



Analysis

Deforestation and seigniorage in developing countries: A tradeoff?

J.-L. Combes^a, P. Combes Motel^{a,*}, A. Minea^a, P. Villieu^b^a School of Economics & CERDI (University of Auvergne), 65 Boulevard François Mitterrand, B.P. 320, 63009 Cedex 1 Clermont-Ferrand, France^b LEO (University of Orléans), Rue de Blois, B.P. 6739, 45067 Cedex 2 Orléans, France

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ABSTRACT

Most of countries covered by natural forests are developing countries, with limited ability to levy taxes and restrained access to international credit markets. Consequently, they are amenable to draw heavily on two sources of government financing, namely seigniorage and deforestation revenues. First, we develop a theoretical model emphasizing a substitution effect between seigniorage and deforestation revenues. Second, a panel-data econometric analysis over the 1990–2010 period confirms our findings. Consequently, a tighter monetary policy hastens deforestation. Third, we extend the theoretical model and show that international transfers dedicated to forest protection can upturn the positive link between tighter monetary policies and deforestation, and then discuss the relevance of this finding with respect to recent institutional arrangements.

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1. Introduction

IMF Managing Director Christine Lagarde warned on a triple crisis – Economic, Environment, Social – and announced IMF research support on the use of fiscal tools in climate policies (De Mooij et al., 2012). This warning signals a clear recognition of a close linkage between macro- and environmental outcomes within an institution which traditionally targeted economic performance in a narrow sense. Moreover, many observers outlined the link between lower deforestation rates and the financial crisis, which dried up credit flows towards activities fueling deforestation: for example, Nepstad et al. (2009) did not exclude that the 2008–2009 financial crisis had something to do with an impressive decrease in deforestation rates in the Amazonian region. This proposition makes reminiscent earlier debates between those arguing that economic growth is detrimental to the environment (Meadows et al., 2005) and those promoting economic growth as a mean to alleviate the pressure on the environment (Beckerman, 1992). The objective of this paper is precisely to build on this link between macroeconomics and the

environment; namely, it focuses on the channel through which macro-economic policies can affect environmental quality.

Several studies focused on the role of macroeconomic factors in the process of deforestation, in the wake of the economic reforms implemented under structural adjustment programs in the 1990s. For instance, Angelsen and Kaimowitz (1999) found that adjustment programs may increase the pressure on forests, a view supported by other studies focusing on debt and deforestation (Culas, 2006). Trade liberalization affects deforestation in a more ambiguous way, through movements in prices of agricultural outputs and inputs, as well as timber prices (López and Galinato, 2005; Robalino and Herrera, 2010), while relative prices, measured by real exchange rates, were shown to determine deforestation dynamics (Arcand et al., 2008). In addition, countercyclical fiscal spending increases deforestation (Galinato and Galinato, 2013).

In this paper we explore the link between macroeconomic performances and the environment, by explicitly modeling a tradeoff between economic and environmental performances. More precisely, in the wider environment-development dilemma (Combes Motel et al., 2014) context, we analyze a possible tradeoff between inflation-fighting policies and deforestation, through the government budget constraint. To the best of our knowledge this tradeoff channeled by monetary policy has not been modeled so far.

Other authors addressed the relationship between macroeconomic performances and environmental issues. Significant contributions include

* Corresponding author.

E-mail addresses: j-l.combes@udamail.fr (J.-L. Combes), pascale.motel_combes@udamail.fr (P. Combes Motel), alexandru.minea@udamail.fr (A. Minea), patrick.villieu@univ-orleans.fr (P. Villieu).

the pioneer work of Grossman and Krueger (1995), showing the existence of an “environmental Kuznets curve” (EKC), and the study of the relation binding economic growth and the environment (Bovenberg and Smulders, 1995; Fullerton and Kim, 2008; Brock and Taylor, 2010). Environmental constraints versus macroeconomic performance tradeoffs have also been dealt within the Keynesian framework by Heyes (2000).

However, our theoretical setup differs from Heyes (2000) in several respects; first, he develops a short-term green ISLM Keynesian framework whereas we consider a long-term perspective to account for the long-term tradeoff in the government budget constraint. Second, in an ISLM-like model, fiscal and monetary policies are driven by two independent instruments, whereas in our model monetary policy is a mean to levy resources for financing public expenditure. Third, a monetary expansion in Heyes decreases the interest rate and favors capital-intensive activities that are environment friendly: natural and man-made capitals are substitutes.¹ In our setup, a monetary expansion that increases seigniorage lowers the pressure of forests, and is therefore beneficial to the environment. Put differently, the environmental effect of monetary policy is channeled by the cost of capital in Heyes, while in our theoretical setup it relies on substituting deforestation and seigniorage revenues through the government budget constraint.

