

POLITICAL INSTABILITY, INFLATION TAX AND ASSET SUBSTITUTION IN BURUNDI

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The paper shows that civil war in Burundi in the 1990s has provoked an unprecedented decline in government revenue. Both foreign aid transfers and revenue from domestic sources dried up, inducing the government to rely more on inflation tax. Using quarterly data covering the period from 1980:1 to 2002:4 to measure the sensitivity of money demand to inflation we find that the long-run semi-elasticity of inflation to real money in circulation trebled between the pre-war to the war period. The remarkable increase of the semi-elasticity reflects what is known in the literature as “flight from domestic currency,” whereby domestic currency is substituted for less liquid assets. By shedding light on the behavior of the demand for real money amidst persistent political and economic instability, this paper illustrates the limits of inflation tax as a dependable source of government revenue.

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I. Introduction

This study shows, first, the extent to which the war that started in Burundi in October 1993 led to a remarkable decline in government revenue followed by high inflation tax. Using time series econometric analysis, the study finds that the long-run semi-elasticity of real money demand to inflation between the periods before and during the war trebled. This result suggests a strong substitution effect. To avoid predatory taxation, economic agents substituted their domestic currency-denominated assets for less liquid ones. This portfolio substitution shows the limits of inflation tax as a dependable source of government revenue.

Despite Burundi's long history of political instability, there is no research on the economic consequences of past and present wars on the country. The thrust of this study is to show that the war that erupted in 1993 created a regime change that effected the government's ability to raise revenue. It is surprising that empirical studies of the economic impact of regime change have remained limited in spite of the centrality of the question for macroeconomic policy (Agénor and Taylor 1992). This study contributes towards bridging this knowledge gap.

Burundi is an appropriate case study because it has had periods of relative political stability followed by periods of extreme instability in the form of wars, providing a good sample period to analyze shock-induced policy changes. There is no doubt that "changes in legislation, sudden switches in economic policy, and political turmoil" generally cause large shocks or "breaks" in the economy (Hendry 2001, 20). Also, analyzing policy changes based on time series provides a richer framework than the common cross-regime tests that rely on cross-sectional evidence. Time series analysis has the potential to capture the dynamic nature of the incentive

structure facing policymakers. It uses more information, including institutional information, covering a long period of time, to understand the process underlying a specific regime change.

The paper proceeds as follows. Section 2 presents a brief review of the literature followed by a background on Burundi's economy before and during the war period. The third section lays out the methodology used to derive the level of maximum inflation tax rate and the long-run semi elasticity of inflation to money demand. The fourth section discusses the data while section 5 discusses the empirical econometric results. Section 6 concludes.

II. Political Instability, Inflation Tax and Economic Performance

A. *Brief Review of the Literature*

In the studies of the effect of instability on economic performance, instability has often been defined in terms of the turnover of policymakers (see, for instance, Edwards and Tabellini 1991; Cukierman et al. 1992; Nkurunziza and Bates 2003). However, in his empirical study of political instability and economic growth, Ali (2001) argues that the relevant measures of instability should be the volatility of economic policies. He finds that such proxies explain better the variation in growth across countries whereas using the most common measures of political instability does not show any discernible effect on growth.

Other proxies of political instability, such as the number of assassinations (Easterly and Levine 1997) or the duration of wars (Collier and Gunning, 1999) do not produce statistically significant results in cross section or panel data models.

The non-significance of the instability measures may be attributed to poor proxies used.¹ In this regard, Nkurunziza and Bates (2003) note that it is strikingly counter-intuitive to conclude that political instability has no impact on economic performance. There is no doubt that extreme political instability such as civil war has a significant negative impact on economic performance. Collier (1999) discusses the main negative consequences of civil war on the economy. These are destruction, disruption, diversion, dissaving and portfolio substitution.

The fact that the destruction of physical and human capital has direct consequences on the economy does not need elaboration. Furthermore, the disruption of social order and the accompanying suppression of civil liberties hamper service delivery and hence sustained economic activity. Moreover, the diversion of resources from output-enhancing activities to war and security services reduces productive investment, hurting the economy. In addition, wars induce agents to dissave as a response to losses resulting from the three factors above.

Generally, governments in war economies lose revenue from traditional sources and may increase inflationary tax to fund the war.² However, faced with increased predatory taxation and other vagaries resulting from political turmoil, economic agents engage in portfolio substitution. They switch to foreign currency denominated assets or simply transfer their assets abroad. Alternatively, agents may over-invest in non-productive sectors such as real estate. The direct impact of these portfolio changes is a further decline in a country's tax base and hence lower government revenue, including seigniorage and inflation tax revenue.

The empirical literature on the use of inflation tax in politically unstable regimes points to a number of reasons why

governments use this source of revenue. First, during periods of political instability opportunistic governments that do not expect to remain in office to reap the benefits of low inflation have no incentive to adopt inflation-reducing policies (Edwards and Tabellini 1991). Second, a collapsing government may choose high inflation to leave a legacy of high economic instability that would destabilize subsequent governments (Cukierman et al. 1992). Third, high inflation may reflect a failure by a weak government to implement inflation-reducing policy reforms. Fourth, inflation tax may be an optimal response to transitory unexpected budgetary shocks (Calvo and Guidotti 1993). These hypotheses suggest that the reasons explaining the use of inflation tax are context-specific.

