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Land rights protection in the pulp and paper production system

Carolina Torres Graça and Décio Zylbersztajn

Economics, Business and Accounting Faculty; Business Administration Department; University of São Paulo, Brazil

ctgraca11@gmail.com, dezylber@usp.br

Abstract

This article explores how the quality of institutions influences the strategic choice of agents in the pulp and paper production system based on the forest plantation sector. In order to proceed with the study, we employ the Economic Analysis of Property Rights (Barzel, 1982, 1989, 2002) as foundation, and test the proposition: **in federative states where the institutional environment is fragile and therefore the State has a high cost to enforce property rights, private mechanisms stand out in the protection of property rights**. According to Dixit (2009, p. 8), “if the government does not protect property rights, at least not as well as owners require, many private arrangements arise to satisfy the owners’ needs”. The analysis of three business cases of companies with plantations in more than one federative unit revealed the broad range of **private mechanisms in place to cope with insecure land rights**. In addition to countrywide strategies, in the federative units where government fails to be a good property rights steward, we found geographically specific initiatives being used. Another finding was the identification of **variables that are able to evaluate the quality of institutions and employed in the companies’ decision-making process for the selection of land rights protection strategies**. Findings altogether are empirical evidence of how the quality of institutions influences the strategic choice of land rights protection in the forest plantation sector in Brazil.

Keywords: property rights; business strategy; land rights; forest sector; institutional environment.

Introduction

The beginning of the years 2000 in the Extreme South of Bahia was marked by a peak of agrarian conflicts, permeated by dispute and violence. On the one hand, social movements occupying farms of forest enterprises; and on the other hand, private organizations seeking protection under the justice system. Adjudication was followed by enforcement of repossession mandates by the public security forces, which often turned into violent episodes (Araújo, 2010). The forest companies Fibria and Veracel reported in their 2011 sustainability reports the escalation of farm invasions in the State of Bahia and the beginning of a journey to settle land disputes other than through litigation (Fibria, 2012, 2013, 2014, Veracel, 2012, 2013, 2014). Such positioning on the part of companies raised a question: what are the strategies deployed by forest plantation companies to protect land rights?

To the Economic Analysis of Property Rights Theory, the enforcement of agreements is a basic feature of the state (Barzel, 2002). In order to create enabling conditions for transactions, it first defines the scope of rights to be protected through legislation. Secondly, it employs specialized structure such as justice courts and security forces to enforce regulations. However, there are circumstances where the state fails to be a good property right steward or refrains from its role. The same theory predicts the consequences of such fact.

In Brazil, the historical colonization process plus the formation of a legal framework have put in place a fragile land governance system (Reydon, 2007, 2011a, 2014; Silva, 1997; The World Bank LAC, 2014), which attenuates the state's capacity to protect land rights. The vulnerabilities create a favorable condition to numerous land conflicts (Comissão Pastoral da Terra, 2018) with social implications (Alston, Harris, & Mueller, 2009; Alston, Libecap, & Mueller, 2000), environmental implications, such as deforestation (Alston et al., 2000; Araujo, Bonjean, Combes, Combes Motel, & Reis, 2009; Reydon, 2011b; Robinson, Holland, & Naughton-Treves, 2014; Zylbersztajn, 2010) and economic implications (Nascimento, Saes, & Zylbersztajn, 2010).

This paper explores the implications within firms. It responds the question: **how does the quality of institutions influence the strategic choice for the protection of land rights by the forest plantation sector in Brazil?**

The focus on the planted forest sector is justified by its economic importance, since it represented 6.2% of Brazil's Gross Revenue in 2016 (Indústria Brasileira de Árvores, 2017). In addition, its geographic distribution makes possible a comparison across the federative units. Finally, the numerous papers about land acquisition by companies and land disputes with local communities are extra motivation to study the case under a theoretical lens.

