price stability as less important. To obtain a high employment rate, the central banker will increase the growth rate of the monetary stock. Adding the corrupt incentive does not fundamentally change the central banker's behavior. The corrupt income incentive and the incentive to generate a high rate of employment both work in the same direction. The additional income from increasing the growth rate of the monetary stock over its initial level of $(m = 0)$ and the resulting employment gains compensate for the adverse effects from increased inflation. Corruption generally induces the populist central banker to set higher growth rates of the monetary stock. Thus, corruption in the stochastic model again introduces a policy distortion. In public, the corrupt populist central banker will place a great deal of importance on the employment target. The banker will stress the necessity of an active monetary policy directed at employment gains, while in reality the banker has more private motivations concerned with the resulting flow of corrupt income.

The behavior of conservative corrupt central bankers is not so easy to explain. One complication is that there are two types of corrupt conservatives—the moderate conservatives and the orthodox conservatives.

The moderates are more conservative than society as a whole because they fulfill constraint (IV.28). By their own volition, they choose an equilibrium that lies between *P* and *D* on the shifted supply function $S(w > 0)$ regardless of their possible corruptibility. In this situation, corruption might actually benefit society. The instability of the bribe term means that the corrupt incentive induces the central banker to increase the inflation rate, thus bringing the equilibrium closer to *D,* which is the optimum for society. The disutility stemming from the high inflation rate of the possible equilibria on the supply function $S(w > 0)$ between *P* and *D* is offset by additional income generated from inflating the money supply.

The second group of conservatives are the fundamentally, or orthodox, conservative central bankers.[18] Faced with the contractive shock depicted in Figure IV.5, these conservatives choose to set negative growth rates of the monetary stock $(m < 0)$. They stress the necessity of anti-inflation policies to

combat the inflation-raising effects of the supply shock. Again, the shock is used to disguise the central banker's true intentions. Actively contracting the money supply will not only lower the inflation rate and stem the inflationary tide, it will also provide the central banker with valuable information to sell.

Figure IV.5 illustrates the welfare effects a corrupt populist central banker has on society if a shock happens. The negative welfare impact created by an incorruptible central banker who does not share society's view on the employment target is known and standard in the literature; however, the corrupt incentive creates an additional welfare effect. Because corruption induces further increases in the growth rate of the monetary stock, society's welfare is negatively affected by the corrupt dealing of a populist central banker. The bribe term drives the equilibria to the right—away from society's optimum in *D*. In Figure IV.5, the arrows that point to the right indicate the shift of the equilibrium. Corruption creates a policy distortion.

The same adverse effect of corruption on welfare might arise if the central banker is a conservative. As previously mentioned, the conservative central banker's optimal equilibrium lies on the shifted supply curve to the left of *D*. The welfare implications of the corrupt central banker's deals depend on the conservative central banker political stance toward a given contractive supply shock.

Conservatives will allow lower growth rates of the monetary stock than their populist colleagues only if their decisions solely depend on inflation and employment targets. As compared to the "weak-hearted" equilibrium in *P* of Figure IV.5, the conservative central banker might opt for equilibria with higher or lower inflation rates. If the relevant path of optima intersects with the shifted supply curve in the segment between points *P* and *D*, the corrupt incentive might actively contribute to social welfare. Adding the corrupt incentive influences this group of conservatives in the same way as it does the populists. The conservative central banker's time consistent solution is driven toward the social optimum in *D*. In this situation, corruption may actually benefits social welfare. But never forget that these central bankers are no saints; they will exploit the situation to their own benefit. If the shock is

[18] The ultra-conservative central banker ($\lambda = 0$) as used in the simulations above is an extreme example of this group.

sufficiently large, they will opt for a policy that makes the shock more onerous by actively reducing the monetary stock, $m < 0$.

If the conservative central banker's path of optima intersects with the shifted supply curve to the left of *P*, the conservative, acting of his or her own volition and without the corrupt incentive, will set a negative growth rate of the monetary stock. Adding the corrupt incentive shifts the time consistent solution to the left, further away from point *P*. Further shrinking of the monetary stock increases the conservative central banker's corrupt revenue, which will compensate the banker for the increased costs from lowered employment that result from this policy. Thus, whether conservative corrupt central bankers will react pro-cyclically or counter-cyclically largely depends on the scale of the shock.

IV.6. The Question of Social Costs Revisited

The question of which central banker is best for society in the case of a shock is answered with the help of Figure IV.5 in favor of the mildly conservative central banker. A concise evaluation needs to address the stochastic nature of the shocks. In this context, one usually refers to the expected costs that society incurs from monetary policy. In the case of the present model, one must not lose sight of the fact that the central banker and overall society may not necessarily share the same views on the necessity of stabilization policies. This section addresses the issue of whether it possible for central bank corruption to be beneficial to society, by which is meant that society benefits from the decisions of a corrupt central banker who does not share its views on the importance of employment gains. Thus, one must differentiate between society's views on the relative importance of employment gains in the social cost function (IV.3), λ_S, and the views of the corrupt central banker, λ.

> *Proposition: In a world where central bankers seek a compromise between their own moderate levels of preference for employment* $\lambda = \theta$ *and more extreme preferences by society* λ_S *such that* $\lambda_S < \lambda < \theta$ *or* $\lambda < \lambda_S < \theta$*, society might allow a nonzero level of corruption of the central bank, that is* $\kappa > 0$*.*

An examination of Figure IV.5 reveals that this proposition would be relevant in the case where the economy suffers a positive shock (a shift of the supply function to the left). A conservative central banker would exacerbate output fluctuations. Given a large shock, corruption causes the central banker to decrease the money supply, acting more in line with society's ultra-conservative desires. However, would this still be the case where the shock *w* is unknown?

Proof: Society seeks to minimize the expected costs according to function (IV.3), which can be expressed as:

$$C = \pi^2 + \frac{\lambda_S}{\theta^2}\left(\pi - \pi^* - w - \theta(n-1)\right)^2.$$

This time, we allow society's preference for employment, λ_S, to differ from that of the central bank.

Inserting $\pi = \pi^* + \frac{\lambda - \kappa k^2(1+\theta)}{\theta^2 + \lambda - \kappa k^2(1+\theta)^2} w$ and $\pi^* = \frac{\lambda(n-1)}{\theta - \kappa k^2(1+\theta)}$, one obtains:

$$C = \left[\frac{\lambda(n-1)}{\theta - \kappa k^2(1+\theta)} + \frac{\lambda - \kappa k^2(1+\theta)}{\theta^2 + \lambda - \kappa k^2(1+\theta)^2} w\right]^2 + \frac{\lambda_S}{\theta^2}\left[\frac{\lambda - \kappa k^2(1+\theta)}{\theta^2 + \lambda - \kappa k^2(1+\theta)^2} w - w - \theta(n-1)\right]^2.$$

Rearranging and determining the expected value yields:

$$E(C) = \left[\frac{\lambda(n-1)}{\theta - \kappa k^2(1+\theta)}\right]^2 + \left[\frac{\lambda - \kappa k^2(1+\theta)}{\theta^2 + \lambda - \kappa k^2(1+\theta)^2}\right]^2 \sigma_w^2 + \frac{\lambda_S}{\theta^2}\left[\frac{\kappa k^2(1+\theta)\theta - \theta^2}{\theta^2 + \lambda - \kappa k^2(1+\theta)^2}\right]^2 \sigma_w^2 + \frac{\lambda}{\theta^2}\left[\theta(n-1)\right]^2,$$

$$\Leftrightarrow \quad E(C) = \frac{\left(\lambda - \kappa k^2(1+\theta)\right)^2 + \lambda_S\left(\kappa k^2(1+\theta) - \theta\right)^2}{\left(\theta^2 + \lambda - \kappa k^2(1+\theta)^2\right)^2}\sigma_w^2 + \frac{\lambda}{\theta^2}\left[\theta(n-1)\right]^2 + \left[\frac{\lambda(n-1)}{\theta - \kappa k^2(1+\theta)}\right]^2.$$

The first derivative gives the impact of a marginal increase in κ on social costs:

$$\frac{dE(C)}{d\kappa} = \frac{\lambda^2 (n-1)^2 2\left(\theta - \kappa k^2 (1+\theta)\right) k^2 (1+\theta)}{\left(\theta - \kappa k^2 (1+\theta)\right)^4}$$

$$+ \frac{\left(\theta^2 + \lambda - \kappa k^2 (1+\theta)^2\right)^2 \left[2\left(\lambda - \kappa k^2 (1+\theta)\right)\left(-k^2 (1+\theta)\right) + 2\lambda_S \left(\kappa k^2 (1+\theta) - \theta\right) k^2 (1+\theta)\right]}{\left(\theta^2 + \lambda - \kappa k^2 (1+\theta)^2\right)^4} \sigma_w^2$$

$$- \frac{\left[\left(\lambda - \kappa k^2 (1+\theta)\right)^2 + \lambda_S \left(\kappa k^2 (1+\theta) - \theta\right)^2\right] 2\left(\theta^2 + \lambda - \kappa k^2 (1+\theta)^2\right)\left(-k^2 (1+\theta)^2\right)}{\left(\theta^2 + \lambda - \kappa k^2 (1+\theta)^2\right)^4} \sigma_w^2 .$$

Since the first term is positive, I devote more effort to investigating the second term. Certainly, corruption would have the dismal effect of increasing the inflation bias. However, if equilibrium employment equals the level desired by society, $n = 1$, or if the variance of shocks is so high that the resulting disutility dominates the calculus, the focus on this second term is justified. This term will be positive, that is, corruption would increase social costs, if and only if

$$\underbrace{(\lambda - \theta)^2 \kappa k^2 (1+\theta)}_{>0} + (\lambda - \theta)(\lambda - \lambda_S)\underbrace{\left(\theta - \kappa k^2 (1+\theta)\right)}_{>0} > 0 \cdot$$

See for a derivation of this finding IV.8. Appendix: The Impact of Corruptibility on Social Costs. Given that the first term is positive, this inequality may be violated if the second term is negative and sufficiently large in magnitude. This term would be negative if either $\lambda_S < \lambda < \theta$ or $\lambda_S > \lambda > \theta$. Q.e.d.

Simulations reveal the relevance of these findings. Given $\lambda_S = 0$, $\lambda = 1$, $\theta = 2$, $k = 1$, $n = 1$, $\sigma_w^2 = 1$ and $\kappa = 0$ I obtain expected social costs $E(C) = 0.04$. But with increased corruption, $\kappa = 0.2$ social costs are reduced to $E(C) = 0.016$. Likewise, if $\lambda_S = 2$, $\lambda = 1.2$, $\theta = 1$, $k = 1$, $n = 1$, $\sigma_w^2 = 1$ and $\kappa = 0$ I obtain expected social costs $E(C) = 0.71$. But with increased corruption, $\kappa = 0.2$ social costs are reduced to $E(C) = 0.69$.

The above proposition should not be interpreted as meaning that corruption is a *good* thing. The theoretical and empirical evidence on corruption as being a negative influence on society is strong enough to

withstand any idea of the sort. Rather, the proposition points to policies that might foster *tolerance* toward corruption. It may be that there are societies with extreme tastes (λ_S differing considerably from θ) that are not governed by central bankers with similar preferences, $\lambda_S = \lambda$. In such an environment, society may tolerate bribes to central bankers as a way of bringing actual monetary policies more in line with its desires.

This finding adds some refinement to the general recommendation of appointing central bankers who are more conservative than the society they will serve. In populist societies, $\lambda_S > \lambda > \theta$, tolerance for corruption may actually increase if the central banker is slightly more conservative than the populist society.[19]

IV.7. Conclusions

The present analysis has shown that internal central bank corruption, that is, corruption that originates inside the bank, instead of outside it, as discussed in Chapter III, can create two types of policy distortion. The first is that it can influence the inflation rate and affect the growth rate of the monetary stock. This type of distortion is in the central banker's self-interest as it increases his or her additional income; however, the policy distortion is not usually in society's best interest.

This feature changes the results of the model as compared to the underlying model of the corrupt central banker in the non-stochastic world. The optimal reaction of the central banker may be in the present model to lower the growth rate of the monetary stock. The corrupt central banker actively tries to fight the inflation rate to generate larger additional income. In the previous model (Chapter III.) this always involves an increased growth rate of the monetary stock and thereby increased inflation rates. While corrupt populist and conservative central bankers in that model behave in a comparable way, their reaction differs here. It is influenced by their political beliefs and by the shock, which affects the economy. If the economy were suffering from a recessive shock, the conservative central bankers set lower

[19] To avoid creating tolerance for corruption, a truly conservative choice according to $\lambda \leq \theta$ would also be a choice. However, society's overall tolerance toward corruption is likely to increase even more if the policy distortion induced by bribery is in line with its own preferences. These considerations, however, are beyond the scope of the current model.

inflation rates as the populists would do. As compared to the corruption-free reference situation, corruption may induce higher inflation rates (populists) or lower inflation rates (ultra-conservatives).

The second policy distortion is a pro-cyclical impact of corruption on central bank policy, where employment fluctuations are exacerbated rather than dampened. Boosting production by increasing the money supply becomes more attractive in the event of an expansive supply shock because the profit obtained by the central banker increases, but the risk of being caught does not. I showed that this pro-cyclical incentive could dominate central bank policy in the sense that fluctuations of production are no longer attenuated but, rather, amplified. However, this situation can occur only when the central banker is conservative.

The reason conservatives are more vulnerable to pro-cyclical behavior has to do with their reduced willingness to smooth output fluctuations. This characteristic of conservatives is a standard in the literature and relates to the optimization of social goals, where conservatism tends to prefer inflation stability to output stability. Given their relative unwillingness to stabilize output, conservatives are more easily induced to pro-cyclical behavior. Central bankers of this type may cultivate a public persona of ultra-conservativism. The banker will strive to make it appear that his or her actions are guided by principle, that he or she is very concerned about price stability, while, in reality, the banker's self-interest and a negative supply shock are at play.

One very interesting result from my model is that central bankers who have different tastes than the society they serve might actually create a climate of tolerance for corruption. This would happen, for instance, if the central banker's corrupt acts lead to a monetary policy that is more in line with what society desires than would be the case were the banker completely honest and acting in what he or she believed society's best interests to be, regardless of whether society actually agreed. I thus recommend that central bankers should be representative of the society they are to serve: conservative serving conservatives, populists serving populists.

The cases I have discussed are dramatic instances of corruption, but these are rare; much more frequent, no doubt, are many minor variations on

simple self-seeking. However, by focusing on extreme cases of corruption, we also sharpen our understanding of these more moderate types of individual-maximizing behavior. Central bankers may not necessarily sell inside information, but they may feel undeservedly unimportant. They may wish for public attention and recognition of their important function. These feelings have the potential to produce results very similar to those created by the type of corruption discussed above. The bankers may feel that if they could show themselves to be more active participants in shaping the economy, for example, by constantly interfering with the money supply or making policy that adjusts the inflation rate up or down, they would get more of the attention and tribute they feel they deserve. In short, money is not the only thing that motivates central bankers, and I believe that my model of corrupt central bankers is also valid for more subtle forms of behavior.

IV.8. Appendix: The Impact of Corruptibility on Social Costs

The derivative of expected social costs, $E(C)$, is determined with respect to changes in κ:

$$\frac{dE(C)}{d\kappa} = \frac{\lambda^2 (n-1)^2 2\left(\theta - \kappa k^2 (1+\theta)\right) k^2 (1+\theta)}{\left(\theta - \kappa k^2 (1+\theta)\right)^4}$$

$$+ \frac{\left(\theta^2 + \lambda - \kappa k^2 (1+\theta)^2\right)^2 \left[2\left(\lambda - \kappa k^2 (1+\theta)\right)\left(-k^2 (1+\theta)\right) + 2\lambda_S \left(\kappa k^2 (1+\theta) - \theta\right) k^2 (1+\theta)\right]}{\left(\theta^2 + \lambda - \kappa k^2 (1+\theta)^2\right)^4} \sigma_w^2$$

$$- \frac{\left[\left(\lambda - \kappa k^2 (1+\theta)\right)^2 + \lambda_S \left(\kappa k^2 (1+\theta) - \theta\right)^2\right] 2\left(\theta^2 + \lambda - \kappa k^2 (1+\theta)^2\right)\left(-k^2 (1+\theta)^2\right)}{\left(\theta^2 + \lambda - \kappa k^2 (1+\theta)^2\right)^4} \sigma_w^2.$$

Since the first term is positive, we devote more effort to investigating the second term. This will be positive, that is corruption would increase social costs, if and only if

$$\left(\theta^2 + \lambda - \kappa k^2 (1+\theta)^2\right)\left[2\left(\lambda - \kappa k^2 (1+\theta)\right)\left(-k^2\right)(1+\theta) + 2\lambda_S \left(\kappa k^2 (1+\theta) - \theta\right) k^2 (1+\theta)\right]$$
$$+ \left[\left(\lambda - \kappa k^2 (1+\theta)\right)^2 + \lambda_S \left(\kappa k^2 (1+\theta) - \theta\right)^2\right] 2k^2 (1+\theta)^2 > 0.$$

Division by the term $2k^2 (1+\theta) > 0$ yields:

$$\left(\theta^2 + \lambda - \kappa k^2 (1+\theta)^2\right)\left[\lambda_S \left(\kappa k^2 (1+\theta) - \theta\right) - \left(\lambda - \kappa k^2 (1+\theta)\right)\right]$$
$$+ \left[\left(\lambda - \kappa k^2 (1+\theta)\right)^2 + \lambda_S \left(\kappa k^2 (1+\theta) - \theta\right)^2\right](1+\theta) > 0.$$

We denote the term in angular brackets by $\psi = \lambda_S \left(\kappa k^2 (1+\theta) - \theta\right) - \left(\lambda - \theta + \theta - \kappa k^2 (1+\theta)\right)$ and expand the inequation by adding $-\theta + \theta$ where appropriate:

$$\left(\theta^2 + \lambda - \theta + \theta - \kappa k^2 (1+\theta)^2\right)\psi$$
$$+ \left[\left(\lambda - \theta + \theta - \kappa k^2 (1+\theta)\right)^2 + \lambda_S \left(\kappa k^2 (1+\theta) - \theta\right)^2\right](1+\theta) > 0.$$

Division by $1+\theta$ yields:

$$\left(\theta - \kappa k^2 (1+\theta)\right)\psi + \frac{\lambda - \theta}{1+\theta}\psi + \left(\lambda - \theta + \theta - \kappa k^2 (1+\theta)\right)^2 + \lambda_S \left(\kappa k^2 (1+\theta) - \theta\right)^2 > 0.$$

The term ψ can be rearranged to $\psi = (1+\lambda_S)\left(\kappa k^2(1+\theta)-\theta\right)+\theta-\lambda$ or $\psi = (1+\lambda_S)\kappa k^2(1+\theta)-\lambda_S\theta-\lambda$. Inserting this, we obtain:

$$\left(\theta-\kappa k^2(1+\theta)\right)\left((1+\lambda_S)\left(\kappa k^2(1+\theta)-\theta\right)+\theta-\lambda\right)+(\lambda-\theta)\left((1+\lambda_S)\kappa k^2-\frac{\lambda_S\theta+\lambda}{1+\theta}\right)$$
$$+(\lambda-\theta)^2+2(\lambda-\theta)\left(\theta-\kappa k^2(1+\theta)\right)+(1+\lambda_S)\left(\kappa k^2(1+\theta)-\theta\right)^2>0$$