In Burundi, high inflation and the depreciation of the domestic currency during the war period have reduced the real value of assets held in domestic currency.³ However, the switching cost associated with acquisition of foreign-currency denominated assets is high due to government controls. Some agents buy foreign cash obtained in the parallel market (see Nkurunziza 2001). Anecdotal evidence also suggests that wealthy agents have heavily invested in real estate while others transferred their resources abroad, increasing capital flight.

B. War Incidence and its Economic Impact in Burundi

Burundi represents a case of extreme political instability. The country has experienced wars in 1965, 1972, 1988, 1991 and from 1993 to date. In fact, it is more appropriate to say that the country has experienced five episodes of one civil war. However, only the war that started in 1993 has had dramatic consequences on the economy given its exceptional length relative to all previous episodes. The current

episode is in its twelfth year, compared to a total duration of nine months for the previous four episodes.⁴ In the first four episodes, repressions shortened the duration of the conflicts to a few months, limiting economic but not human loss. From October 1993 to date the toll has been particularly severe: about 300,000 lives have been lost, 700,000 people have become refugees and up to 900,000 have been internally displaced.

Until the onset of the current war episode, Burundians tended to expect short wars. Despite their brutality, the first four episodes were short and had a relatively limited direct impact on the economy. When the current war erupted in October 1993, economic agents' expectations were that it would be another short war. It was only when it was felt that the army had failed to crush the rebellion as it had done before that economic agents' attitudes changed. These expectational errors help explain why most economic variables reacted to the war onset with a lag.

The war has increased macroeconomic instability. For instance, the probability of a monthly inflation rate exceeding 2.5% was 0.13 between 1980 and 1989 but almost doubled to 0.23 between 1990 and 1999. The increase in inflation was mostly due to an increase in food prices. Food items account for 51% of the consumer price index (CPI) and 98% of the food items in the basket are domestically produced. As the country fell into chaos in October 1993, food prices rose sharply. As a result, inflation increased from an average of 5% per annum between 1970 and 1989 to 16% in the period from 1990 to 1999 (see Figure 1(a)).⁵

Another factor explaining the rise in inflation was the increase in the prices of imported goods due to devaluations. Faced with a foreign currency crisis, the government devalued regularly the official exchange rate as it could no longer afford to defend it. In this regard, the depletion of foreign

reserves in 1998/1999 corresponded with the highest level of the premium and the highest devaluation rate of the official exchange rate over the sample period (see Figures 1(d) and 1(c)). Subsequently, the government was forced to adopt a more open foreign exchange policy that has produced some success (IMF 2003). From the year 2000, the premium has dropped back to its pre-1990s level, oscillating between 20 and 40%.⁶

There is a negative relationship between macroeconomic instability and economic growth and the relationship tends to be stronger the higher the instability (Agénor 2000; Ali 2001). In this light, GDP per capita has declined to less than \$200, one third lower than at independence 40 years ago. The economy recorded successive negative growth rates between 1993 (-6.0%) and 1996 (-8.4%), the latter being the lowest growth rate in the last 25 years.

Macroeconomic and political instability have also increased uncertainty, reducing investment and production. The rate of investment plummeted from 13.8 to 5.8% of GDP between 1993 and 1998 (Ministry of Planning 1999). The ratio of medium and long-term credit to GDP declined from 34 to 25% between 1992 and 1997, reflecting bankers' perception of high risk and uncertainty. During the same period, cash credit to firms increased by 71% as a result of rising input prices and difficult economic conditions facing the business community. War has also badly affected the government's ability to raise revenue and to attract foreign aid. Being aid-dependent, Burundi has seriously suffered from the decline in aid transfers.

C. War, Fiscal Crisis and Inflation Tax

The fiscal revenue crisis in Burundi does not originate from the war of the 1990s (Ndikumana 2001). However, Table 1.1