Theoretical background and proposition

Why does the state fail to be a good property rights steward? To Barzel (2002), the state has comparative advantage in protecting rights over standardized goods, whose contracts can be used repeatedly within a territory. However, as size increases, at some point the magnitude of the effect of the diseconomies become the same as that of the effect of the economies. As a consequence, it becomes expensive to enforce contracts by making use of legal mechanisms. The more expensive it is to make and enforce contracts via formal institutions, the more will people use dispute-resolving mechanisms that are substitutes for the state, who can itself create such substitute operation (Barzel, 2002).

Dixit (2004) also argues that the high cost of legal mechanisms prevents their use and explores other sources of costs. The time to obtain a judicial decision, the undervaluation of losses by employing underestimated interest rates, the difficulty in taking into account all factors, the difficult-to-predict court decisions, the disclosure of confidential information and the courts difficulty in verifying contractual conditions are all reasons for the high cost of legal protection.

The same two authors discuss the consequences of the state's limited capacity to be a good property rights steward. According to them, alternative dispute resolution mechanisms or alternative economic governance mechanisms fill the gap (Barzel, 2002; Dixit, 2004). One sort of alternative mechanism is the close-knit groups, such as religious groups, who enforce their rules by threatening expulsion. Another sort is vertically integrated organizations who are able to avoid disputes by transforming transactors in not fully residual claimants to their own organizations, therefore less likely to dispute not-well-defined attributes. A third sort is the trade organizations who promote enforcement by publicizing non-compliance and by expelling. Criminal organizations can enforce agreements that the state prohibits by making use of arms.

Some examples of alternative economic governance mechanisms explored by Dixit (2004) are: economic governance based on relationship, economic governance based on the provision of service by a third party specialized in contract enforcement and private property rights protection. The gain from repetitive transactions and the reputational capital allow contracts to be self-enforced in an economic governance based on the relationship. In parallel, an organization may become specialized in collecting and disseminating information about transactors' behavior, such as credit cooperatives. By frequently being an intermediary organization, it establishes a long-term relationship with both parties involved in a transaction, irrespective of the frequency with which the transactors meet with each other, being therefore able to enforce contracts. Finally, a private owner can take actions to prevent, detect or punish individuals who break the rules, i.e. having security patrols who prevent thieves from violating private property.

Monteiro & Zylbersztajn (2012) developed a model to explain the adoption of three strategies for the protection of property rights based on the quality of the institutional environment: strategy focused on the legal system (L), on the establishment of private mechanisms (P), and on the abandonment of valuable

attributes on public domain (figure 1). L and P cost curves are functions of capture efficacy vis-à-vis protection effort (σ) and a group of shifter parameters (w). In a sound institutional environment (I_1), the protection of rights via legal mechanisms is provided by the State at a low cost, therefore it is the preferred protection mechanism. In a poor institutional environment (I_2), the effectiveness of protection by the State is low; for example, it is marked by dubious or slow court judgments, and consequently the cost of the legal mechanism increases more rapidly than the private mechanism, which then becomes the preferred mechanism for rights protection (the most efficient mechanism at the lowest cost). However, there is a maximum protection cost that firms can bear (\bar{c}). Beyond the tipping point, the right owner opts to leave the right unprotected.