Simplifying this expression, we obtain:

$$\left(\theta-\kappa k^2(1+\theta)\right)(\theta-\lambda)+(\lambda-\theta)\left((1+\lambda_S)\kappa k^2-\frac{\lambda_S\theta+\lambda}{1+\theta}\right)+(\lambda-\theta)^2+2(\lambda-\theta)\left(\theta-\kappa k^2(1+\theta)\right)>0,$$
$$\Leftrightarrow(\lambda-\theta)\left((1+\lambda_S)\kappa k^2-\frac{\lambda_S\theta+\lambda}{1+\theta}+\theta-\kappa k^2(1+\theta)\right)+(\lambda-\theta)^2>0$$

Multiplication by $(1+\theta)$ brings about:

$$(1+\theta)(\lambda-\theta)^2+(\lambda-\theta)\left((1+\lambda_S)\kappa k^2(1+\theta)-\lambda_S\theta-\lambda+(1+\theta)\theta-\kappa k^2(1+\theta)^2\right)>0$$

Adding $\lambda\left(\kappa k^2(1+\theta)-\theta\right)-\lambda\left(\kappa k^2(1+\theta)-\theta\right)$ yields:

$$(1+\theta)(\lambda-\theta)^2+(\lambda-\theta)\left(\kappa k^2(1+\theta)+\lambda_S\left(\kappa k^2(1+\theta)-\theta\right)+\lambda\left(\kappa k^2(1+\theta)-\theta\right)\right.$$
$$\left.-\lambda\left(\kappa k^2(1+\theta)-\theta\right)-\lambda+(1+\theta)\theta-\kappa k^2(1+\theta)^2\right)>0$$
$$\Leftrightarrow(1+\theta)(\lambda-\theta)^2+(\lambda-\theta)\left(\lambda\left(\kappa k^2(1+\theta)-\theta\right)+\lambda+(1+\theta)\theta-\kappa k^2\theta(1+\theta)\right)$$
$$+(\lambda-\theta)(\lambda-\lambda_S)\left(\theta-\kappa k^2(1+\theta)\right)>0$$
$$\Leftrightarrow(1+\theta)(\lambda-\theta)^2+(\lambda-\theta)\left(\left(\kappa k^2(1+\theta)-1-\theta\right)(\lambda-\theta)\right)+(\lambda-\theta)(\lambda-\lambda_S)\left(\theta-\kappa k^2(1+\theta)\right)>0$$
$$\Leftrightarrow(\lambda-\theta)^2\kappa k^2(1+\theta)+(\lambda-\theta)(\lambda-\lambda_S)\left(\theta-\kappa k^2(1+\theta)\right)>0.$$

V. Why Corruption Drives Inflation—Malicious vs. Benevolent Motivation

V.1. Introduction

This chapter makes an empirical investigation into the impact of corruption on monetary policy. Two models offer explanations of how corruption may influence central bank policy. The models offer two possible avenues by which corruption may distort the decisions of this policy-making body. One possibility discussed in the theoretical literature is the central banker's tendency toward corrupt dealing, that is, the banker's desire for the revenue he or she can attain by selling inside information. In this case, the central banker's objective function differs from society's objective function. The corrupt incentive leads the central banker to set higher growth rates of the monetary stock and thereby increase inflation rates.

The other avenue postulates that the central banker is not corrupt himself or herself. Instead, the banker works under a coercive government that orders an increase in monetary growth. This model by Huang and Wei (2003) employs a natural rate model similar to the one used in Chapters III and IV. Their paper postulates that the central bank is free of corruption, but society is not. Following Al-Marhubbi (2000), Huang and Wei argue that corruption decreases the state's revenue from taxes and the selling of licenses. To compensate for the lower revenue, the government orders the central banker to increase the money supply and bring about higher inflation rates.

In this chapter, I will test the validity of these two theories empirically using two different samples: a large sample of 80 countries and a smaller sample of 26 transitional economies. The structure of the chapter is the following. The next section describes the corruption-related data used for the large sample. Section V.3 presents the working assumptions drawn from the two models of Huang and Wei (2003) and Chapters III and IV, including details on methods used to compile average inflation rate data. Section V.4 gives a brief review of some basic econometric concepts. Section V.5 describes the actual regressions and provides their results and validity,

dealing with the Huang and Wei (2003) model and those of Chapters III and IV individually. Section V.6 runs comparative tests between the two competing models; Section V.7 describes the results drawn from the smaller sample. Section V.8 concludes.

V.2. The Data: The World Economic Forum Socio-Economic Indicators and the Average Inflation Rate

To test the model empirically, it is necessary to discover how corruption affects the inflation rate. Empirical data on central bank corruption is scarce. Apart from a survey by the World Bank (WB) and European Bank for Reconstruction and Development (EBRD) run in 26 transition economies, there is no broad cross-country data on corruption-related issues available. The Business Environment and Enterprise Performance Survey (BEEPS 2002) contained a question touching on the issue of corruption and central banks. Respondents had to assess the impact on their businesses of fund mishandling by the central bank. This question was in the context of several other corruption-related questions dealing with issues such as the selling of votes in parliament and court decisions. The BEEPS focused solely on transitional economies. Some empirical results drawn from the BEEPS will be given in Section V.7.

Because I wanted to take a broader cross-country approach to the issue of central bank corruption, I used data from the World Economic Forum's *Socio-Economic Indicators in the World Competitiveness Report 2002–2003*. The World Economic Forum (WEF) surveyed 8,000 business professionals from 80 countries.[20] The sample is comprised of local and foreign residents in each country. In the survey, respondents state their perceptions of the corruption situation in different sectors of government and

[20] The analysis of this chapter focuses on the following countries: Argentina, Australia, Austria, Bangladesh, Belgium, Bolivia, Botswana, Brazil, Bulgaria, Canada, Chile, China, Colombia, Costa Rica, Croatia, Czech Republic, Denmark, Dominican Republic, Ecuador, El Salvador, Estonia, Finland, France, Germany, Greece, Guatemala, Haiti, Honduras, Hong Kong SAR, Hungary, Iceland, India, Indonesia, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Korea, Latvia, Lithuania, Malaysia, Mauritius, Mexico, Morocco, Namibia, Netherlands, New Zealand, Nicaragua, Nigeria, Norway, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Romania, Russian Federation, Singapore, Slovak Republic, Slovenia, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Taiwan, Thailand, Trinidad and Tobago, Tunisia, Turkey, Ukraine, United Kingdom, United States, Uruguay, Venezuela, Vietnam, and Zimbabwe. Taiwan had to be dropped from the analysis because of missing data. Thus, the final sample was comprised of 79.

in the banking sector. Among others, these included loan applications, public utilities, import and export permits, and tax authorities. In the question concerning corruption in the loan application process, interviewers asked respondents to rate on a scale ranging from one to seven to what extent they thought corrupt payments are involved in the process of loan applications. The precise question asked is:

> *In your Industry, how commonly would you estimate that firms make undocumented extra payments or bribes connected with loan applications? (1 = Common, 7 = Never occurs).*

The way this question was phrased leads to some difficulties for my analysis of central bank corruption. The general definition of corruption is the misuse of public power for private benefit. The problem here is that the WEF question asks specifically about corruption in loan applications, and not all loan applications necessarily take place in or involve the central bank. However, I argue that this variable can be interpreted to measure corruption or the possibility for corrupt exchanges in the sphere of the central bank. If loan applicants frequently need to pay bribes to obtain loans from private banks, this opens the way for central bankers to ask for bribes, seeing as it is the central bank's obligation and duty to monitor the loan business of commercial banks. Once central bank supervisors uncover problems in the loan contracts, they are in a strong position to demand a share of the bribes because they can threaten punishment or to close the bank. The Bank of Japan (BoJ) corruption case revealed that BoJ bankers had an informally institutionalized system for punishing banks perceived as too rebellious or that failed to comply with BoJ's demands (see Section IV.4). In one instance, BoJ withdrew liquidity from an already struggling bank.[21] In certain cases, the central bank may even be directly involved in the negotiation of loans at commercial banks. If large banks that are important to the national economy are in danger of bankruptcy or have a large number of nonperforming loans, the central bank will step in to handle negotiations, claim settlement, and so

[21] Cf. Süddeutsche Zeitung (March 13, 1998).

forth, and in the course thereof, put itself and its officers in a prime position for demanding bribes and kickbacks.

In the second part of the analysis, regressions are run to discern which of the two competing theories can be supported by empirical evidence. The WEF's question concerning absence of corruption in the tax collection process is used to test the Huang and Wei (2003) or Al-Marhubbi (2000) model. The specific question asked was:

> *In your Industry, how commonly would you estimate that firms make undocumented extra payments or bribes connected with annual tax payments? (1 = Common, 7 = Never occurs).*

These undocumented payments might influence the tax burden of a company or an individual. Pervasive corruption in tax collection should go along with low tax revenue and an increased dependence by the government on the inflation tax.

It must be noted that the correlation of these WEF corruption-related socioeconomic variables is rather high. The correlation of the two indicators is 0.93. A scatterplot of both WEF indicators is illustrative (see Figure V.1). The data points are largely concentrated in one line. Therefore, some results obtained from using the indicator on the absence of corruption in loan applications might also be obtainable by using the data set on the absence of corruption in tax collection. However, there are some interesting differences, particularly in countries with high levels of corruption. The actual data are provided in Section V.9.

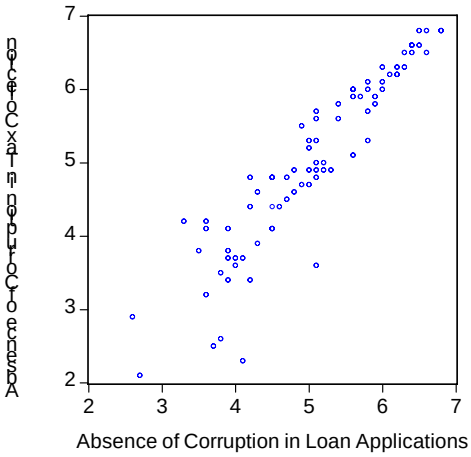


Figure V.1: Indicators on the Absence of Corruption in Loan Applications" and the Absence of Corruption in Tax Collection

V.3. Inflation and Corruption: Two Hypotheses

The regressions concentrate on the impact of corruption on the inflation rate. The analysis of the two influence channels identified by Lambsdorff and Schinke (2002, 2004) and Huang and Wei (2003) is run simultaneously. The argument as to why corruption influences central bank decisions draws on Klitgaard's observation that corruption flourishes in institutions that combine three necessary factors: (1) monopoly power, (2) discretionary freedom, and (3) almost no public interference in the form of checks and balances.[22] All these factors can be found in central banks. The central banker is in a position to sell valuable information to the private banking sector and will do so if he or she is corrupt, resulting in a policy distortion. The central banker systematically inflates the monetary stock to increase the value of his or her inside information.[23] This leads to the first hypothesis.

> *In countries that are perceived as less corrupt according to the WEF question on absence of corruption in loan applications, a*

[22] See Klitgaard (1988: 75).
[23] The model of Lambsdorff and Schinke (2002) can also apply to the situation in which the central banker is simply the loyal servant of a corrupt administration. Even so, he or she could still be personally corrupt. In this respect, the model is reconcilable with both theories. The present empirical analysis neglects this possibility.

corrupt central bank staff member has a lower motivation to extract bribes and increase his or her personal income. These countries have lower inflation rates as compared to countries that are perceived as more corrupt in this respect.

The second hypothesis concentrates on the model of Huang and Wei (2003). Corruption—so goes the argument—causes a drop in the state's revenue and leads to increased inflation tax revenue. Huang and Wei included this idea, first expressed by Al-Marhubbi (2000), in a model by Alesina and Tabellini (1987). The model's basic reasoning is as follows. Countries with a higher degree of corruption tend to have problems with corruption in their tax authorities. Corruption deteriorates the tax base because constituents who wish to escape tax payments or lower their tax burden might prefer to pay a bribe rather than paying their full tax debt. As tax revenues become ever lower, the state needs new ways of generating income. The government might start putting pressure on the central bank to increase the money supply. The government could force the central bank to buy government bonds or, less subtly, just force the central bank to print and hand over new currency. The inflation tax revenue can be used to compensate for revenue lost when taxpayers bribe tax collectors instead of paying their taxes. This method of income generation allows the state, in effect, to levy taxes on the underground economy (very often a fast-growing sector of a corrupt country's economy) because such an economy is highly dependent on cash. These theoretical considerations give rise to the following hypothesis.

Countries in which corruption erodes tax revenue have higher inflation rates. The increased inflation rates generate higher inflation tax revenue, which is intended to make up for the deterioration of the ordinary tax revenue.

This argument assumes that the government is strong enough to impose its will on the central bank or, alternatively, that the central bank views sufficient public revenue as an important goal.

The WEF question concerning the absence of corruption in tax collection can be used to test Huang and Wei's (2003) theory only if poor performance on this indicator also goes along with a high degree of tax evasion in the respective country. Unfortunately, the WEF did not ask its respondents directly for such an assessment. The BEEPS (2000) did include a question on this issue but, again unfortunately, the combined sample of the BEEPS and WEF World Competitiveness Report 2002/03 would be too small to draw any valid conclusions.

The WEF compiled an indicator of the perceived extent of the shadow economy. A large underground economy offers many opportunities for corrupt tax officials to demand and receive bribes. The Global Competitiveness Report 2002/03 included a question related to this issue:

> *What percentage of businesses in your country would you guess are unofficial or unregistered? Less than 5% of all business, 6–10%, 11–20%, 21–30%, 31–40%, 41–50%, 51–60%, 61–70% or more than 70%.*

The report provides the estimated average percentage of unofficial or unregistered business in a country. The variable on the absence of corruption in tax collection and the data on the percentage of unregistered or unofficial business correlate at –0.76. A regression of the absence of corruption in tax collection and the variable on the extent of unregistered business highlights the negative functional relationship between the two variables.[24] Following the model of Huang and Wei (2003), the WEF indicator on corruption in tax collection seems useful for testing the model.

To test the two hypotheses, the growth rate of the consumer price index as provided by the International Monetary Fund (IMF)'s International Financial Statistics is used to depict the inflation rate of 80 countries. The analysis focuses on the average inflation rate for the period 1994–2003. During this timeframe, some of the included countries reported negative

[24] The regression coefficient of –0.61 (*t*-value: –9.97) shows the negative impact. Note that the variable captures the *absence* of corruption. If most of the companies do register with the tax authorities, the tax collectors are not in a position to demand bribes. A high value for the variable on the absence of corruption in tax collection reflects this issue. The residuals are normally distributed (JB = 0.88).

inflation rates. This presents a problem in that the geometric mean cannot be applied to calculate the average inflation rate. An arithmetic mean is not an option because the analysis focuses on growth rates. This study uses a technique that has rather similar properties and, in the case of low and moderate inflation rates, provides similar results. The inflation rates were added to the value of 1. This ensures that the values for countries that experienced deflation are positive. With these new "transported" inflation values, the geometric mean concept can be used because all the values are nonnegative:

$$1+\tilde{\pi} = \sqrt[10]{\prod_{t='94}^{'03}(\pi_t + 1)}\,.$$

A table containing the inflation rate date is included in Section V.9.

V.4. Some Basic Concepts in Econometrics

This analysis involves a cross-section of 80 countries. The set includes transition economies, industrialized economies, and developing countries. On average, the industrialized countries experienced low inflation rates between 1994 and 2003. Average inflation rates vary more in developing countries and these countries also have a higher level of corruption. There is often a problem of heteroskedastic error terms in cross-country analyses, which is the case here due to this variability between the two groups of countries. A heteroskedastic error term produces the problem that the estimators obtained from the ordinary least squares regression method are not efficient. Efficiency is one desirable property of a regression's estimators in that the estimators have the lowest possible variance. Thus, the regressions presented here are White-heteroskedasticity corrected. The basic assumption of an error term with a constant variance can be rejected.

The *lack of bias* property means that on average the estimator $E(\hat{\theta})$ obtained through a regression is the same as the true value of the parameter, θ. Thus, the distribution of the estimator has the value of the parameter as its mean. On average, the estimates are correct:

$$E(\hat{\theta}) - \theta = 0\,.$$

In econometric models with heteroskedastic error terms, the regression line obtained from the ordinary least square (OLS) procedure can

place too strong an emphasis on observations with higher error variances. This is because the sum of the squared residuals of high variance error terms is likely to be higher and have a more significant impact in the OLS regression than are observations with a lower error variance. This implicit favoring of the high variance error term leads to unbiased and inefficient estimators (cf. Pindyck and Rubinfeld: 145–48). Thus, the regression line "favors" the information from the "high variance" group. Because this group is given a large weight in the OLS regression, the fit of the model for this group will appear overly good. Therefore, statistical tests such as the *t*-statistic or the construction of confidence intervals are not reliable (Hackl 2004: 173–78).

Before presenting the actual regressions, let us take a more detailed look at the average inflation rate data. The histogram of the average inflation rates (see Figure V.2) shows that they are not normally distributed. The descriptive statistics of the distribution, shown to the right of Figure V.2, provide support for this observation. The assumption of a normal distribution is easily rejected based on the Jarque-Bera statistic, which is a formal test of the normality of a distribution. The Jarque-Bera statistic has a chi-square distribution with 2 degrees of freedom where *N* depicts sample size, *S* stands for the sample's skewness, and *K* is for its kurtosis.

$$JB = \frac{N}{6}\left[S^2 + \frac{(K-3)^2}{4}\right]$$

If the value of the Jarque-Bera statistic is greater than 5.99, the null assumption of normality of a variable's distribution, for instance, the residuals from a regression, is rejected at the 5% level.

The skewness statistic *S* depicts whether the distribution of a stochastic variable is symmetrical. In the case of true symmetric or approximately symmetric distribution, the *S* will be 0, or very close to 0.[25]

[25] If a distribution of a variable is not symmetrical enough to be approximately a normal distribution, there will be a large difference between the sample's mean and its median.

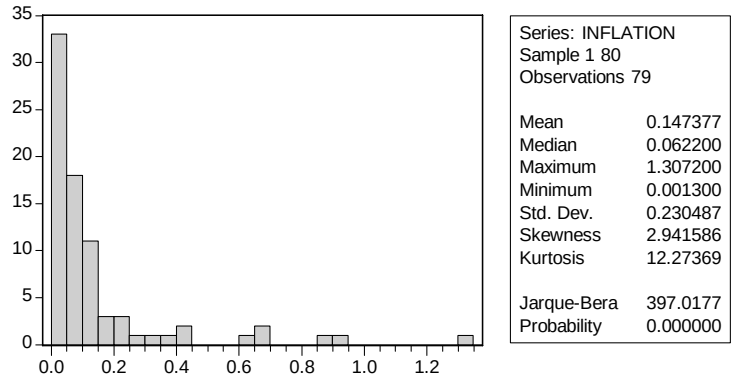


Figure V.2: The Average Inflation Rates.

The Jarque-Bera statistic incorporates another descriptive statistic, *kurtosis* (*K*). Kurtosis measures the thickness of the tails. If a variable's distribution has thick tails it means that large deviations of this variable from its mean are common. Thin tails are desirable because if the tails are thin, observations of a stochastic variable are concentrated around its mean. A *K* value of close to 3 generally indicates that a distribution has acceptably thin tails.

