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Public spending, credit and natural capital: Does access to capital foster deforestation?

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ABSTRACT

Improving access to man-made capital through domestic credit and public spending is a step towards development. Developing countries rely also on natural capital, which may generate possible conflicts between environment and development targets. Taking the case of land-use and deforestation, this paper revisits the links between man-made and natural capital. Relying on a model of income maximization, we theoretically assess how better access to man-made capital through public spending and credit, influences forest cover loss. Econometric investigations, over the period 2001–2012, show that forest cover loss is positively influenced by credit and public spending. A better access to capital is thus detrimental to the forest. This can be interpreted as a Tinbergen rule: the development objective of facilitating access to man-made capital cannot be tackled without facing the objective of environmental protection.

1. Introduction

Natural capital constitutes a far greater share of the wealth of developing countries than that of man-made capital. Natural capital thus represents a pivotal element in sustaining the development and welfare of developing countries (the World Bank, 2005; Ruta and Hamilton, 2007). An iconic form of natural capital is the one of forested land, of which conversion into crop and pasture land and timber harvesting can be seen as the use of natural capital in an attempt toward poverty alleviation (Wunder, 2001; Celentano et al., 2012) and economic development by agents lacking other forms of capital (Azqueta and Sotelsek, 2007; Barbier, 2011). However, relying heavily on natural capital in the early stages of development can bring serious environmental concerns. Land conversion and deforestation have global and local environmental impacts, such as climate change, biodiversity loss and accelerated erosion of local forest ecosystem services.

At the same time, improving access to man-made forms of capital is an important development objective. The Sustainable Development Goals

illustrate how crucial is the investment in essential infrastructures for economic development (Goal 9) or in human capital and the better management of natural resources (Goal 15) like the forests. A crucial question to investigate is then the relationship between natural capital and man-made capital: how does better access to man-made capital influence the reliance on natural capital?

This relationship has been extensively investigated within the weak vs. strong sustainability debate, which dates back to the 1970s.¹ The weak sustainability approach, which is rooted in mainstream economic analysis, asserts that the different forms of capital are substitutes: natural capital depletion can contribute to (and be replaced by) the accumulation of man-made capital. Optimal growth models have been extended where the conditions of technical progress and substitution between natural and man-made capital are analyzed (Dasgupta and Heal, 1974; Solow, 1974; Krautkraemer, 2005; Bretschger and Smulders, 2012). They suggest that substitution between natural and man-made capital can create the conditions of boundless economic development, even in a world with finite natural capital. van Geldrop and Withagen (2000) show that broadly

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E-mail addresses: philippe.delacote@nancy.inra.fr, philippe.delacote@inra.fr (P. Delacote).¹ See, for example, Neumayer (2013) for an in-depth presentation of this debate.<https://doi.org/10.1016/j.econmod.2018.04.006>

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defined natural capital converges to a steady state provided there exists a sector that allows investments in natural capital.

This weak view of sustainability has been challenged by proponents of the strong sustainability paradigm. They put emphasis on the specific characteristics of natural capital, which lead them to argue in favor of maintaining a minimum amount of the different types of natural capital (Daly and Townsend, 1993; Daly, 1994, 1997; Ayres et al., 1998). The main premise of this argument is that natural capital differs from other forms of capital in many different ways, which creates complementarity between man-made and natural capital (Cleveland and Ruth, 1997; Stern, 1997; England, 2000). For instance, natural capital's depreciation is an irreversible phenomenon, degraded natural assets are often considered as irreplaceable and lastly are subject to abrupt collapses and irreversible changes quoted as tipping points (Dasgupta, 2007). Therefore, natural capital may become a constraint on development and thus be the key factor generating environmental crises (Scott Taylor, 2009). The authors of the updated Meadows Report (Meadows et al., 2005), or more recently Diamond (2013), illustrate such environmental crises, giving examples of unsustainable and collapsing societies that have relied too heavily on natural capital depletion.

Facilitating access to credit and the use of government expenditure are ways to increase the stock of man-made capital. Our research question is thus more precisely: does increased access to man-made capital through the provision of domestic credit and public expenditures tend to increase or to relax the use of natural capital? Our intuition is that diverse forms of man-made capital may not have homogenous impacts on development and on natural capital use.