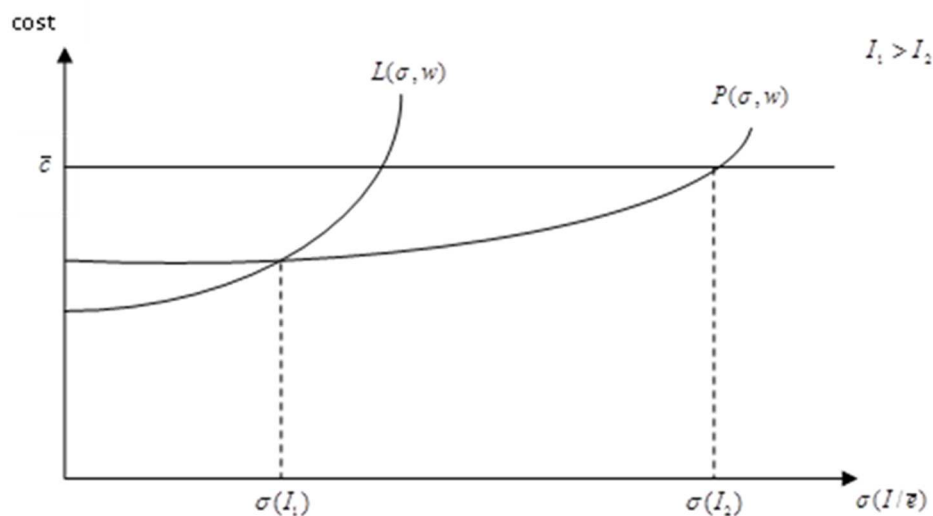


Figure 1 : Efficacy of capture effort vis-à-vis protection effort. Source: Monteiro e Zylbersztajn (2012)

Based on the rational proposed by Monteiro & Zylbersztajn (2012), the following proposition was outlined: **in federative states where the institutional environment is fragile and therefore the state has a high cost to enforce property rights, private mechanisms stand out in the protection of property rights.** The proposition was then confronted with empirical evidence from three study cases in order to comprehend the connection between the quality of institutions and the use of private mechanisms to protect land rights.

Methodology

The quality of institutions was built on the analysis of publicly available indicators and information. The identification of strategies to protect land property rights and of variables able to evaluate the quality of institutions employed by companies, were built on the content analysis of the interviews with executives from three forest plantation companies and on the analysis of internal documents. Conclusions were

drawn on the confrontation between federative units with greatest evidence of vulnerable institutional environment and geographically specific initiatives.

3.1 Analysis of quality of institutions

Eleven indicators¹ were used to analyze the quality of institutions at a federative unit level: Number of properties registered with the land governance system called *Sistema de Gestão Fundiária* (SIGEF) in July 2018; Territorial extension in hectares of the area registered with SIGEF in July 2018; Percentage of state surface registered with SIGEF in July 2018; Number of Indigenous communities with land traditionally occupied in stages prior to the regularized condition in June 2018; Number of indigenous communities with land traditionally occupied in stages prior to the regularized condition in June 2018 per 10,000 hectares; Number of filled cases for demarcation of quilombola² land by June 2018; Number of filled cases for demarcation of quilombola land by June 2018 per 10,000 hectares; Number of land conflicts in 2017; Number of land conflicts in 2017 per 10,000 hectares; Percentage of rural population in 2010; and Human Development Index (HDI) in 2010.

Federative units' performance was compared based on indicators. The three most critical ones were highlighted. A score representing the number of times each federative unit has been highlighted was created. The higher the score, the greater the evidence of fragility of the institutional environment in the given federative unit.

3.2 Selection of three business cases

The criteria for selecting business cases were: (i) size of owned commercial plantations and natural vegetation conservation areas; and (ii) frequency with which the company is associated with land conflicts in the literature review.

According to information compiled by the consulting company Consulfor in March 2018, Fibria and Suzano were the largest planted forest companies in Brazil, holding more than 500 thousand hectares each. Jari occupied the twelfth position.

Papers for literature review were retrieved from the Web of Knowledge database in January 2018, related to publications from 2001 to 2017, using the key words: land conflict, land tenure, land rights, forest companies, forest sector, paper industry and Brazil. Nine publications were reviewed. The criteria for classification by citation frequency were: high when the company's name was mentioned in six or more

¹ Sources of information are available in appendix A

² Afro descendent community

papers; average, when mentioned in three to five papers; and low when mentioned in one or two papers; and absent from the literature review when the company's name was not cited in any paper.

The top two forest plantation companies were the ones with high citation frequency. Despite the fact that Jari had a low citation rate and was the twelfth largest forest cultivator in Brazil, it has been selected for the study case because of the length of time that its land regularization process has been taking.

3.3 Identification of strategies to protect land rights and variables for decision making

Ten key-informants from the three forest companies were interviewed using semi-structured questionnaires, between January and June 2018. A content analysis has followed. Nine categories³ were used to identify and classify strategies for land rights protection. The initial category list was based on alternative conflict resolution mechanisms studied by Barzel (2002) and alternative economic governance mechanisms listed by Dixit (2004). It was then complemented with categories that emerged from the interviews. Eleven categories⁴ were proposed for the classification of variables employed in the strategic decision-making process. They were based on the review of transcribed interviews. According to the content analysis technique, the most significant themes are the ones more frequently included in the discourse (Bardin, 2016).

