The Political Economy of Land Conflict in the Eastern Brazilian Amazon

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An important goal of regional development in the Brazilian Amazon was to enhance social welfare and alleviate dire poverty in other parts of the country by providing land to the poor. Nevertheless, both poverty and landlessness have persisted despite development policies that distributed billions of dollars on highway construction, loans, and outright subsidies. Inequitable land distribution has been held as a prime factor in land conflict across the country. Although episodes of conflict over land are common in Brazilian history, this paper focuses on agrarian issues that arose with the opening of the Amazon frontier in the 1970s. The paper presents a political economy approach that considers the role of hierarchical forces interacting across spatial scales, in creating conditions ripe for land conflict at the local level. The premise is that the Brazilian government, intending to bring about economic and social development, promoted contradictory strategies creating land scarcity. These strategies led to expansion of large ranching operations, creation of conservation units, and demarcation of indigenous reserves, which constrained the pool of land available for small farmer settlement. Empirical analysis employing regression and spatial statistics is used to test the proposed model, advancing previous efforts by applying spatial regression, incorporating improved indicators of conflict and explanatory variables generated by a Geographic Information System (GIS). The findings provide support for some elements of the argument, demonstrating statistically significant relationships between land conflict and land concentration, cattle ranching, and road construction. Finally, a case study analysis of a county in the heart of the land conflict zone is provided, illustrating the interaction of scalar forces, and the articulation of land conflict at the local level. Key Words: Amazonian development, agrarian reform, social and environmental justice, conservation policy.

Land conflict was a significant driver of social, political, and environmental change throughout the 20th century (Homer-Dixon 1999; Carius and Lietzmann 1999). Monumental political transformations during this period, including the Chinese and Russian revolutions, were sparked in part by inequitable distribution of land. The struggle for land has also been identified as a source of internal strife in countries such as Bangladesh, the Philippines, South Africa, and Israel and the precipitate factor of war between Senegal and Mauritania and El Salvador and Honduras. Even in the present era of globalization, world cities, and rapid urbanization, land struggle persists. The 1980s and 1990s witnessed revolutions springing from the rural hinterlands of numerous Latin American nations, where rapid population growth, economic decline, and failing industrial sectors left countless people disadvantaged (Brockett 1988, 1994; Booth 1991; LaFeber 1993). In this region of the world, pronounced land concentration and entrenched power of land-based elites have long been regarded as the cause of poverty, and desire for agrarian reform continues to be a powerful source of political and social confrontation (Paige 1975, 1996; Tutino 1986; Seligson 1995; Diskin 1996; Mason 1998; Kay 2002).

This paper addresses land conflict in the Brazilian Amazon, better known for problems associated with deforestation and environmental change. Land conflict is not new to Brazil, and has accompanied the process of frontier expansion that started more than 500 years ago with Portuguese settlement (Mueller, Alston, and Libecap 1994). Numerous accounts of early peasant resistance (e.g., the War of Cunudos in 1821, the Ronco de Abelha rebellion in 1851, the Quebra-Quilos rebellion in 1874, the Contestado rebellion in 1912, and others) have pointed to the maldistribution of land.1 Other land-related conflicts occurred during frontier expansion into São Paulo State beginning in the 19th century (Welch 1999; Brannstrom 2001), western Paraná in the 1940s, Matto Grosso in the 1950s (see Velho 1972; Katzman 1977; Foweraker 1981; Schmink and Wood 1992; Mueller, Alston, and Libecap 1994; Alston, Libecap, and Mueller 2000), and Southern Pará at the turn of the 20th century as entrepreneurs started claiming large tracks of Brazil nut forest. A very recent account of land conflict garnering much international attention was the clash between the military police and landless farmers in Eldorado do Carajás, Pará, which led to 19 fatalities (New York Times, April 21, 1996).