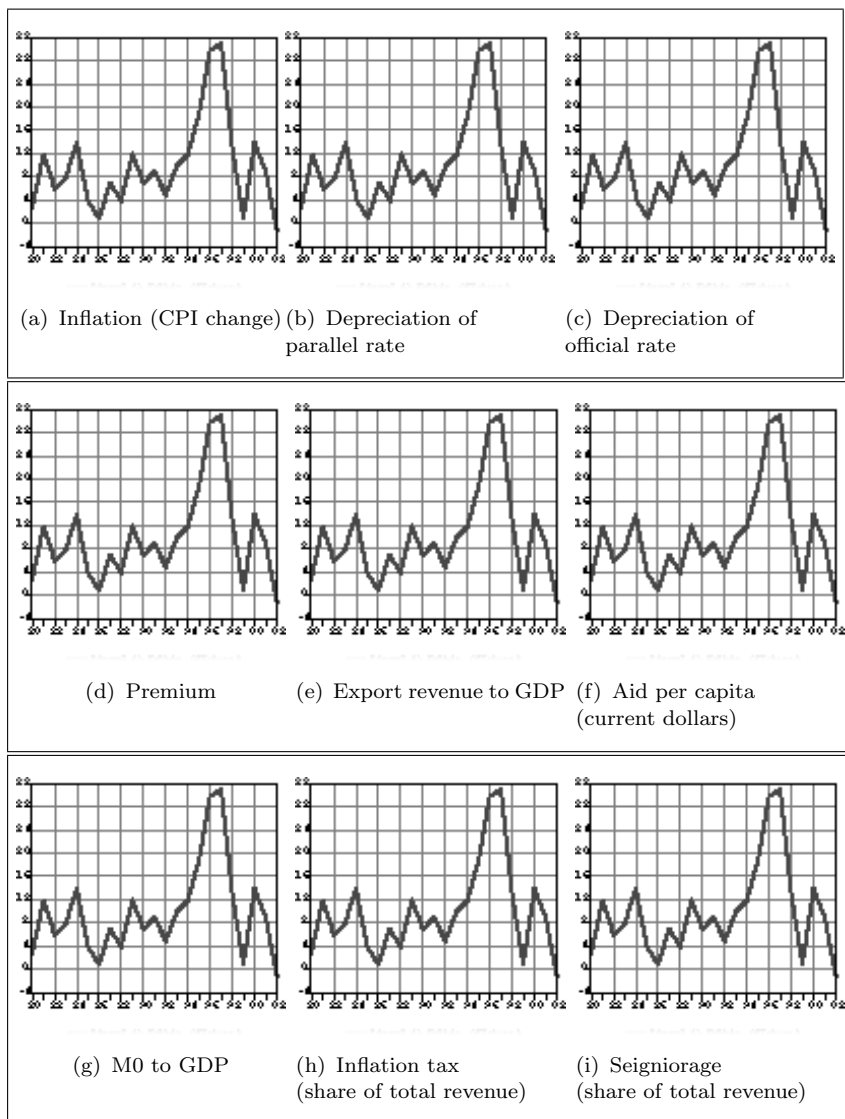


FIGURE 1.

shows clearly that government revenue collapsed as a result

of the war. The lowest value of tax revenue in 1997 corresponds to half of the value in 1991-92, just one year before the war. Some factors specific to the war period help explain this decline. First, the destruction of the economy reduced the tax base. Second, the war disrupted economic and moral institutions, making tax compliance and tax collection difficult. Third, the imposition of an economic embargo on Burundi in July 1996 dramatically reduced import and export transactions, and hence taxes on international trade. Fourth, the dwindling of international aid transfers starved Burundi of its main source of foreign currency.

Moreover, Burundi's high fiscal burden may help explain why the country increased inflation tax. According to data from the Heritage Foundation,⁷ Burundi's score for fiscal burden is high. The score is a composite index combining three measures: the top marginal income tax rate, the top marginal corporate tax rate and the change in government expenditure as a share of GDP.⁸ On a scale of 1 to 5, where 5 is the least conducive fiscal environment, Burundi scores 4. This high score reflects the country's high income tax which has a top rate of 60%, and a high corporate tax rate which stands at 35%. Moreover, the high score is also the result of high increases in government expenditure. As Table 1.2 illustrates, there was an upward trend in the ratio of expenditures to GDP over the period 1992 to 2001.

Burundi's fiscal burden is high even by African standards. There are more African countries with a lower score than with a higher one.⁹ High tax rates during a period of economic meltdown and political instability may have induced taxpayers to go underground and evade government taxation. This may have increased the government's budget deficit as the drop in tax revenue occurred simultaneously with a drop in foreign aid at a period of high government

spending to fund the cost of the war. Faced with these difficulties, it is possible that the government decided to finance its revenue gap through inflation tax.

The revenue side of the budget suggests that in terms of their shares of GDP, most taxes did not change remarkably. This is misleading because GDP itself declined steadily over the period. Generally, un-scaled values (real Burundi francs) in Table 1.1 show more decline than the shares of GDP. Almost all sources of government revenue, including grants, declined immediately after the war began in 1993. Although some of these revenue sources are recovering they have not reached their pre-war levels.

Grants experienced the most dramatic decline due to the freezing of international aid in reaction to a coup d'état that triggered the war. From almost 9% of GDP in 1992, the share of grants had been divided by five in 2001. The lowest share in 1998 represented just one tenth of the value in 1992, the lowest level in the country's post-independence history. The ratio of aid to GDP dwindled to a mere 4% in 1998 from 29% in 1992, while per capita aid dropped from its record high of \$54 in 1992 to its record low of \$9, reflecting an 83% decline. The government's misery was compounded by the fact that the country's export revenues showed no sign of recovery from their declining trend.