Initiatives not employed in all federative units where the company has operations were classified as geographically specific. The states in which such initiatives have been implemented were compared against the ones with higher institutional environment score.

Empirical findings

4.1 The quality of the institutions at federative unit level

The quality of institutions in twelve federative units with forest plantations revealed that Maranhão is the one with greatest evidence of institutional fragility regarding land rights protection, since it scores 6 points. The second position is occupied by Pará with a score of 5 points. Espírito Santo, Piauí and Rio de Janeiro share the third position with 4 points each. In the fourth position are Bahia and Rio Grande do Sul with 3 points each. In the fifth place come Amapá and Mato Grosso do Sul with 2 points each.

Minas Gerais and São Paulo come in the sixth position with 1 point each. They are the top two states with the largest forest plantation area in Brazil (Serviço Florestal Brasileiro, 2017).

³ Categories for classification of strategies for the protection of land rights are available in appendix B

⁴ Categories for classification of variables employed in the strategic decision-making process are available in appendix C

Tocantins is the state with the best institutional quality performance, since it scored zero within the group of indicators.

Table 1

Analysis of the quality of institutions in twelve federative units

Federative unit/Indicator	AP	BA	ES	MA	MG	MS	PA	PI	RJ	RS	SP	TO
Number of properties registered with SIGEF in July 2018 (in thousands plots)	0.558	16.34	2.67	13.5	55.388	24.419	9.27	4.79	2.005	22.841	53.664	17.67
Territorial extension in hectares of the area registered with SIGEF in July 2018	4.7	8.706	0.352	7.82	11.079	11.391	16.07	3.21	0.337	3.752	4.56	10.45
Percentage of state surface registered with SIGEF in July 2018	33%	15%	8%	24%	19%	32%	13%	13%	8%	13%	18%	38%
Number of Indigenous communities with land traditionally occupied in stages prior to the regularized condition in June 2018	1	13	0	7	6	34	26	0	3	28	20	3
Number of indigenous communities with land traditionally occupied in stages prior to the regularized condition in June 2018 per 10,000 hectares	0.07	0.23	0	0.21	0.1	0.95	0.21	0	0.69	0.99	0.81	0.11
Number of filled cases for demarcation of quilombola land by June 2018	33	292	19	339	232	18	48	65	25	96	51	33
Number of filled cases for demarcation of quilombola land by June 2018 per 10,000 hectares	2.31	5.17	4.12	10.21	3.96	0.5	0.38	2.58	5.71	3.41	2.05	1.19
Number of land conflicts in 2017	45	97	9	180	38	32	67	14	7	7	34	28
Number of land conflicts in 2017 per 10,000 hectares	3.15	1.72	1.95	5.42	0.65	0.9	0.54	0.56	1.6	0.25	1.37	1.01
Percentage of rural population in 2010	10.22	27.9	16.6	36.9	14.7	14.36	31.5	34.2	3.28	14.9	4	21.2
HDI in 2010	0.708	0.66	0.74	0.639	0.731	0.729	0.646	0.646	0.761	0.746	0.783	0.699
Score	2	3	4	6	1	2	5	4	4	3	1	0

4.2 Strategies for protecting land rights

Nine strategies are used by the three companies to protect land rights (Table 2).