Because the Jarque-Bera-statistic combines kurtosis and skewness checks, it will be very useful in assessing the regression results. The Jarque-Bera-statistic will also be used to check the normal distribution of the regression's residuals. If the normality assumption is not met, the coefficients can still be used. However, the *t*- and *F*-tests and constructed confidence intervals for the coefficients will not be meaningful because these tests demand that the normality assumption be valid (see Pindyck and Rubinfeld 1998: 58–59).

V.5. An Empirical Inquiry into the Link Between Corruption and Inflation

The nonnormality of the average inflation rate data seen in Figure V.2 is hardly surprising. Low or mid levels of inflation are far more common than high inflation. To get an idea of the relationship between the WEF data on absence of corruption and average inflation rate between 1994 and 2003, correlation and various scatterplots are necessary. As postulated by Huang

and Wei (2003), Lambsdorff and Schinke (2004), and the models presented in Chapters III and IV, there appears to be a link between corruption in tax collection or the banking sector and the inflation rate: if corruption is rampant in one of these crucial sectors, it appears more likely than not that the country will experience a high inflation rates as well.

Looking at the average inflation rate data and the absence of corruption variables, there seems to be a weak and negative relationship between the WEF data on the absence of corruption in loan applications and the average inflation rate. The data correlate with each other at low, but negative, level. The overall correlation coefficient is –0.34. Several outliers—countries that experienced periods of high inflation (e.g., Ecuador) and the concentration of low-inflation countries—appear to have a huge impact on the analysis.

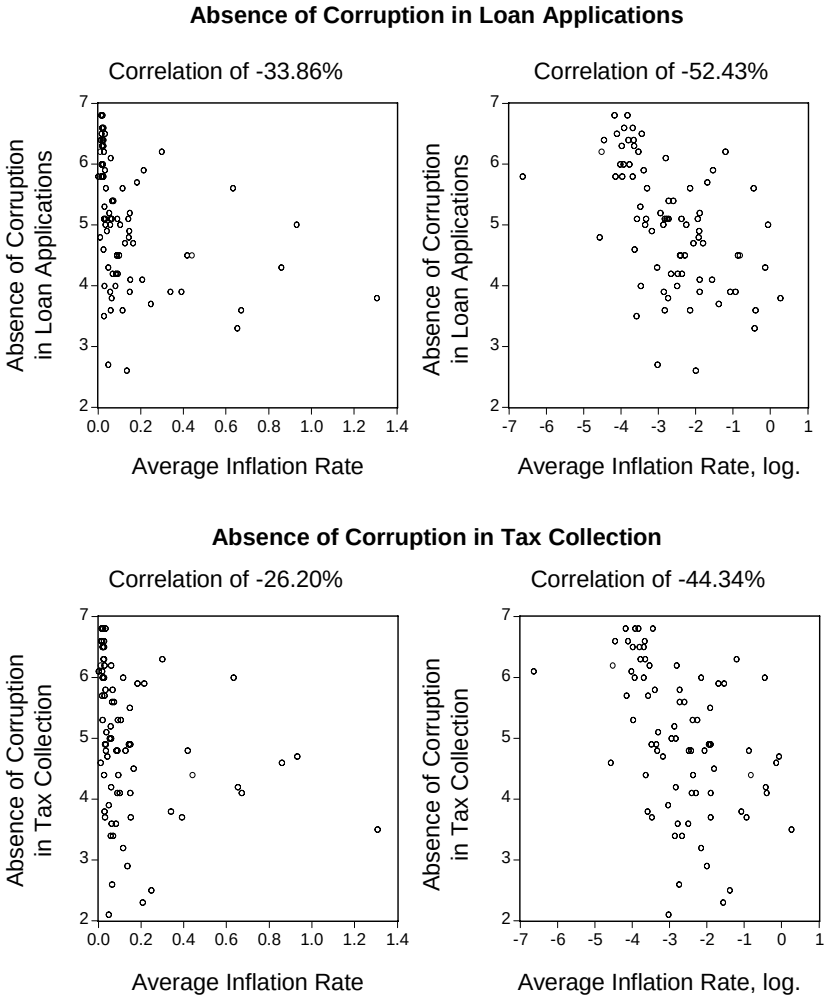


Figure V.3: Absence of Corruption and Inflation.

This property of the data is also reflected by the scatterplots provided in Figure V.3. Because lower inflation rates are by far more common than high inflation rates, it is tempting to fit a very steep regression line that incorporates most of low-inflation countries while casting aside outliers such as Ecuador. However, applying the logarithm to the average inflation rate data softens this effect. The correlation coefficient drops to -0.52. The connection between the logarithm of the average inflation rate and this indicator is stronger. As reflected by the negative correlation, a linear regression equation might fit the data. The weight of countries that achieved lower inflation rates is somewhat reduced. Another positive side effect of using logarithmic data is that the distribution of the average inflation rates is approximately normal. The logarithm also ensures that the regressions' residuals are normally distributed.

The correlation of inflation data against the WEF indicator on the absence of corruption is strong; however, the WEF indicator on the absence of corruption in tax collection does not fare so well. As illustrated by the

Table V.1: The Impact of Corruption in the Sphere of the Central Bank.

Dependent Variable: Log(inflation),

Average Inflation Rate between 1993 and 2003

Variable	1st LS [1]	2nd LS [1]	3rd LS [1,2]	4th LS [1,2]	5th LS [1,3]	6th LS [1,2,]	7th LS [1,2]	8th LS [1,2,3]
Constant	0.53	3.13	2.72	2.07	4.19	2.16	1.08	0.73
	(0.85)	(2.58)	(1.96)	(1.29)	(2.27)	(2.02)	(1.32)	(0.97)
Corruption in Loan Applications, WEF	-0.64	-0.33	-0.33	-0.17	-0.14	-0.17	-0.14	-0.19
	(-5.40)	(-1.69)	(-1.72)	(-0.69)	(-0.61)	(-1.56)	(-1.55)	(-1.61)
Log. GDP per head, ppp. corrected		-0.46	-0.46	-0.50	-0.51	-0.18	-0.05	-0.02
		(-2.29)	(-2.26)	(-2.21)	(-2.10)	(-1.24)	(-0.39)	(-0.19)
Log. M1 Growth Rate, Average 1993 to 2003						1.20	1.34	1.25
						(7.28)	(14.98)	(9.44)
Dummy Variable Ecuador							2.96	
							(15.93)	
Dummy Variable Japan							-3.22	
							(-33.51)	
Central Bank Independence				3.50	2.87			0.54
				(1.62)	(1.59)			(0.60)
Log. Openness, World Bank			0.11		-0.50			
			(0.38)		(-2.30)			
Observations	79	79	79	47	47	78	78	46
R^2	0.27	0.31	0.32	0.52	0.58	0.68	0.83	0.85
R^2, adjusted	0.27	0.30	0.29	0.49	0.54	0.67	0.82	0.83
Jarque-Bera	4.23	3.22	2.64	2.43	3.48	131.46	5.38	0.07

The values given in the variable section show the coefficient (without parenthesis) and White corrected *t* - statistic (in paranthesis).

1 Taiwan had to be dropped due to the unavailability of data.

2 IFS data on the growth rate of the monetary stock did not include Sweden.

3 Japan is excluded.

scatterplots and the correlation coefficients, this connection is weaker but still negative. Again, the use of logarithmic average inflation rates ensures a better interpretation of the link between the absence of corruption in tax collection and average inflation rate. A linear regression equation fits the data well.

The results of the first set of regressions on the impact of the absence of corruption in loan applications are presented in Table V.1. The negative impact of corruption in the banking sector as measured by the WEF variable on inflation is largely supported by the results. In the first regression, along with a constant, the absence of corruption in loan applications variable is included as an explanatory variable. The regression result shows that a higher degree of corruption in the banking system and in the central bank raises the inflation rate. The regression line estimates the impact of the corruption variable on the average inflation rate at –0.64. The *t*-statistic is very significant at its –5.4.

If Nigeria were to improve from its current absence of corruption level of 3.7 to France's level of 5.8, a significant reduction in the annual average inflation rate would result. The Nigerian inflation rate would drop by the factor $e^{(0.64*2.1)}$=3.8. This demonstrates that there is indeed a link between corruption in the banking sector and inflation, but such evidence must be taken with a grain of salt. The fit of the model as given by the R^2 is 0.27, meaning that although the corruption level in the banking industry has an influence on the inflation rate, it is not the only influence. The residuals are normally distributed. The Jarque-Bera statistic is below the 5.99 threshold. Therefore, at the 5% significance level, the null hypothesis of normality of the regressions residuals cannot be rejected.

Other regressions will further analyze the impact of corruption on inflation. Sturm and de Haan (2001) observe that there is insufficient use of control variables in cross-country regressions on central bank performance and inflation in developing countries. They argue that the impact of these performance indicators does not hold if other explanatory variables are included in the regression. Campillo and Miron (1996) make a similar point. In their paper, they conclude that, overall, a measure of central bank independence or information on the exchange rate regime do not exert a

strong influence on the inflation performance of developing countries once information on the degree of openness of the economy or optimal tax considerations are included in the regressions. To take this conclusion into consideration, Sturm and de Haan (2001) suggest that one should employ other potentially important explanatory variables such as income per head, openness, and the ratio of external debt to GDP. They argue that these variables might capture the impact of central bank quality on inflation. Following this line of reasoning, it might also be important to check for the impact of GDP per head. Less developed countries often show higher inflation rates than well-off industrialized countries and they tend to have a more pressing corruption problem.

The second regression uses GDP per head as another explanatory variable. The result shows that this variable does have some explanatory power. However, corruption in loan applications retains a lower but still significant influence on the inflation rate. The *t*-statistic dropped to –1.69, significance at a 10% confidence level. GDP per head as a measure of poverty or development also has an impact. Its *t*-statistic is at – 2.29. Countries with a higher level of income and a lower level of corruptibility in the banking sector have lower inflation rates. Adding GDP per head improved model fit; the R^2 is 0.31. The *t*-statistics are reliable because the residuals are approximately normally distributed (JB = 3.22).

The impact of absence of corruption in loan applications called for a further test of its robustness. Regressions 3 to 5 included important variables that affect the decisions of the central banker. Romer (1993) focuses on the link between openness and inflation. He writes:

> *the larger, and hence less open, an economy is, the greater is the incentive to expand, and so the higher is the equilibrium rate of inflation.* (Romer 1993: 871)

Romer uses a natural rate model in the tradition of the model first proposed by Kydland and Prescott (1977). Romer's model is drawn from Barro and Gordon (1983a, 1983b). Romer postulates that openness of an

economy influences the tradeoff between inflation and the output target set by the society or the government. In a closed, large economy, if policymakers wish to increase output, they can resort to expansive monetary policies. Inflation comes at a higher cost in an open economy, however. As the domestic output increases relative to the output in the other economies, the relative price of the domestic goods lessens. The lowered relative price affects inflation through two channels. The real depreciation of the domestic goods leads to rising prices of imported goods (denominated in the domestic currency). The rise in the import prices is higher than the rise of domestic goods is. Therefore the Consumer Price Index in the economies rises. This development is than rolled over into the domestic prices because the workers try to shield themselves from the real depreciation of their wages and demand higher nominal wages. The production costs in the economy increase further. Therefore open economies pay more dearly for a given increase of domestic output brought about by monetary expansion. Currency fluctuations caused by monetary surprises are more painful and less effective in open economies. The data on openness used in this study come from the World Bank's world development indicators.[26]

Another variable that might have an impact on central bank corruption is the bank's level of independence. Unfortunately, including Romer's (1993) data set on central bank independence gives rise to two problems. First, the data is available for only a limited number of countries, causing a significant drop in sample size. Second, including Japan in the regressions leads to trouble, because although Japan has a rather expansive monetary policy, at the same time it shows signs of deflation. Including Japan caused problems with the distribution of the regressions' residuals in that when Japan is included in the sample, the resulting Jarque-Bera statistic of the residuals exceeds the 5.99 threshold. This renders the linear regression invalid. It was therefore decided to remove Japan from the sample.

The regressions were made in three steps. Regressions 3 and 4 make use of openness and central bank independence separately. Regression 5

[26] A value for Singapore's degree of openness is not available in the World Bank's world development indicators. The value for Singapore was taken from the Penn World Tables (see Heston, Summers, and Aten (October 2002),).

adds both indicators. The logarithm of openness as a further explanatory variable on its own is not significant (t = 0.38) in Regression 3. The regression shows that openness has a positive influence on the average inflation rate, which is counterintuitive to Romer's theory. The inclusion of openness exerts little influence on the absence of corruption in loan applications. The regression coefficient is unchanged as compared to Regression 2. Its significance is now increased to a p-value of 0.09. GDP per head still exerts a negative impact on inflation; the regression coefficient stands at –0.46 and its significance falls in a comparable region. Its t-value drops a little to –2.26—still significant at the 5% confidence level. Including the openness variable does not really improve model fit; the R^2 is 0.32. The adjusted R^2 of 0.30 indicates that the model as such is marginally better compared to Regression 2. The normality assumption for the residuals holds (JB = 2.64).

Adding the central bank independence variable in Regressions 4 and 5 causes the number of observations to almost halve, going from 78 to 47. Thus, the following results should be interpreted with caution. Central bank independence wields some influence on the performance of the absence of corruption in loan applications variable. The impact of central bank independence on the average rate of inflation is positive (3.50) in Regression 4. Countries with less independent central banks receive higher scores on Romer's (1993) index. A high degree of independence accompanies a low average rate of inflation. The variable barely misses being significant at the 10% level (p-value = 0.11). However, its inclusion has strong consequences for the way absence of corruption in loan applications drives the results. The impact of absence of corruption in loan applications is nonsignificant (t = –0.69) and the coefficient has halved (–0.17). Model fit is improved; the R^2 and the adjusted R^2 increase to 0.52 and 0.49, respectively. When both variables (openness and central bank independence) are included, as in Regression 5, the trend of decreasing significance for the absence of corruption in loan applications variable continues. The coefficient of this model is –0.14 and the t-value is –0.61. However, the importance of GDP per head in explaining the average rate of inflation continues unabated. For

the first time, openness has the correct sign (–0.50) and contributes support to Romer's theory. It is significant at the 5% level. Central bank independence has little explanatory power regarding the average inflation rate. It misses significance at the 10% confidence level (*p*-value of 0.12). It does, however, at least suggest that high inflation rates might go along with low levels of central bank independence. The residuals of the two last regressions are normally distributed.

Central bank independence is an issue in analyzing the inflation rate. Fischer (1995) points out that among industrialized countries the inflation rate is considerably lower in countries that have a higher degree of central bank independence. Alesina and Summers (1993) arrive at a similar conclusion. Their findings are backed by a theoretical model of (Alesina and Gatti 1995) showing that an independent central bank achieves low average inflation rates and lowered variations of output. In the present discussion, I will test whether central bank independence aids central bankers in the pursuit of self-serving goals Including central bank independence causes a reduction in sample size, which poses problems for the subsequent analysis. The use of Romer's (1993) indicator on central bank independence results in a sharp drop in the influence of the corruption variable and its significance. It is necessary to find out whether the reported drop in the significance of absence of corruption (Regression 4) is due to the new, smaller subsample or if it is the consequences of the variable itself. To find out, a new sample is drawn that includes only countries for which the indicator on central bank independence is available. This new sample contains a less heterogeneous mix of countries. One of its drawbacks is that several countries, such as Haiti, Paraguay, and Romania, are not included and yet these countries have a rather high average inflation rate and seem to have a problem with corruption in their banking sector because they score low values in the indicator on the absence of corruption in loan applications (see V.9. Appendix: The Data).

Regression 3 was re-run for this smaller set of countries.[27] In this smaller sample, absence of corruption is again insignificant at the 10%

[27] The regression shows that the absence of corruption in loan applications has a negative (–0.22) but insignificant influence on the average inflation rate (t = –0.97). GDP per head continues to have a negative impact on inflation (–0.55), which is almost significant at the 1% confidence level (p = 0.013). Openness now has a negative value

confidence level, indicating that the sudden drop in significance is related to the exclusion of a large portion of the original sample, a problem that recurs throughout this chapter when dealing with data on central bank independence.

The odd behavior of the degree of openness variable raises a similar question (see Regressions 3 and 5). Why does the openness variable retain its predicted influence when central bank independence is added to the regression? One possibility is that Romer's (1993) theory is only suited for the new smaller sample, as the countries in this sample have been assessed for central bank independence. Terra (1998) also questions the link between openness and inflation proposed by Romer (1993). She finds that the link between inflation and openness may depend largely on the inclusion in the sample of countries that became highly indebted during the debt crisis of the 1980s.

When Regression 3 is re-run for this smaller sample of 47 countries,[28] the logarithm of openness has the predicted negative impact on the average inflation rate. The coefficient of openness (–0.57) and the *t*-statistic (–2.40) point to the significance of this variable in explaining the average inflation rate for this reduced set of countries.[29] The coefficient of GDP per capita drops to –0.55, pointing to its significant influence on inflation (*p*-value = 0.01). The absence of corruption retains its negative impact (coefficient = –0.22) but the *t*-statistic of -0.97 shows that this factor is no longer significant. The now predictable behavior of openness in the regression is indicative of the possibility that Romer's theory on the impact of openness appears most valid for higher developed countries for which data on central bank independence is available. The impact of openness on inflation so far remains a puzzle. Recent econometric research by Gruben and McLeod (2003) suggests that the openness-inflation correlation grew stronger and more robust in the 1990s for both developing and OECD countries.

Corruption appears to increase the inflation rate. However, does this apparent impact of corruption on inflation really occur, as postulated, through

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(–0.57)—in line with Romer (1993). Its *t*-statistic is —2.40. This will be scrutinized later. The Jarque-Bera statistic is 3.74; model fit is 0.54.

[28] The sample does not include Japan.

[29] For the results of this regression, please refer to footnote 27.

the central bank channel. If corruption in the bank sector leads to high inflation rates in an economy, this would show up as a high growth rate of the monetary stock. To introduce data on monetary growth into the analysis the growth rate of money (M1) in the respective economies was collected from the International Monetary Fund's International Financial Statistics (IFS). For consistency, the same method is used for averaging money (M1) growth rates as was used to average inflation rates. As the IFS does not report M1 data for Sweden in a manner consistent with the other M1 data, Sweden was dropped from this analysis, meaning that the sample size decreased 79 to 78. Also note that members of the European Monetary Union are included in the analysis as individual countries, even though the IFS reports on monetary conditions at the aggregate European level. Therefore, the analysis covers a shorter time period for the group of countries that were first to replace their traditional currencies with the Euro; the observations for this group stop in the years 1998 or 1999.[30] The Greek series continues until 2001, the year of Greece's accession to the Euro Area.