Our starting point is that the majority of countries covered by natural forests are developing countries, having limited ability to levy taxes and restrained access to international credit markets. This is consistent with recent studies on tax revenues in developing compared to developed countries. In the latter, tax revenues over the 1994–2009 period represent a larger fraction of GDP, and increased faster than in middle-income and poor countries (Le et al., 2012).² This fact is explained either by differences in preferences towards public versus private goods, or by deficient tax collection systems (Gordon and Li, 2009). Consequently, developing countries can be incited to draw on two sources of government financing, namely resource harvesting and seigniorage revenues.³

We pay special attention to “deforestation revenues” accruing to governments, embracing two dimensions. First, revenues generated by timber harvesting performed by public authorities. Indeed, in developing countries, the largest majority of forests are under public ownership, as documented by the 2005 FAO Forest Resource Assessment, or by White and Martin (2002, p.7), who estimate that public forests directly administered by governments in developing countries represent about 70% of the global forest estate. Second, land-use change activities, i.e. revenues resulting from encroachments of agriculture and cities on forested areas, add to deforestation revenues collected by governments through tax revenues. This is all the more true in developing economies, where forest is cleared for agriculture, forestry or commercial purposes, and there can be a pressure for increasing its exploitation or for converting it into “deforestation revenues”. “Deforestation revenues” are therefore meant to cover revenues generated by timber harvesting and by land-use changes, and are closely linked to drivers of deforestation as described by several authors, among which Chomitz et al. (2007) or Geist and Lambin (2001), who emphasized their diversity. In addition,

notice that the last Forest Resource Assessment issued in 2010 by the FAO provides estimates of “forest revenues” defined as “all government revenue[s] collected from the domestic production and trade of forest products and services” (FAO, 2010). They amount to only 14.6 billion USD in 2005, and widely underestimate all “deforestation revenues”, i.e. revenues generated by deforestation activities.⁴ Consequently, the most appropriate way to seize “deforestation revenues” is to consider rates of deforestation.⁵

Deforestation activities have negative effects on the environment. For instance, forests are the second biggest stock of carbon after oceans,⁶ therefore contributing to mitigating climate change. They provide a habitat for a wide range of known and unknown species, which can potentially be lead to extinction by human activity (Laurance et al., 2012). Moreover, land use changes, which are mainly the result of deforestation, are responsible for about 25% of anthropogenic CO₂ emissions (Denman et al., 2007). Houghton (2005) estimates that the magnitude of carbon released by tropical deforestation is about 15 to 35% of annual fossil fuel emissions during the 1990s, and Van der Werf et al. (2009) conclude that forest losses are substantial contributors to GHG emissions into the atmosphere. At last, forests contribute to the water cycle: the Amazon basin accounts for one fifth of total freshwater drained into oceans. Data show that deforestation occurs at a yearly pace of about 7 million ha per year between 1990 and 2010 (Table 1), Africa being mostly affected by deforestation (Table 2).

Moreover, data for the 1990–2010 period (Table 3) show that seigniorage revenues account between 1% and up to 20–30% of GDP in sub-Saharan African countries, thus representing a non-negligible share of government resources. Remarkably, compared to the period 1990–1995, the decrease in seigniorage in almost all regions in the more recent periods confirms that seigniorage revenues were impacted by the disinflation policies promoted by the IMF.

The rest of the paper is organized as follows. In Section 2, we develop a simple theoretical model emphasizing the existence of an optimal (welfare-maximizing) tradeoff between seigniorage and deforestation revenues. In particular, the higher the pressure on lowering inflation (for example, through inflation targeting), the higher the deforestation. Section 3 is devoted to the empirical assessment of this proposition. An econometric analysis performed on a panel of developing countries supports the theoretical conclusions. In light of our results, tight monetary policies designed for reducing inflation might hasten deforestation. To tackle this problem, we extend the theoretical model in Section 4, by considering an international transfer for compensating deforestation reduction. We show that a welfare-maximizing contract based on environmental rewards could circumvent the problem of substitutability between inflation-fighting and environmental policies, and provide a “win-win” strategy. Such a contract might back up recent initiatives as REDD + ones, towards compensations of developing countries which protect their forests, as emphasized in Section 5.

¹ Heyes’ (2000) seminal paper was extended by several authors. Lawn (2003) and Sim (2006) focus on convergence towards the macro-environmental equilibrium with endogenous shifts of IS and LM, while Decker and Wohar (2012) discuss the substitutability hypothesis between natural and man-made capitals.

² Tax revenues as a fraction of GDP equal 21.2%, 18.8% and 11.3% in respectively high-income, middle-income and poor countries in 1994, while in 2009 figures are 29.3, 19.3 and 13.6 respectively.

³ Seigniorage is defined as the value of money minus the cost related to its production. Following Cukierman et al. (1992) and Aisen and Veiga (2008), we measure seigniorage as the change in reserve money in percentage of nominal GDP.

⁴ Several arguments support that these numbers are underestimated, including the absence from this definition of revenues related to (i) land-use change (i.e. agricultural revenues generated on cleared areas), (ii) NTFPs which are marketed, (iii) illegal logging activities (generating indirectly revenues accruing to public finances when they induce more activities in other sectors of the economy).

⁵ Even if the relation between deforestation rates and deforestation revenues may be rather complex (for example, because deforestation activities may be subject to negative returns in the long-run, in which case one should compute the net effect of increasing agricultural revenues and decreasing timber revenues), it is fairly straightforward to assume that deforestation generates more revenues than standing forests, thus supporting the positive link between deforestation revenues and deforestation rates.

⁶ According to IPCC, it is however likely the case that CO₂ uptake from the atmosphere by oceans will decrease (Intergovernmental Panel on Climate Change, 2007, para.7.3.4.2), thus reinforcing the role of forests as carbon sink.

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