Some papers have investigated the impact of access to credit on environmental issues. Antle et al. (2006) argue that credit constrained agents may underinvest in natural resource conservation. Shahbaz et al. (2013) find that financial development reduces CO₂ emissions. Several authors argue that deforestation may be capital-driven (Rudel and Roper, 1997; Geist and Lambin, 2001). For instance, credit allows the financing of investments in infrastructure that boosts deforestation (Pacheco, 2006). Some studies in Latin America do find evidence that access to credit favors deforestation-related activities over others (Barbier and Burgess, 1996; Pfaff, 1999). Focusing on Brazil, other papers find a strong positive correlation between agricultural credit and deforestation rates (Andersen, 1996; Angelsen and Kaimowitz, 1999; Hargrave and Kis-Katos, 2012). In 2008, Brazil decided to restrict access to credit in municipalities that are blacklisted because of their high rates of deforestation. Some studies argue that the curbing of deforestation in the past few years is related to this initiative (Assunção et al., 2013; Nepstad et al., 2014). In contrast, credit may also ease the adoption of more capital-intensive agriculture, which is less forest-consuming (Angelsen, 1999, 2010; Caviglia-Harris, 2003). Moreover, in their studies on Bolivia and Honduras, Godoy et al. (1997) argue that families with better access to credit are less forest-dependent than others.

Government expenditures have also often been thought to have an impact on natural resource depletion (Faria, 1998; Gupta and Barman, 2009) and especially on deforestation (Angelsen and Kaimowitz, 1999; Geist and Lambin, 2001). Linkages between government expenditure and deforestation have been scrutinized when structural adjustment policies were implemented in the 1980s: scholars questioned the effect of cuts in public spending on governments' ability to protect the environment (e.g. Kaimowitz et al., 1998). When public spending cuts consist in drastically reducing funding towards new agricultural settlements, migration towards the agricultural frontier is made more difficult (Kaimowitz et al., 1999). Bulte et al. (2007) show that rural subsidies towards large farmers triggered deforestation in Latin America. Several authors have found evidence of the role of transport infrastructure on deforestation (e.g. Pfaff et al., 2007). López et al. (2011) draw attention on the effect of the level and composition of public spending on the environment. Finally, Galinato and Galinato (2016) present evidence of a positive impact of government spending on deforestation-induced CO₂ emissions.

Our paper makes several contributions on the links between man-

made capital and natural resource depletion. First, relying on the fact that macroeconomic variables may have non-homogenous sectoral impacts (Mallick, 2014), we theoretically present the conditions under which better access to man-made capital may lead to higher deforestation, which is a major case of natural resource depletion. In our case of interest, we argue that better access to man-made capital has a diverse impact on natural resource-intensive sectors (what we call deforestation-related activities) than on other sectors. For instance, it has already been shown that forests can be used as safety nets when credit and insurance markets are incomplete (Delacote, 2007, 2009). In such cases, better access to credit may represent a substitute for the use of forests as natural capital. Alternatively, better access to credit markets relaxes credit constraints and may facilitate agricultural investments, which would possibly favor deforestation. As an illustration, Susanti and Maryudi (2016) show how access to credit helped to develop oil palm plantations, which is an important direct cause of deforestation in Indonesia.

Second, considering that access to credit and public expenditures are key factors of man-made capital accumulation, we examine precisely the joint effect of credit and public expenditures on forest losses. Relying on our theoretical model, we suspect that easing the access to man-made capital has an effect, whether negative or positive, on the deforestation process. Yet, access to capital through credit and public expenditures has been thus far overlooked at cross-national levels. Indeed, to date the literature on macroeconomic deforestation factors has been extended toward the analysis of trade (Leblais et al., 2017), real exchange rate (Arcand et al., 2008), energy policies (Dixon et al., 2016), fiscal and monetary policies (Combes et al., 2015), timber harvesting (Damette and Delacote, 2011), quantile regressions (Damette and Delacote, 2012) and GDP (Choumert et al., 2013).

In addition, we argue that assessing the impact of public expenditures (access to credit) on deforestation cannot be done without considering access to credit (public spending). Indeed, the link between credit and public spending is well established in the macroeconomic literature. On the one hand, a crowding-in effect à la Barro (1990) could exist. Under this hypothesis, private production depends on both credit and productive government expenditures, which are considered as inputs to private production. The marginal productivity of private capital is therefore positively affected by public spending. According to Mallick (2001) fiscal policy can influence output positively through the effects of public sector investment on private investment. On the other hand, the possibility of a crowding-out effect can be put forward according to which an increase in public spending dries out the credit available to private agents.

The rest of this paper is organized as follows. Section 2 presents a simple model of substitutability and complementarity between deforestation and man-made capital. Section 3 presents the econometric analysis using a dynamic panel specification connecting credit and public expenditures to forest losses on a sample of developing countries. Section 4 concludes.

2. Theoretical model

2.1. Main hypotheses

In this section, we investigate the channels by which a better access to man-made capital may be related to deforestation. Consider a country, in which the representative agent (e.g. farmer) maximizes its net income. Net income is derived from the agents' economic activities that depend on its access to two types of assets: natural capital, through deforestation D , and man-made capital (henceforth called capital) K .² Man-made capital requires both credit and public spending, of which specific effects on forest losses will be identified in the empirical section.

² Hereby we implicitly assume that labor supply is fixed, with constant wage, and has no direct implications on capital allocation.

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