Table V.1 reports the findings from this sixth model. A constant, the WEF corruption in loan applications indicator, GDP per head, and the growth rate of money (M1) are used as explanatory variables. As predicted from Lambsdorff and Schinke's (2004) model, the growth rate of money (M1) captured the impact of corruption on the inflation rate. The *t*-statistic of –1.56 is insignificant even at the 10% level. The factor GDP per head is also insignificant at the 10% level; its *t*-statistic is –1.24. Including M1 renders the impact of corruption on the inflation rate insignificant. This finding offers some empirical support for the link between corrupt behavior of the central banker and inflation, but the result should not be overestimated. Due to the high positive correlation (+0.93) of the absence of corruption in loan applications and absence of corruption in tax collection variables, one should also find a similar impact. Unsurprisingly, model fit improved. There is bountiful evidence on the link between money growth rate and inflation in the theoretical and

[30] Because the IFS web-based database did not provide data on the French M1 or its growth rate, M1 for this country was calculated by adding the amount of cash balances (currency in circulation) to the value of demand deposits. The values were available until 1997.
[31] Because the IFS web-based database did not provide data on the French M1 or its growth rate, M1 for this country was calculated by adding the amount of cash balances (currency in circulation) to the value of demand deposits. The values were available until 1997.

empirical literature. McCandless and Weber (1995), as well as King (2002),[32] who replicated their study, point out that there is a very strong positive correlation between the growth rate of the monetary stock and the inflation rate in the long run (between 10 to 30 years). In fact, this link over the long run in both studies was so strong that there was almost unity between inflation and monetary growth for the 30-year average.

Even though the results of Regression 6 replicate previous findings on the link between monetary growth and inflation, there are a few problems. The assumption of normality of the regression's residuals does not hold. The Jarque-Bera statistic is 131.46, evidence of a breach of the assumptions of a multivariate regression model. A closer look at the regression's residuals reveals that Japan and Ecuador are the cause of this extraordinarily poor Jarque-Bera statistic. Japan reported very low inflation rates in the wake of the breakdown of the Japanese asset inflation; Ecuador reports rather high inflation rates despite dollarization. The discrepancy is reversed for the average growth rate of M1. Ecuador has tried to clamp down on the high inflation inherited from the 1980s and early 1990s, whereas Japan's central

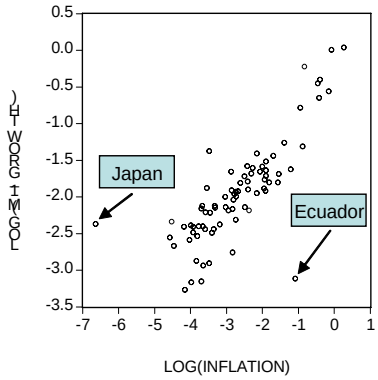

Figure V.4: Scatterplot of Inflation and Monetary Growth.

bank and government were eager to help the Japanese economy out of the post-bubble gloom. This situation of Ecuador and Japan is illustrated by the scatterplot of Figure V.4. Using dummy variables for Japan and Ecuador corrects the problem.

[32] McCandles and Weber (1995) analyze the correlation between the inflation rate and the growth of the monetary base for a sample of 116 countries.

The results of this analysis are provided in Table V.1. The results from the previous analysis (Regression 6) are confirmed. High corruption in the negotiation of loans continues to bring about high inflation. However, this factor is insignificant and its influence is again captured by the average growth rate of M1. The factor continues to have a strong positive effect on the inflation rate. The regression coefficient is 1.34. An increase in the average growth rate of M1 will drive the inflation rate higher by a factor of 1.34. The *t*-statistic for the average growth rate of M1 is 14.98, indicating a strong influence on the average inflation rate. The dummy variables for Japan and Ecuador are both highly significant.

Model 8 mirrors Regression 6 but also includes the indicator on central bank independence. The resulting sample design again renders the absence of corruption variable insignificant (*t*=-1.61), while central bank independence itself is also insignificant (*t*=0.60). The growth rate of M1 is the driving force in this model (*t*=9.44).

As an additional test for the sensitivity of the link between absence of corruption in loan applications, data on the prevalence of an unregistered or unofficial economy (the shadow economy) is included in the following regressions. This can be seen as test of the model of the malicious central banker first proposed by Lambsdorff and Schinke (2002, 2004). This theory would appear questionable if including data on the prevalence of the shadow economy changes the regression coefficients from negative to positive values (cf. Table V.1) because such a reversal in values would show that the impact of the malicious central banker works through the same channel—the tax system. This possibility must be investigated. The findings from these regressions are given in Table V.2.

The shadow economy data also wield a strong influence in these regressions. The coefficients for absence of corruption in loan applications in the two regressions are still negative, but insignificant (see Regressions 9 through 11). The variable on the prevalence of the shadow economy decreases the corruption variable's influence, bringing into question the theory of the malicious central banker proposed by Lambsdorff and Schinke (2002, 2004).

Table V.2: The Interaction of Unregistered Business with Absence of Corruption in Loan Applications
Dependent Variable: Log(inflation),
Average Inflation Rate between 1993 and 2003

Variable	9th LS [1]	10th LS [1]	11th LS [1,2]	12th LS [1]	13th LS [1,2]
Constant	-3.83	-3.65	-5.36	-4.31	-2.36
	(-3.83)	(-2.02)	(-2.52)	(-2.01)	(-1.04)
Corruption in Loan	-0.12	-0.11	-0.11	0.17	0.16
Applications, WEF	(-0.87)	(-0.62)	(-0.61)	(0.86)	(0.82)
Unregistered Business as	0.51	0.51	0.55	0.58	0.52
Percentage of all Business	(4.74)	(4.19)	(4.46)	(3.77)	(3.44)
Log. GDP per head, ppp.		-0.02	-0.01	-0.19	-0.22
corrected		(-0.11)	(-0.04)	(-0.92)	(-1.00)
Log. Openness, World Bank			0.32		-0.32
			(1.18)		(-1.68)
Central Bank				2.72	2.38
Independence , Romer				(1.50)	(1.45)
Observations	79	79	79	47	47
R^2	0.46	0.46	0.48	0.67	0.70
R^2, adjusted	0.44	0.44	0.45	0.64	0.66
Jarque-Bera	1.76	1.67	0.31	1.92	4.41

The values given in the variable section show the coefficient (without parenthesis) and White corrected *t* -statistic (in paranthesis).

[1] Taiwan had to be dropped due to the unavailability of data.

[2] Japan is excluded from the data set.

The impact of absence of corruption in loan applications is sensitive to the inclusion of other explanatory variables. As further explanatory variables, the logarithm of GDP per head, the logarithm of the degree of openness, and central bank independence are considered. It can be seen from the results in Table V.2 that absence of corruption in loan applications is sensitive to the new variables. GDP per head lowers the influence of the corruption variable to –0.11 and causes a further drop in the t-statistic but a high degree of corruption in loan applications is still related to more inflation; it has a negative influence but is insignificant throughout Regressions 10, and 11. The logarithm of openness does not alter these results (see Regression 11). The coefficient of absence of corruption in loan applications is (almost) unchanged and the same holds true for its *t*-statistic. Openness itself has again a positive and counterintuitive regression coefficient of 0.32. Its impact is not significant.

Romer's indicator on central bank independence as used in Regression No. 12 reduces the sample size to 47, which causes a sample design problem mentioned previously in the discussion of the results in Table V.1. The regression coefficient of the corruption variable stands at 0.17. The

variable is still insignificant (t = 0.86). However, the change in the impact of the corruption variable on the average inflation rate should not be overestimated as it seems due to sample design more than anything else. The shadow economy continues to be the driving force behind the average inflation rate. Its impact is steadfastly positive (coefficient of 0.58) and significant (t = 3.77). The final test shown in Table V.2 incorporates all variables (cf. Regression 13). Not surprisingly, the positive impact of absence of corruption in loan applications is persistent, as is its insignificance. Again, its coefficient is positive (0.16). The impact of corruption in loan applications is insignificant (t-value of 0.82). Combining the logarithm of openness and central bank independence does not result in much change, apart from its impact on openness. Once the sample is reduced to 47 countries, openness obtains a negative impact. Its significance is boosted; it has a p-value of 0.10. Central bank independence is insignificant. The shadow economy has an important and positive impact on the explanation of the average inflation rate (coefficient of 0.52, t-value of 3.44).

The empirical evidence presented here offers some support for the link between corruption in the banking sector and the inflation rate as well as arguments against the validity of this link. This supports to some extent the models developed in Chapters III and IV and in Lambsdorff and Schinke (2002, 2004). However, this should not be taken as evidence that corruption is the main force behind inflationary processes, but instead interpreted to mean that corruption is one contributing factor among others. Its negative impact continued throughout these tests on the sensitivity in the first set of regressions (Table V.1). Unfortunately, in some tests the variable was insignificant. Results of the test for the effect of the shadow economy (see Table V.2) are not supportive of this theory. The absence of corruption in loan applications retained its negative influence in the whole sample (that is, when the sample did not have to be reduced due to use of the central bank independence indicator). It failed to be significant in all these regressions (cf. Regressions 9 – 11). In the smaller sample, the impact of the shadow economy as additional explanatory variable was such that the influence of absence of corruption in loan applications was reversed. In Regressions 12 and 13, its positive coefficients imply that less corruption in the banking

sector actively increases the average inflation rate, a finding that is contradictory to the theory under study.

The link proposed by Al-Marhubbi (2000) and Huang and Wei (2003) regarding the impact of corruption in tax collection, is examined next. The

Table V.3: The Impact of the Absence of Corruption in Tax Collection

Dependent Variable: Log(inflation),

Average Inflation Rate Between 1993 and 2003

Variable	14th LS [1]	15th LS [1]	16th LS [1]	17th LS	18th LS [1,2]	19th LS [1]	20th LS [1,2,3]
Constant	-0.35	3.88	-3.36	2.55	2.23	3.43	-1.18
	(-0.68)	(3.04)	(-2.03)	(1.50)	(1.34)	(2.26)	(-0.59)
Corruption in Tax	-0.47	-0.05	0.25	-0.04	-0.06	-0.07	0.22
Collection, WEF	(-4.76)	(-0.34)	(1.61)	(-0.30)	(-0.39)	(-0.44)	(1.32)
Log. GDP per head, ppp.		-0.69	-0.28	-0.64	-0.58	-0.69	-0.36
corrected		(-3.61)	(-1.55)	(-3.10)	(-2.99)	(-3.63)	(-1.88)
Central Bank				4.12	3.71		2.38
Independence , Romer				(1.93)	(1.77)		(1.51)
Unregistered Business as			0.60				0.51
percentage of all Business			(4.71)				(3.19)
Log. Openness, World						0.11	-0.36
Bank						(0.36)	(-1.90)
Observations	79	79	79	48	47	79	46
R^2	0.21	0.29	0.47	0.50	0.52	0.29	0.75
R^2, adjusted	0.20	0.27	0.45	0.46	0.48	0.26	0.72
Jarque-Bera	2.57	2.83	1.02	7.26	2.55	2.68	2.16

The values given in the variable section show the coefficient (without parenthesis) and White corrected *t* - statistic (in paranthesis).

1 Taiwan had to be dropped due to the unavailability of data.

2 Japan is excluded from the data set.

3 Panama is excluded from the data set.

regression results are presented in Table V.3. Again, the regressions have White-heteroskedasticity-consistent standard errors and covariance. When testing the relationship between corruption in tax collection and inflation, it is important to keep in mind the very strong positive correlation between the two indicators that capture the extent of corruption in the two sectors. The data correlates +0.93. Therefore, it is no surprise that the regressions run for this part of the analysis have results roughly similar to those of the previous set of regressions. A negative impact of the absence of irregular payments in tax collection on inflation should be expected, judging from the results reported in Table V.1 and given the correlation of the two WEF indicators.

Table V.3 reports the results from regressions based on the Huang and Wei (2003) approach. Figure V.3 illustrates that a logarithmic approach improves the correlation between the Absence of corruption in tax collection

indicator and the average inflation rate. The scatterplots hint at a possible negative impact of the absence of corruption in tax collection on the logarithm of the inflation rate. Once again, the logarithm was used so as to obtain a better comparison between the two sets of regressions. Regression 14 tests the impact of corruption in tax collection on the average inflation rate. As expected, this variable has a negative impact. The regression coefficient has a value of –0.47, demonstrating a highly significant influence. The *t*-statistic is – 4.76. Countries facing corruption problems in their tax authorities are identified by this analysis as the ones that also suffer from high inflation rates. These values are more or less comparable to the results obtained in the first regression is to be expected. The regression coefficients are negative and the *t*-statistics are similar. However, the fit of the new model is not as good as the model based on the absence of corruption in loan applications. While the R^2 is 0.21 in this case, the fit of the first model is 0.29 (cf. Table V.1). Comparable results in terms of inflation reduction are also obtained here. As in the case of corruption from within the central bank, corruption in tax collection cannot be seen as the sole driving force behind inflationary processes. The fit indicates that this socioeconomic indicator of perceived corruption in tax authorities has some power to explain inflation. Whether the link really works through deterioration in tax revenues requires further empirical testing.

The result implies that curbing corruption can result in a reduced inflation rate. Arguments similar to the previous analysis on the effects of corruption in loan applications can be made. Again, Indonesia and Nigeria are used for illustration because both countries showed high average inflation rates. Indonesia's average inflation rate stands at 13.6%. Indonesia's ranking in the absence of corruption in tax collection indicator is 2.9. The average rank for all 80 countries is 5.0. Indonesia would profit from a reduction in corruption in tax collection. If Indonesia were to improve to Estonia's level, it would experience a reduction in the average inflation rate to 4.4%. Nigeria fared even worse in the rankings. Nigeria ranks as 78 out of 80, with a value of 2.5. If Nigeria were to improve conditions by 4 points and realize the level of Canada, the United Kingdom, or Norway—all with scores of 6.5—the resulting average inflation rate would be 3.3 percent. The JB coefficient of

this regression is 2.57, well below the 5.99 threshold. The regression residuals are approximately normally distributed.

These findings offers some support to Huang and Wei's argument. They note:

> *we model corruption as an erosion of a government's ability to collect revenue through formal tax channels.* (2003: 4)

To check for the robustness of the result, some further explanatory variables were included in Regression 15. To avoid stigmatizing poor countries, the analysis controls for poverty or obtained development level. The GDP per head measure, derived from the WEF 2003–03 Report, was chosen as a measure of obtained development level. The inclusion of GDP per head to control for overall development level renders absence of corruption in tax collection insignificant. While the regression coefficient retains its negative value, indicating that a drop in the corruption-related variable leads to a reduced average inflation rate, the influence of the variable on the regression results dropped sharply. The coefficient stands at -0.05. The *t*-statistic indicates that the variable is insignificant (-0.34). Poverty or a low development level seems to drive the inflation rate. The logarithm of GDP per head has a negative impact on the inflation rate. Conversely, a high per capita income level reduces the inflation rate. The *t*-statistic (–3.61) shows that this influence is highly significant. It captures the influence of corruption in tax collection.

Using the percentage of business made up by the shadow economy one can test if the Huang and Wei (2003) hypothesis is valid. Their hypothesis can be split in two parts:

1. Tax evasion drives the shadow economy.

2. The shadow economy drives the inflation rate through pressure to increase seigniorage revenue.

A high degree of tax evasion should provide ample opportunity for tax collectors and the investigative branch of the tax authority to demand bribes. The absence of corruption in tax collection variable and the shadow economy percentage variable correlate at –0.76. The shadow economy percentage renders insignificant the influence of the corruption in tax collection variable and, even more important, it also changes the direction of its impact (cf. Regression 16). This supports Huang and Wei's (2003) theory. The absence of corruption variable now exerts a positive influence on the average inflation rate (0.25). It barely misses significance at the 10% level. This result indicates that the influence of corruption in tax collection works through the shadow economy. The formerly important influence of GDP per head is reduced to impotence with the inclusion of data on the shadow economy. It still has a negative effect on the average inflation rate (–0.28), but it is no longer the driving force. The *t*-statistic (–1.55) and the *p*-value (0.13) both show that it misses being significant even at the 10 % confidence level.[33] The increase of the R^2 and the adjusted R^2 over the values in Regression 15 show that the model benefits from the additional regressor. The normality assumption for the residuals holds.

This finding supports the theory proposed by Huang and Wei (2003) and Al-Marhubbi (2000). Once the shadow economy data is included in the regression, the impact of absence of corruption in tax collection becomes counterintuitive. Because the two variables correlate at a high level (–0.76), multicollinearity is an issue. This multicollinearity is exploited to check whether the shadow economy lowers tax revenue (and increases the average inflation rate) because it leads to an increased bribing of tax collectors. This notion was rejected. The impact seems to be a direct one. Once a measure for the possibility of engaging in corrupt deals is implemented in the regressions, the absence of corruption in tax collection variable does not behave in the way theory would predict. The shadow economy variable has taken over the role of absence of corruption in tax

[33] In addition, a modified version of Regression 14 was tested. It produced the same results when the data on the shadow economy were included. The variable on the absence of corruption in tax collection was insignificant (*p*-value of 0.30). The influence from absence of corruption in tax collection was positive (0.12). The shadow economy variable was completely dominate. The coefficient of this variable is 0.65. It is highly significant in explaining corruption (*t* = 5.66). The residuals are normally distributed (JB = 1.21).

collection. This finding indicates that the proposals of Al-Marhubbi (2000) and Huang and Wei (2003) appear to be valid.

Regression 17 adds data on the independence of the central bank as an additional explanatory variable. In the context of the Huang and Wei (2003) model, the impact of central bank independence should be the following. If corruption in tax collection brings about reduced tax revenue, the government must find different ways to generate the funds needed to cover its expenses. The model postulates that the government will order the central bank to increase seigniorage revenue.

Including central bank independence serves as a test of the model's validity. Because countries with an independent central bank have lower scores for independence the impact of this variable should be positive. Furthermore, the government must have the power to order changes in central bank monetary policy to suits its funding needs. Therefore, the index should capture some of its influence.

Regressions 17 and 18 combine the variable on corruption in tax collection, the development measure of GDP per head, and the indicator on central bank independence. (Note that, due to previously mentioned sample design problems concerning the central bank independence data, the regressions do not have the same number of observations.) Again, Japan produces problems when its inflation data is combined with GDP per head and the Romer (1993) indicator on central bank independence. For reasons of completeness, both regressions are reported here to show that the exclusion of Japan has consequences for the results but does not change them fundamentally; the results for Regression 18, which excludes Japan, will be given in parentheses. The results from the two regressions are as follows. The impact of corruption in tax collection is considerably reduced. The regression coefficient is -0.04 (-0.06). This indicates that fewer corruption incidents reduce inflation, but the *t*-statistic shows that this impact is no longer significant. GDP per head is still important. The regression coefficient of –0.64 (–0.58) shows that a lower income per head increases the average inflation. The *t*-statistic of -3.10 (-2.99) indicates that this influence is very important in explaining the average inflation rate.

Central bank independence also has a significant impact. A country with a more dependent central bank has higher inflation rates. The *t*-statistic of 1.93 (1.77) shows that the influence of central bank independence on the average inflation rate is valid at the 10% level. The fit of the model gradually increased to 50%. The Jarque-Bera statistic indicates that there are problems with the distribution of the residuals as at 7.26, it exceeds the 5.99 threshold. Distribution of the residuals is not normal. However, removing Japan from the sample solves this problem and reduces the Jarque-Bera statistic to 2.55.