Although episodes of conflict over land are common in Brazilian history and widespread throughout many parts of
the country today, this paper focuses on agrarian issues that arose with the opening of the Amazon frontier in the 1970s. An important goal of regional development in Amazonia during this period was to enhance social welfare and alleviate dire poverty in other parts of the country by providing land to the poor (Simmons 2002). Nevertheless, both poverty and landlessness have persisted despite development policies that distributed billions of dollars on highway construction, loans, and outright subsidies (Ianni 1979; Mahar 1979; Moran 1983; Hecht 1985; Hecht, Norgaard, and Possio 1988; Hall 1987, 1989, 2000; Browder 1988; Browder and Godfrey 1997; Becker, Miranda, and Machado 1990; Foresta 1991; Schmink and Wood 1992). It is the apparent contradiction between these prodigious development efforts and the recalcitrant nature of the regional agrarian problem that motivates this work. While conflict in the Amazon is multifaceted and involves numerous actors (e.g., Amerindians, miners, loggers, ranchers, small farmers), this paper considers the plight of the rural landless and situates their current struggle within a political economy framework.

Many have addressed land conflict in Amazonia, attributing it to (1) the failure of land tenure institutions (Mueller et al. 1994; Alston, Libecap, and Schneider 1995; Alston, Libecap, and Mueller 1997, 2000); (2) the conflictive nature of production and exchange relations (Foweraker 1981; Wood 1983; Schmink and Wood 1992; Walker and Homma 1996; Walker 1999; Walker, Moran, and Anselin 2000); and (3) the contradictory nature of Amazonian development efforts (see for example Mahar 1979; Smith 1982; Hecht, Norgaard, and Possio 1988; Browder 1988; Hall 1989; Moran 1983; Becker, Miranda, and Machado 1990; Almeida 1992; Cleary 1993; Hecht and Cockburn 1989). The basic premise of this paper regarding Amazonian conflict follows from the notion of development contradictions but is broadened to include the literatures on spatial scales and environmental and resource scarcity. In essence, this paper attempts to integrate the work that has been done to date and to provide a comprehensive understanding of land struggle in light of a regional development process that was influenced by global, national, regional, and local circumstances.

This task is accomplished as follows. First, a theoretical discussion considers the environmental security and resource scarcity positions and examines the diverse work addressing Amazonian frontier development. An analytical framework incorporating this literature provides an overview of the political economy of land conflict, illustrating the scalar interaction of processes and forces that created intense land competition in the region. A detailed description of land conflict in the Brazilian Amazon is provided next, and the historical patterns of land distribution are assessed. Within this discussion, the social and spatial dimensions of the struggle are elaborated, which involves a description of historical trends, current actors, and areas of intense conflict.

This is followed by an empirical analysis using regression and spatial statistics to test the proposed analytical framework. The analysis advances previous efforts (see Alston, Libecap, and Mueller 1997) by applying spatial regression and by incorporating improved indicators of conflict and several explanatory variables generated by a Geographic Information System (GIS). Although the regression analysis provides insight into some important influential macroscale processes, it does not address the interaction of scalar forces, and the articulation of land conflict outcomes at the local level. To address this, a specific place in the heart of the present conflict zone is considered, the county of Eldorado do Carajás. This county, located in the so-called South of Pará, was the scene of the 1996 massacre. While the discussion in general treats the entire Brazilian Amazon region, the analyses focus on Pará State (see Figure 1), which was the site of much early development interest and ongoing advance of the agricultural frontier. The paper concludes with a discussion of research findings and policy implications.

Theoretical Constructs of Land Conflict

This paper argues that land conflict in the Eastern Brazilian Amazon results from power struggles over the region’s abundant resources, which have been structured and restructured within a multifaceted political economy. Central to this contention are two bodies of literature. One will be referred to as the resource access literature, which examines links between violent conflict and resource competition. The second is a literature addressing land conflict in Amazonia in terms of frontier development processes. The analytical framework deployed considers the dynamics of political relationships and interactions of agents along a spectrum of spatial scales from global to local.