With respect to the expenditure side of the budget, three points are worth noting. First, as expected, the military burden increased substantially as a result of the war. The share of the cost of military goods and services increased by more than 300% in less than ten years, while the salaries to the army increased by about 50%.¹⁰ Military spending increased from an average of 7.2% of government spending in the 1980s to 25.8% in 1997. Second, the fact that domestic interest payments due increased by more than 300% between 1992 and 2001 suggests that the government was relying more

Table 1.1
Principal Budget Components: Revenue & Grants
GDP Shares (1) and in Billions of Real Burundi Francs (2)

	1992		1994		1996		1998		2000		2002	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Tax on:												
Income & Profits	4.0	7.8	3.6	5.9	3.9	4.8	4.6	5.7	3.9	5.4	5.2	7.0
Goods & Services	6.6	13.0	7.6	12.5	6.2	7.7	6.3	7.9	9.2	12.7	8.9	12.1
In'tl Trade	3.7	7.5	5.4	8.8	2.7	3.4	4.6	5.7	4.5	6.1	3.9	5.3
Other Tax	0.1	0.4	0.0	0.2	0.1	0.2	0.0	0.1	0.8	1.0	0.7	1.0
Total Tax Revenue	14.5	28.8	16.7	27.4	13.0	16.0	15.6	19.5	18.3	25.3	18.8	25.4
Non-Tax Revenue	2.4	4.7	1.4	2.3	2.6	3.2	1.5	1.9	0.9	1.2	1.3	1.8
Grants	8.6	17.1	2.4	4.0	2.2	2.7	0.9	1.2	3.1	4.3	1.7	2.3
Grants (% total revenue)	34	34	12	12	12	12	5	5	14	14	8	8

Source: Data from IMF 1997, 1999, 2002.

Table 1.2
Principal Budget Components: Expenditures
GDP Shares (1) and in Billions of Real Burundi Francs (2)

	1992		1994		1996		1998		2000		2002	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Salaries (total)	6.5	13.0	7.4	12.3	7.9	9.7	6.8	8.5	6.6	9.1	7.3	9.9
Civilian	4.3	8.5	4.9	8.2	4.9	6.0	3.7	4.7	3.5	4.9	3.9	5.3
Military	2.2	4.4	2.5	4.1	3.0	3.7	3.0	3.8	3.1	4.3	3.4	4.6
Goods & Services	3.5	7.0	4.4	7.3	4.8	5.9	6.3	7.8	7.4	10.2	8.0	10.9
Civilian	2.4	4.8	2.6	4.3	2.4	2.9	2.7	3.4	4.5	6.3	3.3	4.5
Military	1.1	2.2	1.8	3.1	2.3	2.9	3.5	4.4	2.8	3.9	4.7	6.3
Transfers & Subsidies	2.9	5.8	2.4	4.1	2.2	2.7	1.8	2.2	1.9	2.7	2.9	2.7
Interest Payments (due)	1.8	3.6	1.5	2.5	1.9	2.3	2.4	2.9	2.9	3.9	3.4	4.5
Domestic	0.4	0.9	0.3	0.5	0.4	0.4	0.8	1.1	1.3	1.9	1.7	2.4
Foreign	1.4	2.7	1.2	2.0	1.5	1.8	1.5	2.0	1.5	2.1	1.6	2.2
Capital Expenditure	11.7	23.3	9.0	14.8	10.4	12.9	5.9	7.3	6.1	8.4	6.0	8.1
Domestic	1.1	2.2	1.7	2.9	3.1	3.8	1.4	1.8	1.7	2.4	3.4	4.5
Foreign	10.6	21.1	7.3	12.0	7.3	9.0	4.5	5.6	4.4	6.0	2.6	3.6
Overall Balance												
Including Grants	-2.9	-5.8	-4.3	-7.1	-10.1	-12.5	-5.2	-6.6	-1.9	-2.6	-5.2	-7.0
Excluding Grants	-11.5	-22.9	-6.7	-11.1	-12.4	-15.2	-6.1	-7.6	-5.0	-7.0	-6.8	-9.3
CPI(1990=100)	114		141		221		319		369		404	
GDP Growth	0.7		-3.7		-8.4		4.8		-0.9		2.1	

Source: Data from IMF 1997, 1999, 2002.

and more on domestic debt to compensate for the loss of its revenue from traditional sources.

Third, total capital expenditure was halved and capital expenditures financed by external resources were divided by four between 1992 and 2001. This was a consequence of the decline in grants since capital expenditures had been traditionally financed by foreign resources. Unsurprisingly, the overall government deficit, including grants, increased from -2.9 to -10.1% of GDP between 1992 and 1996 before decreasing to -5.20% in 2001.

In an attempt to reconcile the decline in revenue with the increase in military spending, inflation tax became an alternative source of revenue, as Table 2 illustrates. Inflation tax and seigniorage are based on three aggregates, namely reserve money, money in circulation and reserves of the banking sector.

Table 2
Shares of Seigniorage & Inflation Tax in Total Government Revenue (%)

	<i>Seigniorage to Revenue</i>		<i>Inflation Tax to Revenue</i>	
	Average	Change	Average	Change
Full Sample: 1980-2002				
Reserve money	5.6		6.4	
Money in circulation	4.7		5.4	
Banking sector reserves	0.8		0.5	
Pre-War Sub-Sample: 1980-1993				
Reserve money	5.1		4.5	
Money in circulation	3.9		3.6	
Banking sector reserves	0.7		0.3	
War Sub-Sample: 1994-2002				
Reserve money	6.5	27	9.5	111
Money in circulation	5.8	49	8.2	128
Banking sector reserves	1.0	43	0.8	167

In Table 2, seigniorage increases whether one measures it based on reserve money or money in circulation. However, the most dramatic change is observed with respect to inflation tax. From the pre-war to the war period, inflation tax more than doubled. Reserves of the banking sector

recorded the highest increase, suggesting that the government may have increased the reserve ratio to collect more taxes. However, there could also have been a genuine need to increase the reserves given the increase in risk and uncertainty brought about by war.