Including the shadow economy data in Regression 18[34] has the usual effect of reversing the impact of the absence of corruption in tax collection variable. The regression coefficient of the corruption variable is 0.24; it is not significant at the 10% confidence level. The other two explanatory variables, GDP per head and central bank independence, still have the same influence, as theory predicts, but are insignificant. The shadow economy variable bleeds the significance out of all the other variables. Its influence is, as expected, positive and it is significant at the 1% confidence level. This regression lends further support to Huang and Wei's (2003) theory: the impact of a large shadow economy is positive and results in more inflation.

Openness may also be an influence on a central banker's decisions. Regression 19 employs the logarithm of openness, instead of central bank independence, as an additional explanatory variable to test the robustness of Huang and Wei's (2003) model. Openness increases the impact of absence of corruption in tax collection in explaining the average inflation rate a bit over the results from Regression 15 (t = –0.44). It does retain a negative influence (–0.07). Fewer incidents of corruption in the tax authorities are still related to lower inflation rates. GDP per head again confirms its importance as an explanatory factor; its t-value is at –3.63 and its influence is still negative. Openness has no explaining power on its own. The regression coefficient obtained actually contradicts the Romer's (1993) theory because it is positive.

[34] The following table provides the results from this regression:

Variable	Coefficient	*t*-Statistic	*p*-Value
Constant	-4.24	-2.04	0.05
Corruption in Tax Collection, WEF	0.24	1.44	0.16
Log. GDP per Head, ppp. Corrected	-0.25	-1.30	0.20
Central Bank Independence	2.71	1.56	0.13
Unregistered Business as Percentage of all Business	0.61	3.79	0.0005

The model's R^2 is 0.29. The normality assumption for the residuals holds (JB = 2.68).

How will these influences be affected if the shadow economy variable is included (see Regression 20)? The negative influence of the absence of corruption in tax collection variable on average inflation rate is once again reversed and insignificant at the 10% confidence level (t = 1.32). Openness, GDP per head and the shadow economy drive the results in this regression.

The overall result is that neither the theory of a malicious central banker (see Chapters III and IV) nor the theory of Huang and Wei (2003) received complete empirical backing. Initially, both theories seem to explain average inflation rates; however, once other explanatory variables enter the regressions, the impact of absence of corruption in loan applications and in tax collection is not completely convincing. In particular, the variable concerning the shadow economy wields strong influence on both models. It now seems questionable that corruption plays much of a role in explaining average inflation rates. Some further testing on the robustness of the results is needed.

V.6. Further Tests on the Link Between Corruption and Inflation

The initial tests used only one of the two indicators on the absence of corruption. The following section will combine the two indicators in the same regressions. As highlighted previously in Section V.2, the two indicators are highly correlated, which implies that there is a problem of multicollinearity and this is why the two factors have been dealt with separately until now. However, using both corruption indicators in the same regression will test which of the two competing models (Huang and Wei (2003) or Lambsdorff and Schinke (2002, 2004)) is validated by empirical evidence. The regressions are White-heteroskedasticity corrected. Table V.4 provides the results of the first set of regressions. This analysis will again touch on the issue of the influence of the shadow economy.

The first regression (21) from this set concentrates on the two corruption indicators and provides interesting results. Although the absence

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The R^2 is 0.69. The adjusted R^2 is 0.66. The residuals are normally distributed (JB = 2.80).

of corruption in loan applications turns out as expected, the influence of corruption in tax collection is surprising. The coefficient of absence of corruption in loan applications (–0.90) still has a negative impact; a high value in the WEF indicator appears to accompany a low average inflation rate. This influence is significant (*t*=-3.24). The results for absence of corruption in tax collection point in the opposite direction.

The regression results indicate that absence of corruption in tax collection increases the average inflation rate, which contradicts Huang and Wei's theory. The regression coefficient (0.24) shows that countries perceived as corrupt in their tax authorities have lower inflation rates. The WEF ranking awards high grades to countries that are apparently clean. The *p*-value of the *t*-statistic (1.02) is 0.31. The influence of the WEF indicator on corruption in tax collection is insignificant. The fit of the model is comparable to the fit of Regressions 1 and 14 (see Tables V.1 and Table V.3, respectively). The R^2 stands at 0.28. The Jarque-Bera statistic is below the 5.99 threshold. The residuals have a normal distribution.

In the next regression (22), I again control for the countries' development level by adding GDP per head. Openness and central bank independence are included as further control variables in later regressions (23 – 25). However, the resulting drop in number of observations due to inclusion of central bank independence motivates its omission in some of these regressions. The resulting smaller sample again renders the corruption-related variables insignificant.

The results from the regressions are striking. Regression 22 shows that GDP per head and absence of corruption in loan applications still have the same influence on the average inflation rate, which was also the finding from Regression 2. GDP per head exerts a negative influence. In the new regression, this influence is highly significant (*t*-value of –2.99).

The regression coefficient (–0.80) of absence of corruption in loan applications and the *t*-statistic of this variable (– 2.75) imply that fewer corruption incidents in loan applications lead to low inflation rates. The importance is lowered by the inclusion of GDP per head, as compared to the previous regression (21), but remains significant at the 1% confidence level. Interestingly, the positive influence of the absence of corruption in tax

collection increased in this regression. The regression coefficient (0.53) illustrates that a very corrupt tax authority would reduce the average inflation rate — a fact that is hard to reconcile with the theory. The influence is significant at the 5% confidence level. Model fit improved with the inclusion of GDP per head. The R^2 is 0.35.

To test the robustness of the results, the logarithm of openness is added to the model in Regression 23. The inconsistency in the influence of absence of corruption in tax collection remains. Absence of corruption in loan applications still has a negative impact on the average inflation rate with almost the same regression coefficient of –0.79. Its significance drops a bit, but it continues to be powerful in explaining the average inflation rate (t = –2.61). The corruption in tax collection variable's coefficient is still positive (0.53) and significant at the 10% confidence level. The new variable, openness, is not significant even at the 10% level. The coefficient of openness shows that a higher degree of openness again seems to increase

Table V.4: Tests for Robustness I

Dependent Variable: Log(inflation),

Average Inflation Rate Between 1993 and 2003

Variable	21st LS [1]	22nd LS [1]	23rd LS [1]	24th LS [1,2]	25 th TSLS [1,2,3]	26th LS [1,2]	27th TSLS [1,2,3]
Constant	0.65	4.33	4.25	4.57	7.15	-3.25	-10.98
	(1.01)	(3.20)	(2.62)	(2.38)	(1.14)	(-1.91)	(-1.93)
Absence of Corruption in	-0.90	-0.80	-0.79	-0.36	-2.28	-0.86	-2.08
Loan Applications, WEF	(-3.24)	(-2.75)	(-2.61)	(-0.81)	(-4.46)	(-4.19)	(-3.79)
Absence of Corruption in Tax	0.24	0.53	0.53	0.21	1.82	0.87	1.41
Collection, WEF	(1.02)	(2.06)	(1.93)	(0.78)	(1.56)	(3.95)	(-1.91)
GDP per head, ppp.		-0.62	-0.62	-0.54	-0.59	-0.15	0.91
corrected		(-2.99)	(-3.01)	(-2.30)	(-0.54)	(-0.79)	(1.12)
Log. Openness, World Bank			0.02	-0.51	-0.47		
			(0.06)	(-2.36)	(-1.13)		
Central Bank Independence				2.80			
				(1.52)			
Unregistered Business as						0.59	1.04
Percentage of all Business						(5.17)	(2.97)
Observations	79	79	79	47	78	78	78
R^2	0.28	0.35	0.35	0.58	0.16	0.56	0.15
R^2, adjusted	0.26	0.32	0.31	0.53	0.11	0.53	0.11
Jarque-Bera	5.05	4.92	4.63	3.65	1.96	1.26	1.43

The values given in the variable section show the coefficient (without parenthesis) and White corrected t -statistic (in paranthesis).

1 Taiwan had to be dropped due to the unavailability of data.

2 Japan is excluded.

3 Instruments are the dummies for the regions Africa and the Middle East, Eastern Europe, Latin America and South-East Asia.

the average inflation rate, a finding again related to the sample design problem addressed above. In the present model, the main influence is GDP per head.

Central bank independence has the expected effect (see Regression 24). The importance of the two absence of corruption variables on the inflation rate is lowered, both in significance and impact. Both variables retain their previous type of influence (see Regressions 21, 22, and 23), but the absolute values of their coefficients are lower, compared to the previous regressions. The inconsistent behavior of absence of corruption in tax collection remains. A very corrupt tax authority seems indicative of low average inflation rates. In Regression 24, the inclusion of central bank independence benefits openness, as in previous regressions, but this time the coefficient has the correct sign, signifying a negative influence. It is significant at the 5% level. The influence of GDP per head is also confirmed. A high per capita gross domestic income goes along with low inflation rates. This influence is significant at 5% confidence level (t = –2.30). The normality assumption for the residuals holds.

However, these regressions are troubled by two problems:

1. The corruption-related data suffer from endogeneity.

2. The corruption data might contain measurement errors.

Corruption in loan applications and corruption in tax collection can be endogenous. For example, inflation could increase the real tax burden, which might lead taxpayers to resort to bribery of tax officials so as to decrease this burden. It is thus not clear whether corruption results in higher inflation rates, or if high inflation rates lead to corruption.

Similarly, high inflation rates might be the cause of high bribe payments in the banking sector. For example, prolonged high inflation rates may make banks reluctant to make loans, a situation private parties in need of funds might overcome by offering bribes. Again, it is not clear whether corruption causes the high inflation rates or whether the inflation rates are the result of corruption.

The two-stages least square (TSLS) model can help solve this sort of endogeneity problem. Because the previously employed first-stage model provided better results for the data on the absence of corruption in loan applications, only this variable is seen as possibly endogenous in the following set of regressions. The forecasted values for absence of corruption in loan applications enter the second regression along with the logarithms of GDP per head and openness and the indicator on the absence of corruption in tax collection.

TSLS is also useful in overcoming the second problem mentioned above—the possibility of measurement errors in the corruption-related data, which, if present, could have a severe impact on the regression output. The obtained coefficients tend to be smaller if an explanatory variable with a stochastic error term enters the regression. Furthermore, the basic linear regression model cannot be used in this case because all the explanatory variables must be nonstochastic.

It is quite possible that the corruption data used here suffers from measurement errors. The WEF polls 8,000 individuals to obtain the data for its indicators. This introduces a possible stochastic measurement error. Regional spillover might come into play. Such a spillover can arise if a certain region lacks a clean and transparent central bank as an example to the other central banks. Because of the lacking good example from neighboring countries, there is no public pressure on the central bank to reduce its corruption level. To check for such spillovers, the regional dummies[35] will serve as instruments in the following TSLS-models.

[35] The sample from the WEF 2002/03 World Competitiveness Report includes five regions:

1. **Western Hemisphere**: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom, and the United States of America.
2. **Latin American Countries**: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Trinidad and Tobago, Uruguay, and Venezuela.
3. **Southeast Asia**: Bangladesh, China, Hong Kong SAR, India, Indonesia, Japan, Korea, Malaysia, the Philippines, Singapore, Sri Lanka, Taiwan, Thailand, and Vietnam.
4. **Africa and the Middle East**: Botswana, Israel, Jordan, Mauritius, Morocco, Namibia, Nigeria, South Africa, Tunisia, Turkey, and Zimbabwe.
5. **Eastern Europe**: Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russia, the Slovak Republic, Slovenia, and Ukraine.

For the TSLS model, it is necessary to have a suitable model for the corruption variable so as to run the first-stage model. Choosing a suitable model is not always straightforward. For the given case of possible errors in the measurement of the corruption variable the model will need to address regional discrepancies. As further explanatory variables, the logarithms of openness and GDP per head will be included.[36] The model's fit is $R^2 = 0.67$ and the residuals are normally distributed. Using the same model for the absence of corruption in tax collection produces inconclusive results.

However, running the TSLS for the absence of corruption in loan applications leads to striking results, clearly pointing out that measurement of the absence of corruption in loan applications can have stochastic influences that need to be filtered out.

In TSLS Regression 25, the inconsistency of the influence of absence of corruption in tax collection is again persistent. Absence of corruption in loan applications exerts a negative influence (–2.28) on the average inflation rate, while the absence of corruption in tax collection again increases inflation (1.82). Absence of corruption in loan applications is highly significant (t = –4.46). Absence of corruption in tax collection, as well as the influences from the logarithms of GDP per head and openness, are insignificant. The regression coefficients for openness and GDP per head are negative—as predicted by the theoretical models.

The inconsistent impact of corruption in tax collection survived the inclusion of several explanatory variables. Its coefficient was positive and the impact significant in some cases. Absence of corruption in loan applications behaved as follows. As expected, this variable has a negative impact on the average inflation rate. It only failed to be significant when data on central bank independence was included (cf. Regression 24). How will these results fare if data on the prevalence of the shadow economy in included? Regressions 26 and 27 answer this question.

Both corruption-related indicators have are higher significance in Regression 26. While a high degree of absence of corruption in loan applications seems to be responsible for low average inflation rates (–0.86), the opposite is true for corruption in tax collection (0.87). The shadow

[36] Note that the logarithm of GDP per head and the logarithm of openness will enter the

economy data exerts a positive influence on the average inflation rate (0.59), which is highly significant (*p*-value of 0.00).[37]

An analogous picture emerges if one runs a TSLS model with the shadow economy data set (cf. Regression 27). The explanatory variables of the second stage model are the two absence of corruption variables, GDP per head (log), and the shadow economy data set. Absence of corruption in loan applications still exerts a negative influence on the average inflation rate (–2.08) and is highly significant (*p*-value of 0.0003). The coefficient of the absence of corruption in tax collection is still positive (1.41) and significant at the 10% confidence level. The shadow economy data again wield a positive and highly significant influence (*p*-value of 0.004). Interestingly, GDP per head has a positive but insignificant influence (coefficient of 0.91, *t*-statistic = 1.12).

The findings from these regressions are supportive of the theory set out in Chapters III and IV. Including the shadow economy data fails to make the impact of absence of corruption in loan applications insignificant or to change its impact on the average inflation rate. On the other hand, it increases the positive impact of corruption in tax collection. The finding of a persistently inconsistent impact for absence of corruption in tax collection in Regressions 21 – 27 contradicts Huang and Wei's (2003) theory. More corruption seems to be beneficial in driving down inflation and thereby reducing the inflation costs to society. How can it be that corruption in one sector is beneficial while in the other sector it is harmful? Before drawing any conclusions from the regression results, one must remember that the correlation between the two explanatory corruption variables is very high. These variables on the absence of corruption in loan applications and on the absence of corruption in tax collection are correlated with each other at 0.93. Such high correlations are an indication of multicollinearity.

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second stage as well; they should not be interpreted as instruments.

[37] A comparable model including openness was also tested. Including this variable does not change the results much. Absence of corruption in loan applications continues to lower the inflation rate significantly (coefficient of –0.78; t-statistic = –3.40). Absence of corruption still exerts a positive influence (coefficient of 0.80, *t*-statistic = 3.43). GDP per head retains its negative influence (–0.19) and, again, its impact is insignificant (*t* = –0.96). Openness exerts a positive influence. Its coefficient is 0.21. The *t*-statistic of 0.71 reveals that this influence is not important. The importance of the shadow economy continues unabated (coefficient of 0.62, *t*-statistic = 5.37). The model does not gain from the inclusion of this variable; the adjusted R^2 drops to 0.51. The normality assumption holds (JB = 2.29).

The basic assumption of the multivariate regression model is that there is no linear relation between the explanatory variables. Multicollinearity leads to the problem that the regression coefficients cannot be interpreted because, ceteris paribus, a change in just one of the collinear variables is not possible: a change in one variable always leads to a change in the other variable.

There are two possible way of dealing with this problem. The first way is to subtract the absence of corruption in tax collection indicator from the absence of corruption in loan applications indicator. A second way to overcome the multicollinearity problem is to use a model that fits the value of the absence of corruption in loan applications variable on the basis of the absence of corruption in tax collection variable. This regression's residuals are then used in the regressions on the impact of corruption and inflation.[38]

[38] The results of this technique are not much different from the results presented here. The error term from the regression

$$\text{Loan Applications} = \alpha + \beta_1(\text{Tax Collection}) + \varepsilon$$

has a negative impact on the average inflation rate. Its coefficient stands at –0.78. The *t*-statistic shows it is significant (*t* = –2.64). GDP per head still exerts its negative and significant influence (coefficient = –0.72, t-statistic = –6.15).

The first method allows for a comparative test on the two models. Taking the difference of these two types of corruption reveals whether a diverging perception of corruption in the banking sector and in tax collection influences the average inflation rate. Thus, one can directly test Huang and Wei's (2003) model against the models developed in Chapters III and IV.

The difference between the two indicators is the corruption-related explanatory variable Regression 28. The logarithm of GDP per head is also included in the regression. If the banking sector is perceived as cleaner than the tax collection sector, this new indicator reduces inflation. On the other

Table V.5: Tests for Robustness II

Dependent Variable: Log(inflation),

Average Inflation Rate Between 1993 and 2003

Variable	28th LS [1]	29th LS [1,2]	30th TSLS [1,2,3]	31st TSLS [1,3]
Constant	5.28	5.33	7.00	8.21
	(4.19)	(3.38)	(4.74)	(3.53)
Absence of Corruption in Loan Applications	-0.60	-0.61	-1.78	-1.77
– Absence of Corruption in Tax Collection	(-2.22)	(-2.09)	(-3.90)	(-2.69)
Log. GDP per head, ppp. corrected	-0.87	-0.87	-1.05	-1.09
	(-6.54)	(-6.26)	(-6.72)	(-6.91)
Log. Openness, World Bank		-0.01		-0.21
		(-0.04)		(-0.52)
Observations	79	79	78	79
R^2	0.33	0.33	0.16	0.18
R^2, adjusted	0.31	0.30	0.13	0.15
Jarque-Bera	3.73	3.85	5.00	6.41

The values given in the variable section show the coefficient (without parenthesis) and White corrected *t* - statistic (in paranthesis).

1 Taiwan had to be dropped due to the unavailability of data.

2 Japan is excluded.

3 Instruments are the dummies for the regions Africa and the Middle East, Eastern Europe, Latin America and South-East Asia.

hand, if the corruption problem is seen as more endemic in the banking sector, the variable increases inflation. As Table V.5 shows, the new indicator has a negative impact on the average inflation rate. India and Romania are used as examples to illustrate this point. In the Romanian case, the new indicator is negative (–0.9), while the Indian value is positive (0.8). This indicator is now introduced in a regression with White-heteroskedasticity-consistent standard deviations and error terms.

	Average Inflation Rate, 1994–2003	Average Monetary Growth, 1994–2003	WEF Absence of Corruption in Loan Application	WEF Absence of Corruption in Tax Collection	WEF GDP per head, ppp-corrected	Central Bank Independence, Romer (1993)
India	0.069	0.146	4.2	3.4	2464	0.19
Romania	**0.653**	**0.522**	**3.3**	**4.2**	**7036**	

Romania ranks worse in the socioeconomic indicator on the absence of corruption in loan applications than for the tax collection indicator. Because Romania is perceived as more corrupt in loan applications than in its tax collection, a shift from more corruption in loan applications to more corruption in tax collection would result in an increased inflation rate for this country. The values of this indicator are provided in Section V.10. The regression coefficient is –0.60; the *t*-statistic's *p*-value is 0.03. This new index is significant at the 5% level in explaining the average inflation rate. A reduced corruptibility in and around the central bank reduces the inflation rate. This finding confirms the influence of the WEF indicator on the absence of corruption and is a confirmation of the findings from the first set of regressions (cf. Table V.1).

