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Carrots, Sticks and the Brazilian Forest Code: the promising response of small landowners in the Amazon

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ABSTRACT

The Brazilian Forest Code has been in existence more than 80 years but has largely been ineffective in reducing deforestation in the Amazon due to a lack of adherence and enforcement. Recent revisions to the law reduced the restoration requirements for Areas of Permanent Preservation (APP) and Legal Reserve (LR) and established new tools to facilitate compliance, encourage environmental conservation and strengthen the supervision and monitoring of protected areas. The goal of these changes is to facilitate compliance, encourage environmental conservation, and strengthen the monitoring of protected areas. This paper investigates the probability that a household in Rondonia, Brazil will set aside land for permanent preservation and, once this decision is made, the extent of restoration. Our results suggest that-even in a region that is heavily deforested and under conditions of weak enforcement-households are complying with the law by developing formal plans for restoration. Most important, we find that access to extension agents, existing APP guidelines, and other policy levers (such as environmental licensing) have made a significant impact on the development of these plans suggesting that the 2012 Forest Code has the potential to impact future land restoration decisions.

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Introduction

The Brazilian Amazon is home to a third of the world's rainforests (FAO, 2011) comprises one of the most biologically diverse biome in the world, (Dirzo and Raven, 2003; Mittermeier et al., 2003) and significantly influences global climate (Cao and Woodward, 1998; Foley et al., 2007; Nepstad et al., 2008). Approximately 47% of the existing native vegetation in this region is protected within conservation units and indigenous territories. The remainder of the Amazon forest (with the exception of a few contested public land areas) is privately owned and falls under the protection of the Brazilian Forest Code (BFC), the central piece of legislation designed to protect the public good aspects of forests through the legislation of private property land use (Sparovek et al., 2010). The law requires that landowners in forest ecosystems the Legal Amazon set aside 50% to 80% of the property as Legal Reserve (LR), and that environmentally sensitive areas (such as riverside forest buffers and hilltops) be protected as "Areas of Permanent Protection" (APPs). Although ambitious in scope, to date the law has made little impact on land use due to limited adherence and enforcement.

Recent 2012 revisions to the BFC included the addition of "carrots" by reducing the restoration requirements for APP and LR, the introduction of "sticks," a rural environmental registry (a compulsory, geo-referenced, and self-declaratory database which integrates environmental information with maps of native vegetation), and the establishment of new tools to facilitate compliance, encourage environmental conservation, and strengthen the monitoring of protected areas. The most impressive of these additions is the development of the rural environmental registry (Portuguese: Cadastro Ambiental Rural; CAR), the most comprehensive such registry in the world, which when completed will include over 5 million properties.

This paper investigates the expected impact of the 2012 BFC on the rural landowners in Ouro Preto do Oeste (OPO), Rondonia, a region notorious for noncompliance with this law. We analyze the probability that a household will set aside land for APP and, if

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this decision is made, the extent of preservation. Data used in this analysis include observations from a 2009 household survey that are supplemented with sketch maps of the property (similar to the maps households create digitally for the CAR), GIS data (including biophysical conditions of the property) and remote sensing data (on nine different land cover classifications). These estimates of the potential impact of the 2012 BFC are corroborated with data from the 2012 Rondonian environmental land registry.

The Brazilian forest code

The BFC was established in 1934 when for the first time it was declared that private (and not just public) land was to be formally conserved under the law. This code required the preservation of "protective forests" that, as defined by their location, play an important role in the conservation of hydrological services and the geological stability of the property and a legal reserve (i.e. contiguous forest) of at least 25% of the property set aside to preserve biodiversity. In 1965 the BFC was expanded to include (1) a declarative understanding of the ecosystem services provided by forests (2) the introduction of Areas of Permanent Preservation (APP), and (3) an increase in the areas of Legal Reserve (LR) required within the Amazon biome. The 1989 amendments increased the riparian APP buffer widths for all the Brazilian properties. In 2001 revisions established more concrete terms for forest conservation and the redefinition of the private LR.

Despite the long time period the BFC has been law, the protection of areas preserved as APP and LR has been limited (Bacha, 2005; Gibbs et al., 2015; Soares-Filho et al., 2014; Sparovek et al., 2010; Stickler et al., 2013), especially in the Amazon region containing the greatest amount of forest cover and largest LR deficit (IPEA, 2011). Requirements and deadlines for the settlement of environmental deficit became habitually and institutionally ignored due to a lack of supervision, ever-changing legal requirements, the lack of options for properties that do not comply, the absence of positive incentives for compliance and, in the case of Amazon, the argument was made that conservation requirements ignored the impact of these policies on development (Siqueira and Nogueira, 2004). Historical increases in deforestation rates in the early 2000 s (INPE, 2011) triggered efforts to improve the enforcement of the BFC. These measures included the establishment of APP and LR fines (Federal Decree. 6514/2008) and protection regulations (under Resolution 3545/2008) stipulating compliance with environmental regulations for the granting of rural credit in the Amazon. These changes in turn provoked reaction from the rural sector that combined with a growing agribusiness and future reductions in deforestation rates, contributed to the further revised BFC, eventually approved in 2012.