Resource Access

The connection between land scarcity and conflict has long been the focus of studies examining rural unrest in the developing world (Moore 1969; Johnson 1968; Davies 1971; Gurr 1971; Huntington 1971; Paige 1975, 1996; Prosterman 1976; Midlarsky 1982; Tutino 1986; Brockett 1988, 1994; Homer-Dixon, Boutwell, and Rathjens 1993; Seligson 1995; Diskin 1996). A recent literature on so-called environmental security suggests that such scarcity
may directly generate internal as well as cross-border fights, as groups vie for access and control over limited resources (Ullmann 1983; Mathews 1989; Myers 1989; Brock 1991). Likewise, environmental degradation, created by overexploitation of resources, may lead to worsening socioeconomic conditions that precipitate conflict, and, as a result, represents an indirect cause of struggle.

Some contemporary examples of resource-scarcity wars include the fight for control over water between Egypt, Sudan, and Ethiopia, and cross-border disputes over oil between Iraq and Kuwait (Homer-Dixon and Blitt 1998; Serageldin 1995). The concern that there will be an outbreak of wars instigated by struggle for scarce resources has garnered much attention by the international

Figure 1. Study Region: Pará, State, Brazil.
community, and, consequently the environment became a primary topic for national security under the Clinton Administration (Westing 1989; Myers 1993; Levy 1995). Central to the environmental scarcity contention is the neo-Malthusian notion that population growth is the root cause of environmental problems, and therefore a primary “trigger” to violent reactions.

In contrast to the scarcity school of thought stands a critique based on empirical observations (Levy 1995; Le Billon 2001; Peluso and Watts 2001). Indeed, numerous cases provide compelling evidence that conflict often occurs under circumstances of resource abundance, such as the violent struggles that emerged as groups vied for control over oil in Ecuador and Nigeria (Watts 2001), gold in the Democratic Republic of Congo, and diamonds in Sierra Leone and Liberia (Fairhead 2001).

The resource abundance argument posits that resource-based wealth incites greed-driven conflict (Fairhead 2001). Primary commodities, especially high-value resources such as oil and diamonds, are attractive to ruling elites, and, consequently, their capture may spark struggles between and within states of resource abundance, such as the violent struggles that emerged as groups vied for control over oil in Ecuador and Nigeria (Watts 2001), gold in the Democratic Republic of Congo, and diamonds in Sierra Leone and Liberia (Fairhead 2001).

In this regard, a substantial literature has emerged addressing land conflict in the Brazilian Amazon. This literature, while not expressly influenced by resource access arguments, does consider competition for resources occurring within the frontier, a region defined by abundant resources and weak institutions. Although interest in the frontier as a sociological concept began with the work of Fredrick Jackson Turner at the turn of the 20th century, later work incorporated the frontier thesis into general theories of economic and political development (Taylor 1972; Turner 1920).

In the Brazilian Amazon, land conflict has been attributed to immature tenure institutions (Mueller, Alston, and Libecap 1994; Alston, Libecap, and Schneider 1995; Alston, Libecap, and Mueller 1997, 2000) and the conflictive nature of production and exchange relations found in places far from the long arm of the law (Foweraker 1981; Wood 1983; Schmink and Wood 1992; Walker and Homma 1996; Walker, Moran, and Anselin 2000). The institutional account focuses on the failure of land titling to keep pace with frontier expansion (Mueller, Alston, and Libecap 1994; Alston, Libecap, and Schneider 1995; Alston, Libecap, Mueller 1997), with conflict emerging as individuals compete for access to valuable land, albeit with dubious tenure arrangements. Other accounts of land conflict in Amazonia point to social structures and, in particular, antagonistic relations between large landowners and peasant farmers (Foweraker 1981; Wood 1983; Schmink and Wood 1992; Walker and Homma 1996). Land conflict emerges here as class struggle between individuals differentiated by material wealth and ability to mobilize political power (Schmink and Wood 1992).

Land conflict has also been described in terms of exploitative relations between capitalist and noncapitalist economies during the process of frontier expansion (Foweraker 1981; Wood 1983). In contrast to the traditional notion of dualism frequently used to describe the structural disconnect between these economies, in the Amazon region the two coexist as integral parts of the same regional production system (Wood 1983). Violent struggle has existed during every phase of frontier expansion in Amazonia (Foweraker 1981), both in the early stages when physical coercion was used to force nomadic nut gatherers to extract resources (Velho 1972) and later as large-holders expelled squatters in the process of land appropriation and consolidation.