A high degree of absence of corruption in tax collection seems to increase the average inflation rate, which is contrary to the theory. The logarithmic value of GDP per head retains the same influence as has been reported throughout this section. Again, a higher per capita income level goes along with lower average inflation rates. The *t*-statistic of –6.54 shows the high significance. The fit of the model is in the same range as for previous models (R^2 =0.33). The Jarque-Bera statistic (3.73) shows that the regression residuals are approximately normally distributed.

The results of Regression 28 need to be validated by some further checks on robustness. Regression 29 adds the openness measure. The corruption variable continues to be significant at the 5% level, a continuing indication that less corruption in and around the central bank and banking institutions goes along with lower average inflation rates. The results are driven by GDP per head, which exerts a strong negative and highly

significant influence on the average inflation rate, whereas openness fails to be significant.

The possibility of endogeneity and/or measurement error in the corruption-related data is dealt with by using a TSLS model. TSLS Regressions 30 and 31 use the same instrument variables to explain the difference between the two absence of corruption indicators as did Regression 25. The two TSLS models differ in the number of explanatory variables. Regression No. 30 employs the corruption-related variable and the logarithm of GDP per head; Regression 31 adds the logarithm of openness measure. Both regressions show that the absence of corruption in loan applications is an essential contributing factor in explaining the average inflation rate. Its impact continues to be negative and significant at the 1% confidence level. GDP per head is highly significant in both regressions and continues its expected negative influence. In Regression 31, openness is insignificant but strengthens the impact of GDP per head. The residuals of Regression 31 regression are not normally distributed; it narrowly misses the 5.99 threshold of the Jarque-Bera statistic.

We have yet to control for the shadow economy in this series of regressions. If the inconsistent influence of absence of corruption in tax collection shown in the previous regressions survives the inclusion of the shadow economy data, it will be further proof of the results' robustness. This would be important empirical evidence in support of the theory of the malicious and corrupt central banker as proposed in Chapters III and IV. The results for these regressions are given in Table V.6. The first test, Regression 32, employs the difference between absence of corruption in loan applications and in tax collection and the shadow economy data.

Both variables have powerful explanatory effect for the average inflation rate and both are significant at the 1% level. More importantly, however, the negative influence of the corruption-related variable continues. Its regression coefficient is – 0.84. A low degree of corruption in loan applications is still connected to low average inflation rates, while less corruption in tax collection appears to be connected to higher inflation rates. The R^2 is 0.55. The normality assumption for the residuals holds. The Jarque-Bera statistic is below its 5.99 threshold, implying that the residuals are normally distributed. Comparing these results to those of Regression 28 reveals that the impact of the difference between the two absence of corruption variables due to the inclusion of the shadow economy data as an

Table V.6: Tests for Robustness III

Dependent Variable: Log(inflation),

Average Inflation Rate Between 1993 and 2003

Variable	32nd LS [1,2]	33rd LS [1,2]	34th LS [1,2]	35th LS [1,2]	36th LS [1,2,3]	37th LS [1,2,3]	38th TSLS [1,4]
Constant	-4.82	-3.25	-3.93	-4.12	-2.42	-2.25	-2.64
	(-21.99)	(-1.92)	(-1.76)	(-2.01)	(-1.09)	(-1.26)	(-1.00)
Absence of Corruption in Loan Applications – Absence of Corruption in Tax Collection	-0.84	-0.87	-0.34	-0.79	-0.34	-0.31	-1.76
	(-4.48)	(-4.38)	(-1.52)	(-3.70)	(-1.53)	(-1.56)	(-3.30)
Unregistered Business as Percentage of Business	0.65	0.58	0.56	0.62	0.46	0.46	0.68
	(9.61)	(5.56)	(4.20)	(5.77)	(3.67)	(5.12)	(6.14)
GDP per head, ppp corrected, log		-0.15	-0.12	-0.17	-0.24	-0.25	-0.33
		(-0.98)	(-0.62)	(-1.13)	(-1.29)	(-1.09)	(-1.50)
Central Bank Independence			2.39		2.07		
			(1.32)		(1.23)		
Log. Openness, World Bank				0.21	-0.37	0.02	-0.28
				(0.72)	(-1.98)	(0.06)	(-1.17)
South-East Asia						-0.51	
						(-0.96)	
East Europe						1.35	
						(3.23)	
Africa and the Middle East						0.24	
						(0.58)	
Latin America						0.12	
						(0.32)	
Observations	78	78	47	79	46	77	79
R^2	0.55	0.56	0.68	0.54	0.75	0.76	0.44
R^2, adjusted	0.54	0.54	0.65	0.52	0.72	0.70	0.41
Jarque-Bera	1.63	1.29	2.12	2.37	2.51	3.89	3.59

The values given in the variable section show the coefficient (without parenthesis) and White corrected *t*-statistic (in paranthesis).

1 Taiwan had to be dropped due to the unavailability of data.

2 Japan is excluded.

3 Panama is excluded.

4 Instruments are the dummies for the regions Africa and the Middle East, Eastern Europe, Latin America and South-East Asia.

additional explanatory variable. The impact of corruption in tax collection is now controlled by the shadow economy.

In Regressions 33–37, several robustness tests are performed. These tests involve the inclusion GDP per head, central bank independence, and openness. Almost all these additional explanatory variables fail to be significant even at the 10% level, with the exception of openness in Regression 36. The impact these additional variables have on the inflation rate more or less confirms the theory. One noteworthy exception is the behavior of the openness indicator. If openness alone, that is, without central bank independence, is included in the regression, it achieves a positive, but insignificant, influence. GDP per head always wields a negative influence, whereas central bank independence has the expected positive influence in Regression 36. More politically dependent central banks receive higher scores. The more control the ministry of finance has, the higher is the inflation rate. A possible explanation for this result could be that the government might be tempted to use the central bank to finance its expenditure via the creation of additional money.

Regression 37 shows that the regional dummies have a strong impact on the difference between the absence of corruption in loan applications and in tax collection:[39] this formerly highly significant explanatory variable is now insignificant. The regional dummies also increase the regression coefficient from its former value of around –0.80 to –0.31. The emerging picture is one of the average inflation rate being strongly dependent on regional characteristics and the shadow economy. Again, it is possible that the corruption-related variable itself is stochastic. To test for this, another TSLS model is calibrated, which largely parallels TSLS Regression 31. Added to the instruments on the difference between the absence of corruption in the loan application and tax collection sectors is data on the shadow economy. It is essential to include this data in the model because the shadow economy exerts a strong impact on absence of corruption in tax collection.

TSLS Regression 38 highlights that the difference between the two absence of corruption indicators has a significant impact on the average inflation rate ($t = -3.30$) and, as expected, the impact is negative. The

[39] For a description of the regional dummy variables, see footnote 35.

inconsistency in the behavior of absence of corruption in tax collection indicator continues despite including the shadow economy as an additional explanatory variable. The other explanatory variables behave as expected. A high prevalence shadow economy continues to be connected to high average inflation rates. The logarithms of openness and GDP per head retain their formerly reported negative influence, but are insignificant.

What is the relevance of these robustness test results carried out in this section? There is some inconsistency in the way corruption in tax collection influences the average inflation rate. Section V.5 found out, that countries that are more corrupt in tax collection tend to have higher inflation rates. This influence is not robust to the inclusion of GDP per head or openness. Some doubt has been cast on the empirical validity of Huang and Wei's (2003) model. Yet, other tests for the robustness of the channel proposed by Huang and Wei support their model. Once the prevalence of the shadow economy (Unregistered Business as Percentage of all Business) enters the regressions along with absence of corruption in tax collection (cf. Table V.3), absence of corruption in tax collection has a positive impact on the average inflation rate, as result of the multicollinearity problem. While the absence of corruption indicator attempts to measure actual (perceived) corruption, the other indicator, the shadow economy, measures the possibility of corruption. The fact that the importance of the shadow economy captures the influence of absence of corruption supports their theory.

The tests of the present section, which combine both absence of corruption indicators, are less supportive of this channel. The robustness tests performed in this section exploit the multicollinearity of the two absence of corruption indicators. This comparative study of the models under study (Huang and Wei (2003) and Lambsdorff and Schinke (2002, 2004)) shows mixed results for both theories. The hypothesis that corruption in the central bank increases the average inflation rate is not fully supported by the empirical results. Three findings are of special interest.

First, the impact of absence of corruption in loan applications continues to be negative despite the inclusion of absence in corruption in tax collection and other variables. The variable is significant in explaining the average inflation rate in most models. Only the inclusion of the data on

central bank independence or the regional dummy variables rendered the impact of corruption in loan applications insignificant. In the case of regressions that include central bank independence indicator, this result is due to sample design; in the case of the regional dummies, it led to the use of TSLS models to control for endogeneity or for measurement errors of the corruption-related data. These TSLS models revealed that a high degree of absence of corruption in loan applications tends to be accompanied by low average inflation rates. These findings offer some support to the theory of the intrinsically corrupt, malicious central banker proposed by Lambsdorff and Schinke (2002, 2004) and Chapters III and IV. The influence of absence of corruption in tax collection is inconsistent with the theory proposed by Huang and Wei (2003).

Second, the results may be due to multicollinearity. The two absence of corruption indicators correlate at 0.93. This problem was addressed by using the difference of the two variables. However, the inconsistent performance of absence of corruption in tax collection continues. The impact of the new variable is mostly significant in describing the average inflation rate.

Third, the prevalence of the shadow economy was included in the regression as a final test for the validity of the two competing models. Despite the fact that the prevalence of the shadow economy is highly significant, inconsistency in the impact of absence of corruption of tax collection remains.

V.7. Corruption and Inflation in Transitional Economies

The empirical tests on the validity of the models proposed in Chapters III and IV offered some backing. This section attempts to test the models for a different sample of transitional economies. The effects of corruption on monetary policy remain a conjecture until there is an empirical check for validity. The previous section investigated these effects by using a proxy. Until recently, there was a lack of data useful for conducting empirical research into the causes and consequences of central bank corruption. However, the World Bank and European Bank for Reconstruction and Development included the following question in BEEPS:

Use this scale (No Impact; Minor Impact; Significant Impact; Very Significant Impact; Don't Know; Not Applicable): To what extent the following forms of corruption had an impact on your business?
The Central Bank's mishandling of funds …

This question was included in the survey conducted for 26 transition countries. The countries included: Albania, Armenia, Azerbaijan, Belarus, Bosnia, Bulgaria, Croatia, the Czech Republic, Estonia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Macedonia, Moldova, Poland, Republic Serpska, Romania, Russia, Slovakia, Slovenia, Turkey, Ukraine, and Uzbekistan.

About 4,104 senior businesspeople were polled on corruption-related issues in these 26 countries. In the following empirical investigation into the impact of central bank corruption on the average inflation rate, Republic Serpska, Bosnia, and Uzbekistan had to be omitted because the International Monetary Fund does not report inflation rates or, more precisely, the year-by-year percent change of the Consumer Price Index, for them. Thus the final sample is comprised of 23 countries.

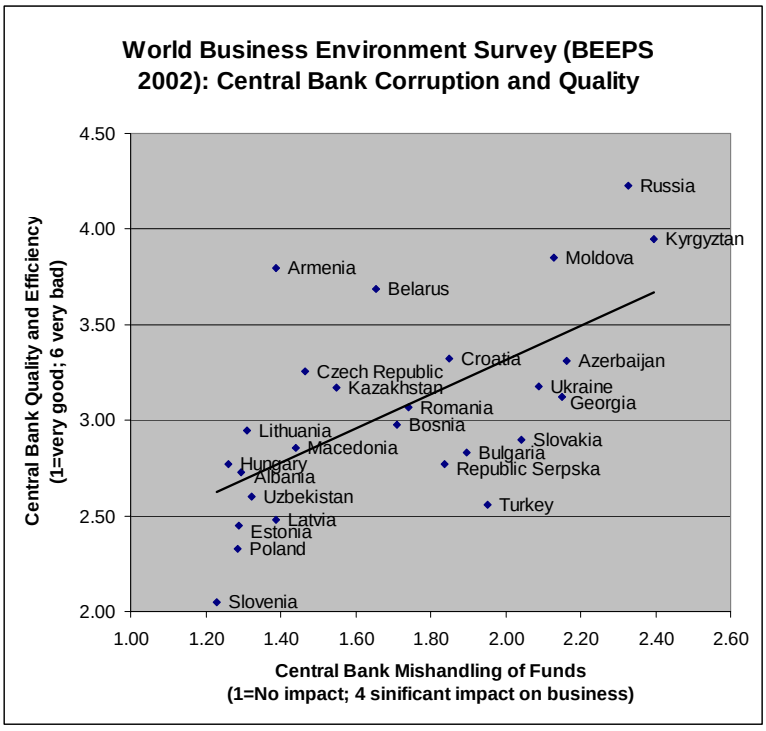

Figure V.5: Relation Between Corruption in the Sphere of the Central Bank and Central Bank Quality.

As a first glance at the corruption-related data used in this analysis, a scatterplot of the BEEPS central bank corruption indicator and an indicator on central bank quality from the same survey is presented in Figure V.5. As can be seen from the scatterplot, the two data sets are positively correlated at 0.62. Thus, there is a link between the perception of central bank quality and central bank corruption. A central bank perceived as highly corrupt was also judged as of rather poor quality by the respondents. The upward sloping regression line in Figure V.5 reflects this result. The term “mishandling of funds” is somewhat vague. It might include the embezzlement of funds from the central bank’s employees or the selling of funds or inside information, but it could also encompass things not as obviously corrupt, for example, incompetence of central bank staff. Incompetence could lead to bad decisions in the course of seigniorage maximization or poorly constituted central bank portfolios. However, In the context of the BEEPS questionnaire, the question regarding the central bank’s mishandling of funds occurred in a section that dealt with several other corrupt issues, such as the sale of parliamentary votes, presidential decrees, court decisions, and the extent of bribery and patronage among public officials and thus the term “mishandling” was likely interpreted by the respondents as relating to illegal acts where benevolence is absent.

The model of the intrinsically corrupt central banker hypothesizes that corruption in the sphere of the central bank leads to increased inflation rates. To check this hypothesis for 23 countries, data on their annual inflation rates were retrieved from the International Financial Statistics website for the period from 2000 to 2004. This period corresponds to the period (2002) in which the corruption-related data were collected. To balance out asymmetric shocks and their impact on the regression results, an average inflation rate for the given period was established with the technique described in Section V.4:

$$\pi_n = \sqrt[5]{\prod_{t=1999}^{2004}\left(1+\pi_t\right)} - 1.$$

The regression results are presented in Table V.7. As hypothesized by the model of the corrupt central banker, corruption may exert an inflation-augmenting influence.

In Regression 39, the BEEPS variable on corruption in the sphere of the central bank is included along with a constant factor. The regression results show that both regressors have a significant impact on the inflation rate. Corruption in the sphere of the central bank retains a positive impact on inflation in all 23 transition economies. The *t*-statistic demonstrates that this influence is significant. The null hypothesis can be rejected at the 5% level.

Table V.7: Corruption and Inflation in Transitional Economies
Dependent Variable: Log(Inflation)
Average Inflation Rate Between 1999 and 2004[a]

Independent Variable	OLS 39	OLS 40	OLS 41	OLS 42	OLS 43	OLS 44
Constant	-3.78	-9.13	-5.27	-5.17	-5.48	0.75
	(-8.41)	(-3.38)	(-1.45)	(-1.52)	(-1.56)	(0.23)
Central Bank Mishandling of Funds, BEEPS, log	1.89	2.61	3.07	3.09	3.26	
	(2.37)	(3.34)	(3.53)	(3.53)	(3.35)	
GDP per Head, ppp-corrected, log		0.57	0.25	0.36	0.42	-0.11
		(1.95)	(0.72)	(0.96)	(1.07)	(-0.30)
Percent of Tax Evaded, BEEPS			-0.06	-0.08	-0.08	-0.09
			(-1.90)	(-2.45)	(-2.47)	(-2.57)
Openness, WDI				-0.01	-0.01	-0.01
				(-1.64)	(-1.40)	(-1.39)
Ratio of External Debt to GDP					-0.58	
					(-0.55)	
Central Bank Mishandling of Funds, corrected[b]						3.40
						(3.11)
Observations	23	23	23	23	22	23
R^2	0.17	0.25	0.44	0.49	0.51	0.43
R^2, adjusted	0.13	0.17	0.35	0.38	0.36	0.30
Jarque-Bera [c]	0.38	0.12	0.80	0.12	0.08	0.12

[a]White corrected *t*-statistics are in parenthesis.
[b]The logged variable has been regressed on the perception of central bank quality and a constant. The residuals from this regression are employed as the explanatory variable.
[c]The Jarque-Bera statistic measures whether a series is normally distributed by considering its skewness and kurtosis. The assumption of a normal distribution can clearly be rejected for results greater than 6.

To cross-check the simple regression, further explanatory variables for the set of 23 transition countries are employed. These follow the suggestions of Sturm and de Haan (2001) and Campillo and Miron (1996).[40] Regression 40 employs GDP per head as additional explanatory variable. Although this variable increases the influence and the significance of the corruption-related variable, its impact is positive, which is contrary to the findings from the

[40] The suggestions from Sturm and de Haan (2001) and Campillo and Miron (1996) already guided the choice of additional explanatory variables in Section V.5.

previous sets of regressions presented in Sections V.5 and V.6. In later regressions (41–44), this positive impact is not significant.

The theoretic literature contains two reasons why corruption could lead to higher inflation rates. First, corruption inside the central bank itself, for example, a corrupt staff, might lead to increased levels of inflation, an idea that is at the core of the theoretical models presented in Chapters III and IV. Second, corruption might lead to higher inflation rates (cf. Huang and Wei 2003) because the government needs to replace corruption-induced lower tax revenue by higher seigniorage revenue. Regression 41 tests this notion. Fortunately, data on perceived tax evasion was collected BEEPS. Respondents were asked:

> *What percentage of the sales of a typical firm in your area of activity would you estimate is reported to the tax authorities, bearing in mind difficulties with complying taxes and other regulations?*

The following regression uses an average perception of taxes evaded for each of the countries. The results from the regression fail to support the theory. In theory, inflation should increase with a government's greater dependence on the seigniorage revenue, that is, with the extent of tax evasion. However, the coefficient of –0.06 reveals an unexpected negative influence, which is significant at least at the 10% level (*p*-value of 0.07). The corruption-related variable, mishandling of funds by the central bank, is the only significant influence. The impact is—as predicted—positive and the *t*-statistic of 3.35 means that it is significant even at the 1% confidence level. In summary, the result of this regression is that the link between corruption and inflation via tax evasion does not hold.

This result should be interpreted with some caution, however. The negative impact of corruption might stem from a public misperception of the central banker. Due to underreporting of economic activity, which is a direct offshoot of tax evasion, the official GDP is lower than the actual GDP. In this situation, the official GDP data might lead central bankers to set inflation rates that are too low. Then, so as to meet their announced (or unofficial)

inflation targets, central bankers could set lower growth rates of the monetary stock, leading to an insufficient money supply.