Table 2

Strategies for protecting property rights over land

Fibria		Jari		Suzano	
Strategy	Citation	Strategy	Citation	Strategy	Citation
Stakeholders relationship	22	Use of legal mechanisms for dispute resolution	21	Stakeholders relationship	22
Land title regularity	15	Stakeholders relationship	19	Use of legal mechanisms for dispute resolution	11
Support to agricultural production and income generation alternatives in rural areas	10	Land title regularity	15	Assessment of the socio-environmental, land and legal compliance risks associated with the asset	10
Multi stakeholders agreement	9	Support to agricultural production and income generation alternatives in rural areas	13	Negotiation of property rights	7
Negotiation of property rights	8	Multi stakeholders agreement	12	Multi stakeholders agreement	7
Use of legal mechanisms for dispute resolution	7	Negotiation of property rights	10	Land title regularity	6
Assessment of the socio-environmental, land and legal compliance risks associated with the asset	6	Asset protection and patrolling	7	Support to agricultural production and income generation alternatives in rural areas	5
Territorial planning and improvement in asset management	5			Asset protection and patrolling	3

Stakeholder relationship is the most relevant strategy for protecting land rights, since it was top ranked for two companies and ranked second for another one. The continuous interaction between the company and the local community allow the identification of disputes in their roots and before the conflict escalates. Most cases are solved through direct interaction between the parties for clarification or definition of land rights.

The **Use of legal mechanisms** and **Land title regularity** were among the three main strategies for two companies. Despite the effort to align land property rights by using stakeholder relationship, this is not always achieved, and therefore, property invasion or claiming of land rights by third parties are quite frequent in the country. Hence, disputes are brought to justice courts for ownership clarification and enforcement. Besides that, in Brazil, there are many land registers and cadasters in place that are managed by various institutions: notary, land institute, environmental agency, and treasure department, among others. The more the legal documentation converges, the more effective is the enforcement of rights by the State. However, not unfrequently, records are inconsistent or incomplete, which reduces the leverage of legal protection. Therefore, companies aim to obtain Land title regularity. In case of litigation, land titles and registers can be used as evidence of tenure and ownership.

Support to agricultural production and income generation alternatives in rural areas comes in the third place, since it appears in the third, fourth and seventh positions in the ranks according to the organizations. Forest plantations are located near rural communities who have limited access to agriculture technology. In those groups, rural development is an opportunity and some companies support agriculture production by providing technical assistance and/or access to credit.

Both **Negotiation about property rights** and **Multi-stakeholders agreement** are at an intermediary level of importance. One possible explanation for their restricted use is the implication (deduction) over the company's assets. One asset may have various attributes, and consequently, various rights associated to it (Barzel, 1997). This fact is particularly true for land assets. Beyond the right to cultivate the land, there are also the rights to use forest resources and water resources, to access places of special interest, such as religious places and cemeteries, among others. Also, land records and measurement were not as precise in the past as they are today. Imprecision is the root cause of conflicts between owners about boundaries location, size, overlap, title duplication, etc. Therefore, direct negotiation about use, tenure and ownership rights is quite common between the parties, including forest companies. However, the participation of third parties is sometimes a requirement to ensure formality, to ensure that minority rights be uphold, to provide credible information, and to serve as a moderator, among other reasons. The agreements with the participation of three or more organizations, with rights and obligations of signatories about land use, tenure and ownership, are called multi-stakeholders agreements.

The **Assessment of the socio-environmental, land and legal compliance risks associated with the asset** also appears at an intermediary level of importance for two companies. It consists of gathering information by various company departments before the acquisition of the land to prevent the purchase or rental of properties whose characteristics are not suitable for the cultivation of forests or whose rights are not clearly defined.

Asset protection and patrolling mentioned by two companies and with a small number of citations, and **Territorial planning and improvement in asset management**, employed by only one organization, are at the bottom of strategy rankings. Asset owners are legally allowed to take action to protect their property. In the case of forest companies, they undertake efforts to protect the private farms from invasion or unauthorized use by third parties, including security patrolling (**Asset protection and patrolling**). In addition, geospatial technology is a good ally to support the management of huge extensions of forest plantation. The geo information is used to plan and manage land use. Along with other information, it is possible to have a clear view of the landscape, which is useful for understanding conflicts over the use of resources (**Territorial planning and improvement in asset management**)

The number of strategy citations by companies was converted into percentage by using the total number of citations per organization. The objective was to compare the relative importance of strategy across companies. Percentages obtained were then included in pie charts (Figure 2).