Although the absolute values of inflation tax may appear low relative to other countries, the changes were unprecedented in a country that had traditionally enjoyed low levels of inflation tax and seigniorage. Between the 1970s and the early 1980s, inflation tax was 6.4% of revenue in Burundi, 10.3% in Rwanda, 25.5% in the Democratic Republic of Congo and 55.6% in Uganda (Edwards and Tabellini 1991). The average inflation rate from 1970 to 1982 was 10.8% in Burundi relative to 12.7% in Kenya, 12.5% in Rwanda, 16.4% in Tanzania, 34.3% in Uganda and 42.8% in the Democratic Republic of Congo. Over the same period, the level of seigniorage as a percentage of government revenue was 6.4% in Burundi in comparison to 4.5% for Kenya, 10.3% for Rwanda, 9.3% for Tanzania, 24.8% for Uganda and 15.5% for the Democratic Republic of Congo (Cukierman et al. 1992). The traditionally low level of inflation in Burundi suggests that economic agents inflation thresholds that trigger their flight from the domestic currency may be relatively low than in other countries in the region.

III. Methodology

The section will determine the extent to which the government may rely on inflation tax as a source of revenue. Given that the capacity of the government to collect inflation tax depends on the semi-elasticity of money demand with respect to inflation, the determination of the maximum inflation tax rate is based on the parameters of a money demand model.¹¹

A. Determination of the Revenue-Maximizing Rate of Inflation

We outline a simple framework used for the determination of the revenue-maximizing rate of inflation in the light of Rodriguez (1994) and Agénor and Montiel (1996). Consider a standard money demand equation of the form:

$$MV = pQ \quad (1)$$

where M is the stock of money, V is velocity, p is price level and Q is GDP. Issuing money allows the government to finance its current expenditure amounting to $(dM/dt)/p$. As a ratio of GDP, this revenue is equivalent to:

$$I_{tax} = [-(1/V)(dV/dt) + (\pi + g)]/V \quad (2)$$

where I_{tax} is inflation revenue, π is the rate of inflation and g is the rate of GDP growth. Assuming constant velocity consistent with the actual level of inflation and assuming that actual and expected inflation are identical equation (2) gives the steady-state level of inflation tax as:

$$I_{tax} = (\pi + g)/V \quad (3)$$

If velocity is of the standard form:

$$\ln(V) = V_0 + b\pi \quad (4)$$

where b is the inflation semi-elasticity of demand for money, substituting (4) in (3) we have:

$$I_{tax} = (\pi + g)e^{(-V_0 - b\pi)} \quad (5)$$

Maximizing (5) with respect to π and solving for π yields the maximum level of inflation:

$$\pi^* = (1/b) - g \quad (6)$$

B. *Estimation of the Semi-Elasticity of the Demand for Money*

The parameter b , the semi-elasticity of the demand for money with respect to inflation, can be easily estimated on the basis of equation (4).¹² However, as we are interested in contrasting the levels of pre-war and war inflation tax, we use quarterly data and estimate money demand models on both sub-samples and on the full sample. Agénor and Montiel (1996) propose an equation of money demand expressed as a partial adjustment mechanism of actual to desired levels of the stock of money:

$$m_t = \lambda a_0 + \lambda a_1 y_t - \lambda a_2 \pi_{t+j}^a + (1 - \lambda)m_{t-k} + e_t \quad (7)$$

where m_t is the log of the real stock of money, y_t is the log of real income as a scale variable, π_{t+k}^a is the expected rate of inflation for period $t+k$, which proxies for the opportunity cost of holding money, $0 < \lambda < 1$ is the rate of adjustment and e_t is a disturbance term. The expected level of inflation is proxied by the actual inflation rate measured as the change in CPI. Given that y_t is not available in quarterly frequency and since we are interested in splitting the sample in two sub-samples, we estimate a model including inflation and the lagged values of real money.¹³

$$m_t = a_0 + \sum_{i=0}^k b_i \pi_{t-i} + \sum_{j=1}^p c_j m_{t-j} + e_t \quad (8)$$

The long-run semi elasticity of money is computed as:

$$\text{Semi - elasticity} = \sum_{i=0}^k b_i / (1 - \sum_{j=1}^p c_j) \quad (9)$$

Equation (8) is estimated using the general-to-specific methodology by which a general over-parameterized model is reduced to its most parsimonious specification. Potential simultaneity and other general econometric issues posed by the estimation of money demand models (Goldfeld and Sichel, 1990) require ensuring that the error term e_t is well-behaved.

IV. Data Characteristics and Structural Change

A. *Data: Sources and Definitions*

The sample period covers 23 years, from January 1980 to December 2002. We, therefore, have 55 quarters before October 1993 and 37 quarters after. The data on money aggregates, official exchange rate and prices were collected from IMF (2004) and Burundi central bank. The data on government revenue are from Burundi central bank. The data on the parallel exchange rate were collected from different issues of Currency Alerts and Burundi central bank. The quarterly frequency is recomputed from monthly observations.

In order to reduce the impact of outliers, money in circulation and government revenue were re-computed as three-month moving averages before their transformation into quarterly variables. There are three variables of focus in this section, namely M0, government revenue excluding inflation tax (in real millions of Burundi francs), and inflation. The first two variables are deflated using the consumer price index based on 1990.