Following the advice of Sturm and de Haan (2001), this study adds degree of openness as an additional explanatory variable (Regression 42). The data on openness is based on the World Bank's world development indicators and is calculated as the sum of imports and exports of goods and services as percentage of GDP. To soften the impact of special influences, the data from 1996 to 2002 were used. The arithmetic mean is used to calculate the average degree of openness. Romer (1993) suggests that openness can be influential in explaining the inflation rate in a cross-section of countries. Currency fluctuations caused by monetary surprises are more painful and less effective in open economies. In the context of the models developed in Chapters III and IV, it is assumed that for an open economy the coefficient θ is higher than it is in closed economies (see Equations (III.10) and (IV.1) respectively).

The data on openness was included in Regression 42 along with the data on the mishandling of funds by the central bank, GDP per head, and the percentage of taxes evaded. The inclusion of the new explanatory variable saw the R^2 increase to 0.49. The adjusted R^2 also increased—indicating that the econometric model benefited from the inclusion of this variable. The variable itself, however, proves insignificant for the results. Its impact is slightly negative; the regression coefficient is at –0.01. The *t*-statistic barely misses significance at the 10% level (*p*-value of 0.12). As is true for the other variables, mishandling of funds by the central bank retained its positive impact. The regression coefficient stands at 3.09 and its significance was also bolstered. The *t*-statistic of 3.53 indicates significance at even the 1% level. The regression coefficient of taxes evaded increased to –0.08 and the *t*-statistic grew to -2.45. The impact is now significant at 5 and 10% confidence levels. The residuals of the regression are normally distributed.

Sturm and de Haan (2001) emphasize that another influential factor in the study of central bank quality and inflation in developing countries is the ratio of external debt to GDP. Highly indebted countries might prefer to generate additional income from seigniorage. However, the effect of adding this variable was not significant and its influence was negative. As was the

case for the 42nd regression, mishandling of funds by the central bank and, to a somewhat lesser extent, percentage of taxes evaded remained the only significant influences.

Despite the results of these regressions, some skepticism is warranted. In most empirical analyses on corruption involving subjective data, which is the case here where we use respondents' assessment of central bank corruption, the problem of an endogeneity bias arises. In the BEEPS, respondents might have ranked central banks as more satisfactory if the banks were responsible for lower inflation rates. This would result in an upward bias of the coefficient. However, the subjective assessment of central bank *quality* is susceptible to the same bias. To work around this problem, the variable on mishandling of funds has been regressed on the BEEPS variable for central bank quality and efficiency. This regression's residuals are employed as the variable "central bank mishandling of funds, corrected" in Regression 44. The residuals now represent the strength of the relationship between the central bank's mishandling of funds and perceived central bank quality and efficiency. Because both variables are susceptible to the same bias, the residuals from this regression should be free of the bias. This variable exerts a positive and significant influence on the logarithm of the inflation rate. The regression coefficient of 3.40 and the *t*-statistic of 3.11 show that the influence is highly significant (*p*-value less than 0.01). Comparison of Regressions 43 and 44 shows that the data do not suffer from an endogeneity problem. The influence of this corrected mishandling of funds variable is comparable to the impact in Regression 43, where it was not "corrected." The other explanatory variables in the regression are also comparable in terms of coefficients and significance. The only other significant explanatory variable is the percentage of taxes evaded, an influence in contradiction to theory.

V.8. Conclusion and Discussion

Corruption and inflation are at the core of this study. Theoretical models suggest that there is a link between corruption and inflation and this work has investigated two competing strands of thought on how this link is forged. It has been hypothesized either that (1) the central banker is outright corrupt

and benefits directly from selling inside information or (2) various external corrupt forces have decreased the state's revenue and the banker decides (or is pressured) to make up the revenue by pursuing a monetary policy that is quite possibly not in the best interest of society, if not outright illegal. The present study tested these two theories empirically with data from the Global Competitiveness Report 2002–2003 (Cornelius, Porter, and Schwab 2003) and BEEPS (World Bank and the European Bank for Reconstruction and Development 2002).

The empirical data lent partial confirmation to one model. As hypothesized in Chapter III and IV, corruption in the sphere of the central bank may exert a positive influence on inflation. However, in achieving this result, certain assumptions were necessary. Because the WEF's Global Competitiveness Report does not report directly on corruption in the central bank, data derived from answers to its question regarding "*irregular payments in loan applications*" were used as a proxy for central bank corruption. Even taking this limitation into consideration, however, the measure has some power in explaining the average inflation rate. Countries appear to be prone to high average rates of inflation if their banking institutions are corrupt. In this situation, the central banker and his or her staff are able to generate additional income from corrupt dealing. For example, the central banker could sell valuable information about future monetary policy or use his or her supervision power to influence the actions of commercial banks, possibly forcing or enabling them to over-lend, both of which would have an effect on the money supply and the inflation rate. For a cross-section of 80 countries, this influence, corruption in loan applications, was shown as one possible factor that could affect the inflation rate. When this measure is the single corruption-related indicator in the regression, the results are sensitive to the inclusion of additional explanatory variables.

The competing model of a benevolent central banker who fulfills the demands of the government but pursues societal goals in the fight against unemployment and inflation also does not receive full empirical support. The impact of the variable for this model — absence of corruption in tax collection—confirms the theory if it enters the regression model alone, but its influence is sensitive to the inclusion of other explanatory variables. GDP per

head seems to catch some of the influence. The indicator however proves to be robust to the inclusion of a measure of central bank independence.

The impact of the absence of corruption indicators was tested in combination with data on the prevalence of a shadow economy. The shadow economy data correlate at –0.76 with the data on absence of corruption in tax collection. Thus the inclusion the shadow economy data confirms the theory because when these data enter the regression, it not only annihilates the impact of absence of corruption in tax collection, but also renders the impact of the absence of corruption variable positive on the average inflation rate. This effect was persistent for all robustness tests. The shadow economy data were also used in the model of the malicious central banker. In this case, although the relative importance of the shadow economy removes some influence, it does not reverse the impact, but renders the explanatory variable impotent. This finding supports Huang and Wei's (2003) theory, but makes questionable the theories put forth in this study.

When the model included only the absence of corruption in tax collection indicator, it produced results fairly consistent with the theory, but these results change once both indicators on the absence of corruption are combined (see Section V.6). When both indicators on corruption are included, corruption in loan applications retains its influence. However, in a direct contradiction to the previous regression results and the underlying theory, corruption in tax collection exerts a positive influence. This impact also survives the inclusion of the data on the prevalence of the shadow economy. The results from these comparative tests offer some support for the theory expounded in Chapters III and IV.

I next tested the validity of the competing theories (Huang and Wei (2003) and Lambsdorff and Schinke (2002, 2004)) using data from BEEPS, which was a smaller sample of 23 countries with transition economies. This analysis had no need of a proxy for central bank corruption because the BEEPS specifically asked for about the "*mishandling of funds by the central bank.*" The pertinent question was asked in a section of the survey devoted to other forms of corruption, such as the sale of political decisions, and thus I believe that respondents would have interpreted the "mishandling" question as one related to corruption, and not as about some other sort of more

benign behavior, such as mere incompetence. The indicator on corruption in the central bank increased the average inflation rate in all 23 countries. This is strong support for the theory propounded in Chapters III and IV as well as for that of Lambsdorff and Schinke (2002, 2004). Huang and Wei (2003) did not fare so well; the validity test of their theory failed to convince.

In summary, neither of the two theories concerning the link between corruption and inflation was confirmed beyond doubt by the data analyzed in this study. Even though the data used in this study are the best available to date, certain limitations may have influenced the results. It could be that use of the proxy, mentioned above, created problems for the model of the malicious central banker (cf. Chapters III and IV). Perhaps the respondents incorrectly assessed the prevalence of corruption in their respective banking sectors or, alternatively, perhaps the data on the absence of corruption in loan applications did not actually reflect corruption in the sphere of the central bank. One thing is clear, though. Comparative studies resulted in findings that contradict the benevolent central banker theory—this theory should be rejected.

V.9. Appendix: The Data

	Average Inflation Rate, 1994–2003	Average Monetary Growth, 1994–2003	WEF Absence of Corruption in Loan Application	WEF Absence of Corruption in Tax Collection	WEF GDP per Head, ppp-corrected	Central Bank Independence, Romer (1993)
Argentina	**0.048**	**0.135**	**4.3**	**3.9**	**12098**	**0.39**
Australia	0.026	0.120	6.4	6.6	26552	0.06
Austria	**0.020**	**0.083**	**6.0**	**6.0**	**27518**	**0.05**
Bangladesh	0.049	0.118	2.7	2.1	1644	
Belgium	**0.019**	**0.042**	**5.8**	**5.3**	**27912**	**0.07**
Bolivia	0.058	0.148	3.9	3.4	2439	
Botswana	**0.092**	**0.150**	**5.1**	**5.3**	**8196**	**0.22**
Brazil	0.932	1.007	5.0	4.7	7759	0.33
Bulgaria	**0.633**	**0.636**	**5.6**	**6.0**	**6182**	
Canada	0.019	0.092	6.3	6.5	28611	0.06
Chile	**0.060**	**0.130**	**6.1**	**6.2**	**9753**	**0.33**
China	0.057	0.190	5.0	5.2	4329	
Colombia	**0.149**	**0.180**	**5.2**	**4.9**	**6202**	**0.17**
Costa Rica	0.126	0.191	4.7	4.8	8490	0.22
Croatia	**0.417**	**0.269**	**4.5**	**4.8**	**8414**	
Czech Republic	0.059	0.115	3.6	4.2	14885	
Denmark	**0.022**	**0.057**	**6.8**	**6.8**	**28342**	**0.05**
Dominican Republic	0.090	0.167	4.5	4.1	6189	
Ecuador	**0.340**	**0.045**	**3.9**	**3.8**	**3295**	
El Salvador	0.059	0.063	5.1	5.0	4603	
Estonia	**0.183**	**0.236**	**5.7**	**5.9**	**10380**	
Finland	0.015	0.090	6.8	6.8	25611	0.07
France	**0.016**	**0.038**	**5.8**	**5.7**	**25074**	**0.07**
Germany	0.018	0.075	6.0	6.1	25715	0.04
Greece	**0.062**	**0.141**	**5.1**	**3.6**	**17482**	**0.17**
Guatemala	0.082	0.179	4.0	3.6	3879	
Haiti	**0.208**	**0.165**	**4.1**	**2.3**	**1444**	
Honduras	0.150	0.194	4.1	3.7	2505	0.14
Hong Kong SAR	**0.023**	**0.091**	**6.0**	**6.3**	**25581**	
Hungary	0.147	0.147	4.9	5.5	12941	
Iceland	**0.032**	**0.109**	**6.5**	**6.8**	**30725**	**0.06**
India	0.069	0.146	4.2	3.4	2464	0.19
Indonesia	**0.136**	**0.205**	**2.6**	**2.9**	**3059**	**0.17**

	Average Inflation Rate, 1994–2003	Average Monetary Growth, 1994–2003	WEF Absence of Corruption in Loan Application	WEF Absence of Corruption in Tax Collection	WEF GDP per Head, ppp-corrected	Central Bank Independence, Romer (1993)
Ireland	0.029	0.153	6.2	6.2	32133	0.06
Israel	**0.065**	**0.136**	**5.4**	**5.8**	**19867**	**0.17**
Italy	0.031	0.055	5.3	4.9	24510	0.07
Jamaica	**0.142**	**0.151**	**5.1**	**4.9**	**3890**	
Japan	0.001	0.098	5.8	6.1	27101	0.07
Jordan	**0.026**	**0.053**	**4.6**	**4.4**	**4080**	
Korea	0.041	0.093	4.9	4.7	18149	0.25
Latvia	**0.165**	**0.165**	**4.7**	**4.5**	**7750**	
Lithuania	0.300	0.197	6.2	6.3	7764	
Malaysia	**0.028**	**0.110**	**5.1**	**5.7**	**8424**	**0.17**
Mauritius	0.065	0.099	5.1	5.6	10400	
Mexico	**0.145**	**0.171**	**4.8**	**4.9**	**8969**	**0.19**
Morocco	0.027	0.087	3.5	3.8	3787	0.16
Namibia	**0.089**	**0.206**	**4.5**	**4.8**	**6650**	
Netherlands	0.026	0.090	6.3	6.3	26242	0.06
New Zealand	**0.020**	**0.090**	**6.6**	**6.8**	**20725**	**0.07**
Nicaragua	0.100	0.186	4.5	4.1	2514	0.22
Nigeria	**0.248**	**0.283**	**3.7**	**2.5**	**898**	**0.14**
Norway	0.022	0.082	6.4	6.5	30727	0.07
Panama	**0.010**	**0.078**	**4.8**	**4.6**	**5986**	**0.17**
Paraguay	0.116	0.142	3.6	3.2	4379	
Peru	**0.104**	**0.201**	**5.0**	**5.3**	**4797**	**0.2**
Philippines	0.064	0.145	3.8	2.6	4113	0.17
Poland	**0.149**	**0.220**	**3.9**	**4.1**	**9327**	
Portugal	0.036	0.117	5.6	5.1	17571	0.2
Romania	**0.653**	**0.522**	**3.3**	**4.2**	**7036**	
Russian Federation	0.859	0.571	4.3	4.6	8948	
Singapore	**0.012**	**0.069**	**6.4**	**6.6**	**23250**	**0.28**
Slovak Republic	0.083	0.117	4.2	4.8	11739	
Slovenia	**0.116**	**0.245**	**5.6**	**6.0**	**18233**	
South Africa	0.074	0.164	5.4	5.6	9565	0.17
Spain	**0.033**	**0.083**	**5.9**	**5.8**	**20374**	**0.07**
Sri Lanka	0.094	0.112	4.2	4.4	3634	
Sweden	**0.016**		**6.5**	**6.6**	**24978**	**0.06**
Switzerland	0.011	0.096	6.2	6.2	29587	0.05

	Average Inflation Rate, 1994–2003	Average Monetary Growth, 1994–2003	WEF Absence of Corruption in Loan Application	WEF Absence of Corruption in Tax Collection	WEF GDP per Head, ppp-corrected	Central Bank Independence, Romer (1993)
Taiwan			5.6	5.9	22559	
Thailand	**0.036**	**0.120**	**5.1**	**4.8**	**6630**	**0.14**
Trinidad and Tobago	0.052	0.113	5.2	5.0	10018	
Tunisia	**0.035**	**0.087**	**5.0**	**4.9**	**6769**	
Turkey	0.672	0.668	3.6	4.1	6716	0.22
Ukraine	**1.307**	**1.041**	**3.8**	**3.5**	**4224**	
United Kingdom	0.025	0.115	6.6	6.5	24421	0.07
United States	**0.025**	**0.037**	**5.8**	**6.0**	**34888**	**0.05**
Uruguay	0.215	0.185	5.9	5.9	8781	0.19
Venezuela	**0.390**	**0.458**	**3.9**	**3.7**	**5966**	**0.25**
Vietnam	0.031	0.252	4.0	3.7	2130	
Zimbabwe	**0.439**	**0.802**	**4.5**	**4.4**	**2406**	**0.14**

V.10. Appendix: Absence of Corruption in Loan Applications Versus Absence of Corruption in Tax Collection

Country	Absence of Corruption in Loan Applications – Absence of Corruption in Tax Collection	Country	Absence of Corruption in Loan Applications – Absence of Corruption in Tax Collection
Argentina	**0.4**	**Latvia**	**0.2**
Australia	–0.2	Lithuania	–0.1
Austria	**0**	**Malaysia**	**–0.6**
Bangladesh	0.6	Mauritius	–0.5
Belgium	**0.5**	**Mexico**	**–0.1**
Bolivia	0.5	Morocco	–0.3
Botswana	**–0.2**	**Namibia**	**–0.3**
Brazil	0.3	Netherlands	0
Bulgaria	**–0.4**	**New Zealand**	**–0.2**
Canada	–0.2	Nicaragua	0.4
Chile	**–0.1**	**Nigeria**	**1.2**
China	–0.2	Norway	–0.1
Colombia	**0.3**	**Panama**	**0.2**
Costa Rica	–0.1	Paraguay	0.4
Croatia	**–0.3**	**Peru**	**–0.3**
Czech Republic	–0.6	Philippines	1.2
Denmark	**0**	**Poland**	**–0.2**
Dominican Republic	0.4	Portugal	0.5
Ecuador	**0.1**	**Romania**	**–0.9**
El Salvador	0.1	Russian Federation	–0.3
Estonia	**–0.2**	**Singapore**	**–0.2**
Finland	0	Slovak Republic	–0.6
France	**0.1**	**Slovenia**	**–0.4**
Germany	–0.1	South Africa	–0.2
Greece	**1.5**	**Spain**	**0.1**
Guatemala	0.4	Sri Lanka	–0.2
Haiti	**1.8**	**Sweden**	**–0.1**
Honduras	0.4	Switzerland	0
Hong Kong SAR	**–0.3**	**Taiwan**	**–0.3**
Hungary	–0.6	Thailand	0.3
Iceland	**–0.3**	**Trinidad and Tobago**	**0.2**
India	0.8	Tunisia	0.1
Indonesia	**–0.3**	**Turkey**	**–0.5**
Ireland	0	Ukraine	0.3
Israel	**–0.4**	**United Kingdom**	**0.1**
Italy	0.4	United States	–0.2
Jamaica	**0.2**	**Uruguay**	**0**
Japan	–0.3	Venezuela	0.2
Jordan	**0.2**	**Vietnam**	**0.3**
Korea	0.2	Zimbabwe	0.1

VI. A Concluding Summary

The present study analyzed the effects a corrupt central banker might have on monetary policy and the results of that policy. To this end, the study used case studies of actual corruption in Brazil, Indonesia, and Japan, among others, to illustrate that there is indeed evidence for the existence of a corrupt central banker.

The case study of the Indonesian Bank Bali scandal deserves special mention. Against the background of the Asian Current Account Crisis in 1997, Bank Indonesia was implicated in a string of corruption cases. The corruption took root during the Soeharto era, a time when Bank Indonesia was at the beck and call of Soeharto and his cronies. This case study (see Chapter II) might suggest that corruption is only possible if the central banker is the vicarious agent of a powerful government and the country is in a state of turmoil stemming from the reverberations of an economic shock.

However, the other case studies reveal that corruption can also occur in less dramatic situations. Even in a shock-free environment, the central banker can be self-seeking. In the first model tested, an additional corrupt incentive induced the central banker to increase the growth rate of the monetary stock, which led to increased inflation rates. An empirical test confirmed this hypothesis for a cross-section of 23 transition economies. The regressions revealed that corruption systematically increases inflation rates. Once the central banker engages in corrupt dealing, a new, added inflation bias emerges. The malicious central banker has a low level of concern for how the bank's policy will affect the larger society because the additional income the banker is receiving from his or her corrupt dealing more than compensates the banker for any personal hardship he or she may experience. Society suffers the most from the banker's corrupt dealing as it has to cope with an increased inflation rate.