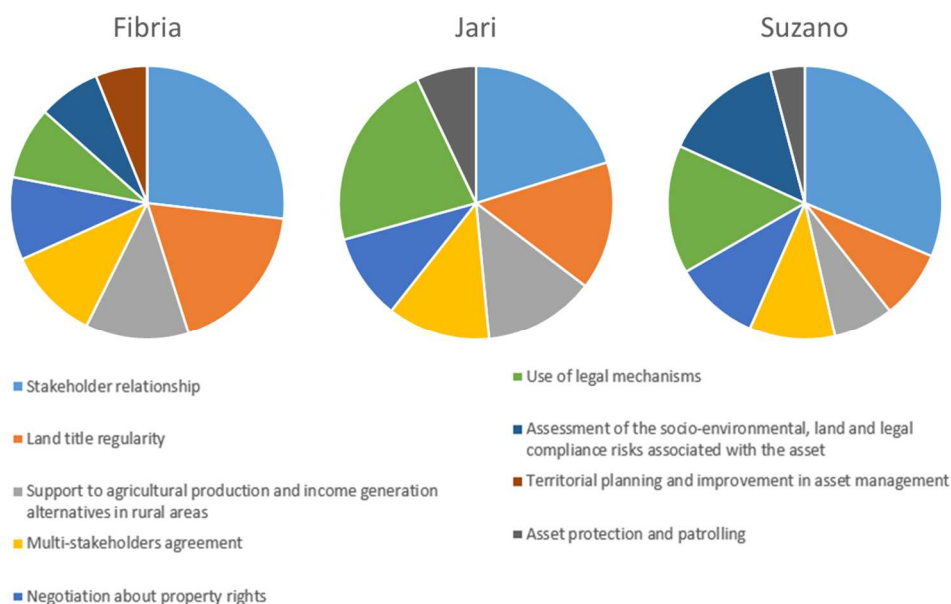


Figure 2: Comparative importance of land rights protection mechanisms by company

Three facts call attention in Figure 2. First and as already discussed, the relevance of Stakeholders relationship. Second, the relevance of Use of legal mechanisms and land title regularity for Jari and Suzano. Third, the similarity in the relative importance of strategies between Fibria and Jari, particularly among the top five positions.

4.3 The quality of institutions at a federative unit level versus the strategies for land rights protection

According to the proposition raised in this paper, in federative units where the institutional environment is fragile and the state faces high cost to provide enforcement, private mechanisms stand out in the protection of property rights. In order to confront the theoretical proposition with empirical data, Table 3 presents the federative units with forest plantations with greatest evidence of institutional environment fragility by business case⁵, number of geographically specific or intensified initiatives in those federative units, and total number of strategies for land rights protection mentioned by company.

Table 3

Federative units with greatest evidence of institutional environment fragility in the protection of land rights and strategies for land rights protection

⁵ In the individual business case, only the federative units with forest plantations of the given organization were compared across each other. This is the reason why most vulnerable units in Table 3 do not necessarily follow the same order as Table 1.

	Fibria		Jari	Suzano			
	BA	ES	PA	MA	BA	ES	PI
Federative units with greatest evidence of vulnerable institutional environment							
Number of geographically specific or intensified initiatives	2	3	4	6	5	2	0
Number of strategies for land rights protection identified in the business case	8		7	8			

The federative units with Fibria's forest plantations with greatest evidence of vulnerable institutional environment are Bahia and Espírito Santo. In three out of eight strategies for land rights protection there were geographically specific or intensified initiatives in Espírito Santo and two in Bahia. Within the Stakeholder relationship strategy, the cooperation agreement with indigenous communities signed in 2017 and the discussion forum about land rights of Afro descendent communities (*quilombola*) have been implemented only in the State of Espírito Santo. Within the strategy Support to agricultural production and income generation alternatives in the rural environment, the family farming program called Rural Territorial Development Program was first launched in Bahia in 2010, followed by subsequent expansion to other units. In December 2018, it assisted 3,685 families in Bahia, 2,302 families in Mato Grosso do Sul, 1,600 in São Paulo and 1,088 in Espírito Santo. However, the company points out that such initiative is part of its engagement strategy, regardless of the presence of land conflicts. Within the Multi-stakeholder agreement strategy, it was in Bahia where the first and largest agreement was made between social movements and the state government for the creation of rural settlements, followed by a massive social investment on the part of the company. A similar agreement was under discussion between Fibria, the state government and landless movements in Espírito Santo in 2018. Finally, within the strategy of Negotiation about property rights in the northern Espírito Santo, land was leased to *quilombola* communities while waiting for the definition of territory boundaries.