B. *Testing for Unit Roots and Structural Change*

The procedure for testing for the order of integration is as follows. First, we use an Augmented Dickey Fuller (ADF) test.

If the null hypothesis of the presence of a unit root is rejected, we conclude that the variable is stationary. However, if the null is not rejected, we do not conclude that we have an integrated variable as the non-rejection of the null may be due to the low power of the ADF test (see Enders 1995). Consequently, if ADF fails to reject the null, we use Phillips-Perron (PP) test. This non-parametric test is known to have more power than the parametric ADF. These two tests are the most commonly used in the literature.

The presence of a structural break in the series may reduce even further the power of ADF and PP tests. As a result, the tests may fail to reject the null of unit root when the series are actually stationary, leading to wrong inference (see Ashworth et al. 1999 for an example). To determine the date of structural change we use pulse and level dummies in the light of the approach proposed by Perron (1989).

Table 3
Unit Root Tests and Structural Change

	Currency in Circulation	Government Revenue	Inflation
Augmented Dickey-Fuller	-2.65 [-3.47]	-2.05 [-3.46]	-8.36 [-3.46]***
Phillips-Peron	-6.39 [-3.46]***	-3.86 [-3.46]***	
Trend	-0.00 [-0.02]	-0.00 [3.01]***	-0.00 [-1.40]
Pulse Dummy (1993:4=1)	0.05 [0.82]	-0.28 [-2.97]***	0.08 [2.34]**
Level Dummy	-0.05 [-1.68]*	-0.16 [-3.21]***	0.03 [2.03]**
Break Date	1994:4	1994:2	1993:4

Note: The values in brackets in the first panel are 5% critical t-statistics for unit root testing. Bracketed values in the second panel are the usual t-statistics. All unit root tests include a drift and a time trend.

The tests show that the three variables are stationary at the 5% probability level or better. ADF and Phillips-Perron tests, despite their low power especially in the presence of

structural breaks, highly reject the null of a unit root. This implies that there is no need to proceed further and use additional tests. Results in the second panel suggest that inflation reacted immediately to war outbreak and that war led to a positive long-term growth in the variable. The revenue variable reacted with a six-month lag and war led to a negative long-term growth in the variable. Currency in circulation took one year to react to the shock of war and there is only weak evidence of a negative long-term effect.

V. Empirical Findings

The computation of the maximum rate of inflation tax requires that we estimate the parameter b in equation (6) from a money demand model based on M0. First we restrict the sample to the period before the war, namely 1980:1 to 1993:3. Second, we compute the semi-elasticity corresponding with the war period from 1993:4 to 2002:4. Finally, we use the full sample from 1980:1 to 2002:4 and contrast the results of the three regressions. Once the semi-elasticity is estimated, its value is substituted into equation (6) to compute the level of inflation that maximizes the government's revenue.¹⁴ Following are the results of the most parsimonious models from an over-parameterized equation that includes 12 lags.

Table 4.1
Estimation of Money Demand Before the War (1980:1-1993:3)
Dependent Variable: Log Real M0^a

Variable	Coefficient	Standard Error	P-Value
Constant	0.46	0.54	0.40
INF	-0.78	0.22	0.00
M0(-1)	0.76	0.07	0.00
M0(-7)	0.12	0.06	0.03
Dummy Q2	0.30	0.02	0.00
R^2	0.88		
Adjusted R^2	0.87		
Jarque-Bera (normality)	0.50		0.78
LM Breusch-Godfrey	9.70		0.21
ARCH Test	4.51		0.72
Long-run semi-elasticity	-6.91		
Maximum inflation tax rate	14.5%		

N=48.

^a Log real M0 is estimated on lagged real M0, inflation and quarterly dummies.

Note: p-values are based on White (1980) heteroskedasticity-consistent standard errors.

A number of observations equal to the highest lag in the equation are 'lost' in the estimation.

Dummy Q2 is the second quarter dummy.

The diagnostic tests suggest that the model is well specified. The R^2 shows that the model explains 87% of the variation in M0. A Jarque-Bera normality test, Breusch-Godfrey Serial correlation LM test and ARCH test all suggest that the error term is well-behaved.

Table 4.2
Estimation of Money Demand During the War (1993:4-2002:4)
Dependent Variable: Log Real M0^a

Variable	Coefficient	Standard Error	P-Value
Constant	-0.28	0.27	0.32
INF	-0.73	0.19	0.00
INF(-3)	-0.56	0.17	0.00
M0(-1)	1.30	0.12	0.00
M0(-2)	-0.35	0.12	0.01
M0(-8)	0.12	0.05	0.03
Dummy Q2	0.16	0.02	0.00
Dummy Q3	-0.11	0.03	0.00
R^2	0.95		
Adjusted R^2	0.94		
Jarque-Bera (normality)	0.62		0.73
LM Breusch-Godfrey	10.99		0.20
ARCH Test	5.66		0.69
Long-run semi-elasticity	-19.35		
Maximum inflation tax rate	5.20%		

N=37.

^a Log real M0 is estimated on lagged real M0, inflation and quarterly dummies.