The second model (developed in Chapter IV) involves a situation in which stochastic shocks occur, and the central banker can sell inside information. The model is illustrated by a cases from Brazil and the Bank of Japan, where a bank employee did precisely that. Corruption in this model distinguishes between two types of central banker, the conservative and the

populist. These two kinds of banker have very different reactions to the same stochastic shock. The conservative might choose to engage in pro-cyclical action and thus exacerbate the shock's impact on employment; the populist will prefer to stabilize employment. These reactions are a result of the corrupt incentive, which tempts the central banker into making decisions that are contrary to the best interests of the larger society.

These results must be interpreted with caution. For one thing, the term "corruption" here may not necessarily mean truly criminal acts but may also encompass activity falling in a gray area. For example, a central banker might choose to bail out banks run or owned by bankers with whom he or she is well acquainted and connected. This would not necessarily be illegal because it is one of the central banker's tasks to insure the functioning of the country's financial system. However, *which* banks the central banker chooses to aid could be a decision falling into a gray area. The bailout could be viewed as an unjustified favor, at least by the bank's competitors, which did not receive such help. Such a bailout could also provide an opportunity for the central banker to be inappropriately "thanked," that is, to receive so-called gifts or bribes.

Actions taken to enhance the central bank's budget may also be cause for suspicion but, again, not strictly criminal. A big budget can benefit the bank in various and fairly subtle ways. For example, employees may feel more important and powerful if they work for a well-funded bank; working conditions might be improved by, say, more attractive offices and staff facilities. This could lead to employees with decision-making power attempting to "optimize" their standing by increasing seigniorage, which would increase the bank's budget.

It is also conceivable that mere suspicion that a central banker is corrupt can lead to the results found in this empirical study. Such a suspicion could lead to distrust of the bank on the part of private agents, who would then raise their inflation expectations and thus, ironically, actually cause an increase in the real inflation rate. The arousal of suspicion, not to mention acts of favoritism as discussed above, is facilitated by the level of secrecy that surrounds the central bank. As noted by Greenspan (2002), despite

recent efforts toward more transparency, central bank policy still involves a considerable amount of secrecy.

> *The undeniable, though regrettable, fact is that the most effective policymaking is done out-side the immediate glare of the press. But that notion and others have been used too often in the past to justify a level of secrecy that turned out to be an unnecessary constraint on our obligation to be transparent in conducting the public's business.* (Greenspan 2002: 5)

Obviously, a veil of secrecy can be very conducive to corrupt dealing, including that undertaken by central bankers entirely at their own volition, as was the case with Brazilian central banker Lopes who allegedly sold inside information to commercial banks (see Chapter IV). However, secrecy may also lead the public to suspect corruption when, in fact, there is none. The central bank's actions may be entirely above board even though not public, but because ordinary people cannot see and perhaps, cannot understand, what the bank is doing, they suspect the worst.

Bofinger (2001: 365–38) raises this issue in a discussion of monetary targeting. Bofinger observes that central banks tend to favor complicated money market instruments. In the framework of the New Political Economy, the central bank is seen as a form of bureaucracy and, like all bureaucracies, it strives to conserve and expand its power. Bofinger notes that:

> *central banks can be expected to*
> 1. *choose particularly labor-intensive instruments, and*
> 2. *adopt a targeting method characterized by a general lack of transparency.* (Bofinger 2001: 366)

By choosing labor-intensive instruments with which to do its work, the central bank ensures its need for a large staff, which, in turn, strengthens the bank's prestige and political power. The adoption of nontransparent monetary policy also increases the bank's political power because such obfuscatory policy makes proper oversight by the public or politicians nearly impossible.

The combination of nontransparent monetary policy and labor-intensive instruments such as "*securities repos in the form of variable rate tenders*" (Bofinger 2001: 366)[41] creates a fertile environment for corruption.

In the final chapter, the inflation-raising effect of corruption was further tested. Two competing theories attempt to explain why corruption increases the inflation rate. One postulates a benevolent central banker; the other assumes that the central banker is somewhat malicious in that he or she acts purely for his or her own benefit, with little regard to what is in the best interests of the society the banker serves. The results from an analysis of 80 countries generally demonstrate that corruption does indeed increase the inflation rate and that this effect can be explained by the models developed and presented in this study on corruption in central banks.

In summary, this study has shown that corruption in the sphere of the central bank has an adverse effect on society. When the central bank is involved in corrupt dealing, either within itself or due to outside influences, it loses sight of its chief goal and reason for being—the pursuit of sound monetary policy that will benefit the larger society. This conclusion is supported by findings from empirical analyses using a sample of 23 transition economies as well as a larger sample of 80 countries. The findings should serve as a warning about the negative effects to society of corruption in the central bank.

[41] Bofinger (2001) notes that this tender type is use by the Federal Reserve and the Bank of Japan.

References

Alesina, A., and R. Gatti (1995), "Independent Central Banks: Low Inflation at No Cost?" *American Economic Association Papers and Proceedings*, Vol. 85, No. 2, 196–200.

Alesina, A., and L. H. Summers (1993), "Central Bank Independence and Macroeconomic Performance: Some Comparative Evidence," *Journal of Money, Credit, and Banking*, Vol. 25, No. 2, 151–62.

Alesina, A., and G. Tabellini (1987), "Rules and Discretion with Non-Coordinated Monetary and Fiscal Policies," *Economic Inquiry*, Vol. 25, No. 4, 619–30.

Al-Marhubbi, A. F. (2000), "Corruption and Inflation," *Economic Letters*, Vol. 66, No. 2, 199–202.

Asia Times (August 12, 1999), "Big Names Linked to Bali Scandal."

Asia Times (July 10, 2001), "Curtain Falls on Bali-Gate."

Asia Times (February 21, 2003), "Bank Indonesia: Changing of the Guard."

Asia Times (January 16, 2004), "Indonesia: IBRA Prepares to Bow Out."

Asiaweek (September 3, 1999a), "Unravelling Bank Bali—The Fallout Could Hobble Indonesia's Economy–And Its Presidency," Vol. 25, No. 35.

Asiaweek (September 3, 1999b), "Follow the Money—Asiaweek's Guide to 'Bali-gate,'" Vol. 25, No. 35.

Associated Press (April 16, 2004), "German Central Bank Chief Welteke Resigns."

Barro, R. J., and D. B. Gordon (1983a), "A Positive Theory of Monetary Policy in a Natural Rate Model," *Journal of Political Economy*, Vol. 91, 589–610.

Barro, R. J., and D. B. Gordon (1983b), “Rules, Discretion and Reputation in a Model of Monetary Policy,” *Journal of Monetary Economics*, Vol. 12, 101–21.

BBC (April 7, 1998), “Scandal Grows at Japanese Central Bank.”

BBC (May 2, 1998), “Japanese Bank Boss Kills Himself.”

BBC (February, 2, 1999), “Brazil Replaces Central Bank Governor for the 2nd Time in a Month.”

BBC (April 14, 1999), “Brazilian Senate Launches Investigation Against Central Bank.”

BBC (April 26, 1999), “Ex-Bank Chief Arrested.”

BBC (December 16, 1999), “Bank Bali Deal Collapses.”

BBC (February, 3, 2000), “Brazilian Central Banker Charged with Fraud.”

BBC (December 6, 2000), “Scandal-Ridden Indonesian Bank Governor Resumes Work.”

BBC (January, 20, 2001), “Brazilian Central Banker Charged.”

BBC (May 2, 2001), “Peru Probes Fujimori Gold Claims.”

BBC (April 4, 2003), “Former Indonesian Central Banker Jailed.”

BBC (May 25, 2003), “Business Anti-Corruption Conference Opens.”

BEEPS (2002), *Business Environment and Enterprise Performance Survey by the World Bank and the European Bank for Reconstruction and Development*. Data downloaded September 2003: http://info.worldbank.org/governance/beeps2002.

Blinder, A. S. (1997), “What Central Bankers Could Learn from Academics—and Vice Versa,” *Journal of Economic Perspectives*, Vol. 11, No. 2, 3–19.

Bloom, M. (1966), *The Man Who Stole Portugal*. New York: Charles Scribner's Sons.

Blumenthal, E. (1982), "Zaire: Rapport sur sa crédibilité financière international," *La Revue Nouvelle, Mensuel sociopolitique et culturel*, Vol. 77, No. 11, 360–78.

Bofinger, P. (2001), *Monetary Policy—Goals, Institutions, Strategies, and Instruments*. Oxford and New York: Oxford University Press.

Braun, M., and R. DiTella (2000), "Inflation and Corruption," Harvard Business School, Division Research, Working Paper No. 00-053.

BusinessWeek Online (September 13, 1999), "The Haunting of Bank Bali."

Callaghy, T.M. (1984), *The State-Socitey Struggle – Zaire in Comparative Perspective*, New York, Guildford, Surrey: Columbia University Press.

Campillo, M., and J. A. Miron (1996), "Why Does Inflation Differ Across Countries?" NBER-Working Paper No. 5540.

CNNfn (February 9, 1998), "Clouds Grip BoJ: Central Bank Officials Allegedly Took Bribes from Japanese Financial Firms."

Cornelius, P. K., M. E. Porter, and K. Schwab (2003), *The Global Competitiveness Report 2002 – 2003*. Geneva, Switzerland: World Economic Forum.

Easterly, W. R., P. Mauro, and K. Schmidt-Hebbel (1995), "Money Demand and Seigniorage-Maximizing Inflation," *Journal of Money, Credit and Banking*, Vol. 27, No. 2, 583–603.

Economist (March 12, 1998), "Japan's School for Scandal."

Express India (August 17, 1999), "Bank Indonesia Freezes Accounts Suspected in Bank Bali Transfer."

Far Eastern Economic Review (December 23, 1999), "The Enforcer—Asia's New Power: PricewaterhouseCoopers."

Federal Reserve Bank of St. Louis (2002), “Getting the Markets in Synch with Monetary Policy,” *Federal Reserve Bank of St. Louis’ Review*, Vol. 84, No. 4.

Feldstein. M. (1999), “Capital Income Taxes and the Benefit of Price Stability.” In: *The Costs and Benefits of Price Stability*. Edited by M. Feldstein. Chicago, IL: University of Chicago Press, 9–40.

Financial Times (May 4, 2001), “Peru to Investigate Missing Gold.”

Financial Times (March 14, 2002), “Bank Chief Sentenced for Corruption.”

Fischer, S. (1995), “Central Bank Independence Revisited,” *American Economic Association Papers and Proceedings*, Vol. 85, No. 2, 201–06.

Friedman, M. (1969), “The Quantity Theory of Money.” In: *The Optimum Quantity of Money and Other Essays*. Edited by M. Friedman. Chicago, IL: University of Chicago Press, 1–50.

Gatti, R. (1999), “Corruption and Trade Tariffs, or a Case for Uniform Tariffs,” World Bank Policy Research Working Paper No. 2216.

geocities.com (March 21, 2002), “Indonesian Central Bank Governor Guilty of Corruption and Embezzlement.”

Greenspan, A. (2002), “Chairman’s Remarks: Transparency in Monetary Policy.” In: Federal Reserve Bank of St. Louis, *Getting the Markets in Synch with Monetary Policy*. 5–6.

Gruben, William C. and Darryl McLeod (2003), “The Openness-Inflation Puzzle Revisited”, Center for Latin American Economics Working Papers, No. 0203. Paper can be obtained at: http://www.dallasfed.org/latin/papers/2003/lawp0302.pdf

Guzzo, V., and A. Velasco (1999), “The Case for a Populist Central Banker,” *European Economic Review*, Vol. 43. No. 7, 1317–44.

Hackl, P. (2004), *Einführung in die Ökonometrie*, München: Pearson Studium.

Huang, H., and S. Wei (2003), “Monetary Policies for Developing Countries: The Role of Corruption,” IMF Working Paper WP/03/183.

Hellman, J., G. Jones, D. Kaufmann, and M. Schankerman (2000), “Measuring Governance Corruption and State Capture. How Firms and Bureaucrats Shape Business Environment in Transition Economies,” World Bank Policy Research Working Paper No. 2312.

Heston, A., R. Summers, and B. Aten (October 2002), *Penn World Table Version 6.1*. Center for International Comparisons at the University of Pennsylvania (CICUP).

International Monetary Fund (June 24, 1998), *Indonesia — Second Supplementary Memorandum of Economic and Financial Policies*. Available at http://www.imf.org/external/np/loi/062498.htm. Appendices available at http://www.imf.org/external/np/loi/062498.pdf.

International Monetary Fund (2000), *Supporting Document to the “Code of Good Practices on Transparency in Monetary and Financial Policy.” Part 2—Good Transparency Practices for Monetary Policy by Central Banks*. Available at http://www.imf.org/external/np/mae/mft/sup/part2.htm.

International Monetary Fund (various years), *International Financial Statistics*.

Japan Economic Institute (March 27, 1998), “JEI Report: New BoJ Leadership Points to Continuity, Change.”

Jarchow, H.-J. (2003), *Theorie und Politik des Geldes*, 11th ed. Göttingen: Vandenhoeck & Ruprecht.

Johnson, S., D. Kaufmann, and P. Zoido-Lobaton (1998), “Regulatory Discretion and the Unofficial Economy,” *American Economic Review, Papers and Proceedings*, Vol. 88, 387–92.

Keefer, P., and D. Stasavage (2002), “Bureaucratic Delegation and Political Institutions: When Are Independent Central Banks Irrelevant?” World Bank Policy Research Paper No. 2356.

King, M. (2002), “No Money, No Inflation — The Role of Money in the Economy,” *Quarterly Bulletin of the Bank of England*, Vol. 42, No. 2, 162–77.

Klitgaard, R. (1988), *Controlling Corruption*. Berkeley: University of California Press.

Kydland, F. E., and E. C. Prescott (1977), “Rules Rather than Discretion: The Inconsistency of Optimal Plans,*” Journal of Political Economy*, Vol. 85, 473–90.

Lambsdorff, J. G. (2002), “Making Corrupt Deals—Contracting in the Shadow of the Law,” *Journal of Economic Behavior and Organization,* Vol. 48, No. 3, 221–41.

Lambsdorff, J. G., and P. Cornelius (2000), “Corruption, Foreign Investment and Growth.” In *Africa Competitiveness Report 2000/2001*. Edited by K. Schwab, J. D. Sachs et al. A joint publication of the World Economic Forum and the Institute for International Development, Harvard University: Oxford University Press. 70–78.

Lambsdorff, J. G., and M. Schinke (2002), “Non-Benevolent Central Banks,” CeGE-Discussion Paper No. 16.

Lambsdorff, J. G., and M. Schinke (2004), “How Corruption Drives Inflation—The Case of Corruption Among Central Banks,” unpublished manuscript. Currently submitted for publication.

LA Times (April 22, 1998), “Slowly, Japan’s Bank Reforms Gain Currency.”

Lohmann, S. (1992), “Optimal Commitment in Monetary Policy: Credibility Versus Flexibility,” *American Economic Review*, Vol. 82, No. 1, 273–86.

McCandless, G. T., and W. E. Weber (1995), “Some Monetary Facts,” *Federal Reserve Bank of Minneapolis Quarterly Review*, Vol. 19, No. 3, 2–11.

Meltzer, A. H. (2002), “Achieving and Sustaining Price Stability,” paper presented at first Conference of the Monetary Stability Foundation, Frankfurt, Germany, December 5–6.

Mulligan, C. B., and X. X. Sala-i-Martin (1997), “The Optimum Quantity of Money: Theory and Evidence,” *Journal of Money, Credit and Banking*, Vol. 39, 687–715.

Niskanen, W. (1975), “Bureaucrats and Politicians,” *Journal of Law and Economics,* Vol. 18, 617–43.

Persson, T., and G. Tabellini (1990), *Macroeconomic Policy, Credibility and Politics,* published in the series “Fundamentals of Pure and Applied Economics,” 3rd reprint. Canada: Harwood Academic Publishers.

Pindyck, R.S. and D.L. Rubinfeld (1998), *Econometric Models and Economic Forecasts*. 4th ed. McGrawHill.

Phelps, S. E. (1973), “Inflation in the Theory of Public Finance,” *Swedish Journal of Economics*, Vol. 75, No. 1, 67–82.

Die Presse (March 12, 1998), “Japanische Notenbank in Skandal verwickelt—Korruption.”

PriceWaterhouseCoopers (1999), *Bank Bali Matter—Report to the Audit Board of the Republic of Indonesia in Relation to a Special Investigation of the Circumstances Surrounding the Dealings by PT Bank Bali Tbk (and Others) in Funds Obtained from the Indonesian Government Guarantee Scheme*. Jakarta, Indonesia: PriceWaterhouseCoopers.

Republic of Indonesia (1998a), Presidential Decree No. 26/1998 (Jan. 26, 1998), The Presidential Decree on Guaranty for Commercial Bank Repayment Obligation.

Republic of Indonesia (1998b), Presidential Decree No. 27/1998 (Jan. 27, 1998), The Establishment of the Indonesian Bank Restructuring Agency.

Rogoff, K. (1985), “The Optimal Degree of Commitment to an Intermediate Monetary Target,” *Quarterly Journal of Economics*, Vol. 100, 1169–90.

Romer, D. (1993), “Openness and Inflation: Theory and Evidence,” *Quarterly Journal of Economics*, Vol. 108, 869–903.

Scoop (September 24, 1999), “The Ongoing Bank Bali Scandal.”

Stern, J. J. (2004), “The Impact of the Crisis — Decline and Recovery,” Kennedy School of Government Faculty Research Working Paper. No. RWP04-005.

Sturm, J. E., and J. de Haan (2001), *Inflation in Developing Countries: Does Central Bank Independence Matter?* Available at http://www.uni-konstanz.de/monec/teaching/WS04/monpol/material/sturmdehaan2001is.pdf.

Süddeutsche Zeitung (March 13, 1998), “So Sorry, “Tokio bei Nacht” ist einfach zu teuer.”

Tempo Online Magazine (June 11, 2000), “Sjahril Sabirin Counts His Days as Central Bank Governor.”

Terra, C. T. (1998), “Openness and Inflation: A New Assessment,” *Quarterly Journal of Economics*, Vol. 113, 641–48.

United States Embassy, Jakarta (2001), *Chronology of the Crisis*. Available at http://www.usembassyjakarta.org/econ/crisis.html.

Waller, C. J. (1992), “The Choice of a Conservative Central Banker in a Multisector Economy,” *American Economic Review*, Vol. 82, No. 4, 1006–12.

Wall Street Journal (September 21, 1999), “In Indonesia, Crisis and Corruption Are Creating Financial Vigilates.”

Walsh C. E. (1995), “Optimal Contracts for Central Bankers,” *American Economic Review*, Vol. 85. No. 1, 150–67.

Winston, G. C. (1979), “The Appeal of Inappropriate Technologies: Self-Inflicted Wages, Ethnic Price and Corruption,” *World Development,* Vol. 7, No. 8/9, 835–45.

Wintrobe, R., and A. Breton (1986), “Organizational Structure and Productivity,” *American Economic Review*, Vol. 76, No. 3, 530–38.

World Bank (August 20, 1999), “News Release: Statement of Mark Baird, Country Director for Indonesia, on Bank Bali.”

World Bank (2003), *Combating Corruption in Indonesia. Enhancing Accountability for Development*. Report by the East Asia Poverty Reduction and Economic Management Unit. Available at http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2003/11/25/000012009_20031125111638/Rendered/PDF/272460IND.pdf.

Yahoo Finance (March 13, 2002), “Indonesian Central Bank Governor Gets Jail for Graft.”