In addition to Bahia and Espírito Santo, the company has made a commitment with the Minas Gerais state government and social movements to give preference to the agrarian reform program when offering land for sale.

Pará is the federative unit having Jari's forest plantations that has greatest evidence of institutional fragility. In four out of seven strategies for land rights protection there were geographically specific or intensified initiatives in that state. Within the strategy of Use of legal mechanisms to resolve disputes, the use of legal adjunction between 2009 and 2011 was reported to solve frequent land invasions within that period. Land regularization is under way both in the States of Para and Amapá, but efforts are greater in Pará. In this location, there is an agreement in place with various state government bodies to promote land regularization in the Jari Valley region (Multi-stakeholder agreement strategy), followed by Land rights negotiation.

Federative units having Suzano's forest plantations with greatest evidence of institutional environment vulnerability are Maranhão, Bahia, Espírito Santo and Piauí. In six out of eight strategies for land rights protection there were geographically specific or intensified initiatives in Maranhão, five in Bahia and two in Espírito Santo. However, there was no initiative in Piauí. Within the stakeholder relationship strategy, in Maranhão and Bahia the company has been engaging with rural settlement groups, with the assistance of a group of outsourced experts. In Maranhão, the company has been contributing to the improvement of the land governance system promoted by local authorities, since a good land rights definition is a requirement for Using legal mechanisms to resolve land disputes. In Maranhão and Bahia there are two internal Land Working Groups under operation. Their role is to deliberate about socio-environmental and non-compliance risks associated to properties under consideration for purchase and rental (under the strategy of Assessment of socio-environmental, land and non-compliance risk associated to the property). Nevertheless, it's important to note two caveats. First, the Working Groups are not restricted to land acquisition in these two states. Pulp mills in Bahia and Maranhão procure wood from neighboring states. The second caveat is that the company's growth strategy, which can also condition the existence of such Groups, was not in the scope of this study.

One type of multi-stakeholder agreement is found only in Maranhão and Bahia, compared to other federative units with Suzano's forest plantation. Suzano has been signatory of the Agreement for Mitigation of Land Conflicts in the Extreme South of Bahia since 2015. According to the agreement, some private farms were to be expropriated and transformed into rural settlements by the government in 2018. The forest company was committed to provide support to settlers. A similar commitment is in place in Maranhão. Former company's farms were turned into rural settlements and technical assistance was being provided to farmers.

The number of Local Development Councils is higher in Bahia and Maranhão. Nine of them are located in Bahia and another nine in Maranhão, against three in Pará, three in Espírito Santo, two in Tocantins and one in Minas Gerais. The Council's objective is to assign to a multi-stakeholder group the responsibilities to foster local development. Among various topics, opportunities for land leasing in favor of communities are discussed within the group.

Under the strategy Support to agricultural production and income generation in rural areas, in Maranhão, the company has a cooperation agreement with Babassu Coconut Cracker Association for fruit collection within the company's farms. Besides that, in Espírito Santo, the company has implemented employment and income initiatives dedicated to the *quilombola* community.

In northern Espírito Santo, Suzano has employed an unusual procedure to ensure Land titles regularity. It contacted the local Land Institute and the Public Archive to trace back the origin of its land titles and assess their quality, given the absence of a centralized credible database.

Finally, the Asset Intelligence Department was first created in Bahia and the Procedure with Criteria and Guidelines for Land Conflicts Resolution was firstly implemented in Maranhão, and both were later extended to other states. Both initiatives belong to the Asset protection and patrolling strategy.