Note: p-values are based on White (1980) heteroskedasticity-consistent standard errors.

A number of observations equal to the highest lag in the equation are 'lost' in the estimation.

Dummy Q2 and Q3 are second and third quarter dummies.

As in the previous case, all the diagnostic tests suggest that the model is well-specified. As expected, the long-run semi-elasticity increases during the war period. However, estimates in Tables 4.1 and 4.2 may be criticized as being inefficient as they are derived on the basis of few degrees of freedom. To address this concern, we re-estimate the model using the full sample and adding a dummy variable (DUMWAR) that takes value 1 during the war period and zero otherwise.

The interaction term of the war dummy with inflation captures the joint effect of war and inflation. Table 4.3 reports the results.

Table 4.3
Estimation of Money Demand For the Full Sample (1980:1-2002:4)
Dependent Variable: Log Real M0^a

Variable	Coefficient	Standard Error	P-Value
Constant	0.43	0.23	0.07
INF	-0.62	0.16	0.00
M0(-1)	0.82	0.06	0.00
M0(-4)	0.19	0.09	0.05
M0(-5)	-0.22	0.08	0.01
M0(-7)	0.11	0.04	0.01
Dummy Q2	0.20	0.03	0.00
INF(-3)*DUMWAR(-3)	-0.66	0.21	0.00
R^2	0.91		
Adjusted R^2	0.90		
Jarque-Bera (normality)	6.44		0.04
LM Breusch-Godfrey	12.21		0.09
ARCH Test	2.31		0.94
Long-run semi-elasticity (full sample)	-12.95		
Maximum inflation tax rate (full sample)	7.7%		
Long-run semi-elasticity (pre-war sample)	-6.27		
Maximum inflation tax rate (pre-war sample)	15.9%		

N=85.

^a Log real M0 is estimated on lagged real M0, inflation and quarterly dummies.

Note: p-values are based on White (1980) heteroskedasticity-consistent standard errors.

A number of observations equal to the highest lag in the equation are 'lost' in the estimation.

Dummy Q2 is a second quarter dummy.

Diagnostic tests in Table 4.3 show that the model fails the Jarque-Bera normality test¹⁵ but the other tests show no significant serial correlation or heteroskedasticity. This model is more efficient as it uses 85 quarters, double the

sample size of each of the two previous models. It is relevant to note that computing the long-run semi-elasticity and the maximum inflation tax rate excluding the interaction term returns almost the same values as in the pre-war period. These are -6.27 against -6.91 for the semi-elasticity and 15.9% and 14.5% for the maximum inflation tax rate, respectively. The value of the semi-elasticity for the full sample is $[(-6.91 - 19.35)/2] = -13.13 \approx -12.95$, which is almost equal to the average of the pre-war and war period semi-elasticities.¹⁶

These results show a clear effect of war on the long-run semi-elasticity of money demand. The doubling of inflation from a relatively low level of 7% before the war changed economic agents' attitudes. Whether we consider the maximum rate of inflation for the full sample or for the war period, inflation moved to the "bad" side of the Laffer curve provoking a negative reaction towards holding domestic currency. The increase in the semi-elasticity from 6.9 before the war to 19.3 during the war illustrates this attitude. This phenomenon described in the literature as "flight from currency" eroded the government's capacity to maintain a high level of inflation tax revenue for a long time as illustrated in Figure 1(h).

People in cities switched to physical assets which are not easily preyed upon by government taxation or easily looted by rebels. To the best of our knowledge, there is no documented evidence of the types of assets economic agents invested in during the war. There is anecdotal evidence that wealthy individuals invested heavily in real estate. This is supported by the observable boom in the construction sector in Burundi cities, despite the pervasive insecurity. Over the last ten years, more than three new estates have been developed in and around Bujumbura. Additionally, but to a limited extent, people with spare cash may have exchanged

Burundi francs for dollars using the parallel market.¹⁷ Burundi may be currently experiencing portfolio behavior similar to Uganda's during the country's war in the 1980s and early 1990s when agents abandoned money for coffee as a store of value (Henstridge 1999).

There is also some evidence that war may have induced agents to transfer their wealth abroad, increasing capital flight. Before the 1993 war, capital flight from Burundi represented 30% of revenue, on average. This rate was higher than in relatively stable countries such as Côte d'Ivoire (5%), Zimbabwe (13%), Mauritius (19%), Rwanda (20%) and Ghana (29%). However, the rate in Burundi was lower than in countries with traditionally high political instability such as Chad (91%), Uganda (57%), Nigeria (56%) and Mozambique (52%). During the war period, between 1993 and 1997, the average ratio of capital flight from Burundi almost doubled to 55% of revenue. This dramatic change over a short period lends some support to the hypothesis that economic agents may have used capital flight to protect their wealth from inflation taxation and other war-associated vagaries.¹⁸

VI. Conclusion and Policy Implications

The paper has shown that the 1993 war has eroded the government's revenue from traditional sources. For example, the revenue from domestic taxes three years after the war onset was about half of its value just before the war in 1992. Confronted with this unprecedented revenue erosion, the government attempted to raise revenue from inflation tax. From an average share in total revenue of less than 4% before the war, inflation tax shot to 18% in 1996 but declined back to its pre-war level in 1999.