The 2012 BFC

The 2012 BFC includes three important modifications: (1) the introduction of new mechanisms to advance forest monitoring and fire management including a rural environmental registry (CAR), (2) the establishment of a system to enable payments for ecosystem services, and (3) the reduction of APP and LR requirements (divided between changes in conservation and restoration requirements). First, forest management has been improved with the establishment of the compulsory CAR registry. Registration enables property owners to (1) have their fines applied to land clearing before 2008 suspended.[1]; (2) obtain environmental license for land use; (3) trade forest quotas; and (4) gain access to rural credit (beginning in 2018). This registry is an institutional innovation from the point of view of environmental and agricultural planners because it provides a digital framework for supporting biodiversity conservation, addressing climate change commitments and advising agriculture development policies.

The second noteworthy modification introduced in the 2012 BFC is the establishment of tradable legal titles of forest (also termed environmental reserve quotas). This system was introduced to allow landowners with intact or regenerating forest in excess of the BFC requirement to trade these rights with property owners that do not meet the BFC standard. Thus, the addition provides cost effective methods for promoting compliance while providing positive incentives to exceed minimum standards. The CRA market has the potential to offset 56% of LR debt within the nation (Soares-Filho et al., 2014) and to become the largest market for forest certificates in the world, enabling the trade of 4.2 million hectares of forest (a potential market value of US$ 9.2 ± 2.4 billion). The Amazon biome has potential to be the largest biome market for CRA in Brazil with 45% of the national trades. Approximately 22,000 ha are expected to be traded within Rondonia, at equilibrium prices corresponding to US$ 1084 ± 279/ha (Soares-Filho et al., 2016).

The last modification addressed here is the reduction of APP and LR requirements. Restoration requirements for land in APP require larger forest buffers for wider rivers (in all iterations of the BFC), but these buffers were reduced in size with the 2012 BFC while land use allowances were expanded. For example, according to the old forest code, rivers of 10 or less meters were required to have a buffer of 30 m from the river edge while rivers of between 50 and 200 m were required to have a buffer of 100 m (Table 1). The required river buffers were not changed, but the new forest code allows for "low impact[2]" use within these buffers. The APP restoration requirements were reduced more substantially; between 50 and 85% lower for properties up to 4 fiscal modules with river under 10m of width and between 0 and 99% lower for properties of different sizes (Table 1). The amount of APP land that needs to be restored is now set according to the property size rather than the river width (Table 2). This means that rivers that once has an APP requirement of between 30 and 50 m, now have a restoration requirement of between 5 and 20 m. The amount of land preserved in legal reserve decreased from 80% of the property in the Amazon to a minimum of 50% and is lower with the inclusion of the APP in this definition (Table 2)[3] Furthermore, the LR restoration requirements declined substantially with the deforestation amnesty clause: all properties that register with the CAR and are four fiscal modules in size[4] (the equivalent of 240 ha in Rondonia) do not need to restore their forests. These changes have resulted in a reduction of the Amazonian environmental debt by approximately 59%, reducing the 1.4 million hectares that would have been restored as APP around rivers under the previous BFC to and the 11.4 million hectares that would have been restored in LR to 7.2 million hectares (Soares-Filho et al., 2014).

[1] The fines are cancelled after the APP and LR are fully restored.

[2] Defined to include agroforestry, sustainable forest management and extraction of non-timber forest products by households.

[3] In this case the state governments within the Legal Amazon define the respective state reduction level. The lowest reduction level of 50% can only be approved if the state has an Ecological-Economic Zoning Plan with evidence that 65% of its public area is protected. However, a current senate bill (PL 390/2013) has been drafted to reduce the reduction of LR in Rondônia to 50%. This bill is backed by the argument that more than 56.5% of the state (24.5% in conservation and 32% allocated to indigenous territory) cannot be used for future development or agricultural activities.

[4] The Fiscal Module (FM) is an agrarian measurement expressed in hectares that varies by municipality. The FM defines the minimum area required for economic viability and is used to define differences between small (area <4 FM), medium (area >4 and ≤15 FM) and large farms (are >15 FM). The FM = 60 ha for all municipalities in Rondônia. For more see Landau et al. (2012).

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