The absence of initiatives in Piauí calls attention to a situation where the adoption of private protection mechanisms was, apparently, different from the proposition outlined in this paper. This fact suggests that (i) other variables should be added to the model that explains the adoption of private mechanisms for the protection of property rights, besides the quality of institutions, such as asset value; (ii) the company's strategic interest in the location should be also taken into consideration. The last point (ii) reflects what Monteiro and Zylbersztajn (2012) called the maximum cost threshold for property rights protection (\bar{c}) that economic agents are able to bear. Once this tipping point is reached, attributes are abandoned in the public domain due to the extremely adverse environmental conditions.

It is interesting to note that, in the three business cases, multi-stakeholder platforms to cope with land rights were found in the federative units with greatest evidence of fragility in the institutional environment, except for Piauí.

4.4 Variables included in the decision-making process

The multitude of mechanisms for land rights protection raises the interest in the criteria for selecting when to use each option. The empirical study revealed six variables that are used by companies to decide on land rights protection strategy (Table 4).

Table 4

Variables for selecting a strategy for protecting land rights

Fibria		Jari		Suzano	
Variável	Citações	Variável	Citações	Variável	Citações
Claim legitimacy	10	Claim legitimacy	10	Claim legitimacy	15
Case complexity	7	Case complexity	10	Openness to dialogue	13
Openness to dialogue	6	Size of the area under dispute	4	Case complexity	9
Leverage of legal property right	6			Leverage of legal property right	7
Number of people involved in the dispute	6			Number of people involved in the dispute	3
Size of the area under dispute	3			Size of the area under dispute	3

The most relevant variable for a strategic decision is Claim legitimacy, since it was top ranked by the three companies. Case complexity comes in second place and Openness to dialogue in third place, as both are among the top three variables for all companies. The fourth variable is Leverage of legal property rights. At the bottom of the ranking are Number of people involved in the dispute and Size of the area under dispute.

Claim legitimacy, Case complexity and Level of legal property rights security are variables connected to the institutional environment. Land possession and claiming used to be a common practice in all regions

in Brazil since the colonial time. Often, the factual land occupation was not formalized in the land titles. Due to this fact, inconsistencies among land tenure, use and ownership are common in Brazil (**Case complexity**), justifying the **legitimacy of the claims**. If there were a sound institutional environment, such situations would not be allowed (Monteiro & Zylbersztajn, 2012) and **legal property rights** would be in accordance with the field situation, and consequently, no questioning would be made on the Leverage of legal property rights. Therefore, the three variables capture the quality of institutions and, consequently, the transaction cost to protect land rights through formal mechanisms.

Conclusion

This paper revealed the wide range of mechanisms for land rights protection employed by three planted forest companies in Brazil and their order of importance according to executives' perception. The nine strategies are in line with Barzel (2002) and Dixit's (2004) predictions about the use of alternative dispute resolution mechanisms and the economic governance system to overcome the high cost associated to legal protection mechanisms.

At the top of nationwide mechanisms in the federative states where the institutional environment has greatest evidence of fragility, geographically specific or intensified initiatives are in place; among them and in all cases, multi-stakeholder platforms were being used. This finding is in accordance with the framework developed by Monteiro & Zylbersztajn (2012) and with the proposition raised in this paper. However, it is important to notice that in one federative unit, result was different from what was expected, which raises the need for additional studies.

An additional finding was the identification of three variables that allow companies to evaluate the quality of institutional at federative unit level and to estimate the cost for right protection through formal mechanisms.

In summary, the quality of the institutions: (i) is considered in the strategic decision-making process for the protection of property rights; (ii) determines the transaction cost for the protection of property rights through formal mechanisms; and (iii) determines the importance of private mechanisms for land rights protection.

Results are important to both private and public organizations. Companies may use the strategies and variables here outlined to improve investment and conflict resolution and decision-making processes. The findings are also valuable to evidence how land conflicts are dealt with above and beyond litigation. In addition, the paper highlights the importance of a sound institutional environment to reduce transaction cost for land rights protection. Government bodies willing to attract investment and at the same time protect minorities' land rights, should pursue improvement in the definition and enforcement of legal property rights.

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