Economic agents responded to the persistence of war and high inflation by holding less domestic currency. The increase in the long-run semi-elasticity of demand for money from 6.9 to 19.3 represented a “flight from domestic currency.” As economic agents substituted their domestic currency for other assets, they limited the government’s capacity to generate revenue out of inflation. There is no detailed systematic information on the substitute assets to which economic agents reverted. Anecdotal evidence suggests that wealthy individuals invested heavily in real estate while others preferred to hold foreign currency acquired in the parallel market. Also, the increase in capital flight during the period of war suggests that economic agents transferred their wealth abroad. More detailed research on this portfolio behavior during the war period would be a relevant extension to this study.

One policy conclusion is that the instability of the money demand function due to political instability makes monetary and fiscal policy difficult. Political instability erodes the government’s capacity to raise revenue, including inflation tax. As a result, regaining economic agents’ confidence in the domestic economy is a key challenge facing conflict and post-conflict economies.

Endnotes

¹For instance, the fact that the vast majority of countries in the samples used have never experienced war may explain why the variable measuring war duration comes out insignificant in cross-section or panel data analysis. Nkurunziza and

Bates (2003) report that zeros represent 85% of all observations of the 'war duration' variable, suggesting that the data have little variation.

²Inflation tax is defined as "the tax imposed on money holders as a result of inflation" (Blanchard and Fischer 1989). Formally, inflation tax revenue is obtained by multiplying the rate of inflation and the real value of money in circulation. Inflation is computed as the relative change in the consumer price index using 1990 as the base year. An alternative measure of inflation that captures the capital loss due to inflation (for instance, Easterly et al., 1995) did not show notable differences with the simple measure used in this study. Seigniorage revenue is the sum of inflation tax and the change in real value of money in circulation.

³The depreciation of the official and parallel exchange rates is the relative change in the level of the variable.

⁴Details on the reasons explaining the length of the last episode may be found in Ngaruko and Nkurunziza (2003).

⁵Although the rate of inflation in Burundi could be considered low in absolute terms, it is high in relative terms. In the 1980s the rate of inflation was about 7%, a relatively low rate in comparison with other developing countries. In the 1990s inflation has been well above the 5% target usually advocated by World Bank-IMF programmes and even the higher 8% benchmark above which inflation is thought to reduce growth (Collier and Gunning 1999).

⁶Nkurunziza (2001) gives a detailed discussion of exchange rate policy and the determinants of the premium.

⁷Source: <http://www.heritage.org/research/features/index/indexoffridom.cfm>.

⁸On the reasons why these measures are used, see Heritage Foundation's Report discussing the methodology used to compute these scores at http://www.heritage.org/research/features/index/chapters/Chapter_5.pdf.

⁹The best score is held by Djibouti (1.8) while the worst is held by the Democratic Republic of Congo.

¹⁰This last figure is most probably underestimated given that the size of the army increased significantly. According to Balancie and LaGrange (1996), Burundi had a 6,000-soldier strong army before the 1993 war. By the year 2000 ICG (2000) reports that the number had swelled to 45,500. Because military expenditures are treated as state secrets even in the most open political societies (see Brzoska 1995), and given that the donor community discourages the use of donor money to purchase weapons, it is very likely that the figures for Burundi are underreported.

¹¹Readers interested in the estimation of structural models of seigniorage may refer to Edwards and Tabellini (1991).

¹²Using general-to-specific methodology, we have run velocity on GDP deflator using annual data covering 34 years (from 1966 to 1999) to estimate equation (4). The regression results are:

$$\begin{array}{rcl}
 VELO & = & 0.17 + 0.01DEFL + 0.89VELO(-1) \quad (10) \\
 s.e. & & [0.36] \quad [0.00] \quad [0.16]
 \end{array}$$

which gives a long run semi-elasticity of 5.94 and a maximum tax rate of 16.8%. These values are almost equal to those based on M1 estimated using quarterly data (not reported).

We proceed and use quarterly data and estimate directly the semi-elasticity of inflation to money demand as the data allow us to have more degrees of freedom and estimate the model on the pre and post-war sub-samples.

¹³Rodriguez (1994) estimates a similar model for Argentina.

¹⁴We do not use the value of economic growth in the formulae, assuming that $g \approx 0$.

¹⁵Even when the error term fails the Jarque-Bera normality test, the coefficients of the model may be unbiased and consistent if the variance is finite. In the specific case under analysis, we know that the variance is finite since both money demand and inflation are stationary.

¹⁶To check the robustness of our results, we computed a semi-elasticity based on M1 and compared the result with other studies on African economies using M1. We found that the semi-elasticity is 5.23, a value that is comparable to Zambia's 5.30 (see Adam 1999). Randa (1999) finds a value of 5.43 for Tanzania, which is close to the values for Burundi and Zambia. We deduce that our data and our methodology produce findings that are comparable with work done on similar economies.

¹⁷The parallel market in Burundi is mostly used for current account transactions (Nkurunziza 2001). This may explain why the parallel market exchange rate variable was insignificant in all the specifications of the models of money demand presented in tables 4.1 to 4.3. The result may be also due to multicollinearity with inflation.

¹⁸We thank Anke Hoeffler for making available the data used to compute the average numbers of capital flight.

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