Besides these institutional and structural accounts, it has also been argued that land accumulation is a behavioral response to market forces (Walker and Homma 1996; Walker, Moran, and Anselin 2000). In particular, cattle ranching benefits from scale economies and, as a result, small and large ranchers have incentives to increase herd size and expand pastures. In the Amazonian case, land concentration emerges on the basis of both the evolution of small ranching operations and the exercise of social power by privileged groups. At some point, however, land accumulation creates social discord that may result in land conflict (Johnson 1968; Huntington 1971; Gurr 1971; Homer-Dixon 1999), as Walker (1999) demonstrates in Viseu, one of the counties of greatest conflict in Pará.

**Analytical Framework**

The analytical framework in this paper incorporates the theoretical contributions of the resource access and the
frontier literature and situates Amazonian land conflict within a political economy perspective, demonstrating the link between an interaction of various interests across spatial scales and violent land conflict. This paper also contends that resource scarcity and abundance interacted in the Eastern Brazilian Amazon to create conditions conducive of conflict. Early settlement in the region was triggered by the discovery of abundant valuable resources, including rubber and brazil nuts. In addition, maldistribution of land in the northeast and southern parts of Brazil created resource scarcity, which served as a push factor and resulted in a large displaced population attracted to the Amazon because of seemingly abundant land. Building on the foundations of the current frontier literature, this paper also suggests that land conflict emerged as institutional failures interacted with social forces and conditions to create land tenure insecurity and resource deprivation, an artificial form of scarcity. Although land abundance characterizes the frontier, it is the land made accessible by government road building that is the target area under contestation. Thus, in the Amazon, scarcity is not due to an absolute lack of land per se, but to land ownership patterns reflecting the relative power of different groups.

To reach a comprehensive understanding of land conflict arising from resource competition, it must be recognized as a site-specific phenomena deeply rooted in local histories and social relations, yet connected to larger processes of material transformation, political power, and historical conjuncture (Peluso and Watts 2001, 5). To this end, the framework adopted uses a political economy approach to situate land conflict within the complex social, economic, and political circumstance of the Brazilian Amazon, an essential first step to understanding such struggle (Homer-Dixon 1999).

In an attempt to dissect the factors influencing relative land scarcity, the conceptual design examines the interaction of numerous forces at the global, national, regional, and local levels (Massey 1984, 1994; Massey and Allen 1984; Kodras 1997). At the local level, land scarcity is the precipitate factor to conflict. Nevertheless, this scarcity must be assessed from within the larger regional and national contexts of land reform and development policies that reenforce power differentials among social groups. Moreover, global forces have clearly affected the national agenda for land distribution, development, and the environment in Brazil. The local articulation of these forces, however, is more than a mere residue of exogenous factors and is conditioned by endogenous, local responses (Cooke 1989). In turn, these local responses feed back into the process by conditioning regional, national, and international actions and reactions.

This paper recognizes that the political and social relationships between scales are not fixed, but are constantly renegotiated (Cox 1997; Swyngedouw 1997). In fact, in recent years the apparently centralized and hierarchical structure of relationships in Brazil has given way to a new realm of power relations. Since democratization in 1985, a plethora of nongovernmental organizations have emerged on the political scene. And, slowly, state and local governments have been reasserting their political control. Perhaps the most important change has been the "glocalization" of the Amazon as grassroots social movements have joined forces with international interests (Swyngedouw 1997). One poignant example that politicized the "Amazonian problem" was the death in 1989 of Chico Mendes, a local syndicate leader who became an international symbol representing the plight of Amazonia’s rural poor (Hecht and Cockburn 1989). As a result of international outcry over his murder, the Brazilian government placed an estimated three million hectares of land in extractive reserves for the rubber-tapper community (ISA 2000). Another example of the renegotiation of power relations having a dramatic impact on land distribution in the region was the organization of Amerindian tribes into a national association, with links to International NGOs. The pressure asserted by this local/national/international coalition in the 1980s directly influenced Brazil’s policy shift on indigenous rights as reflected in the 1988 Constitution and indirectly influenced the international donor community to include indigenous concerns in funding decisions (Turner 1996; Moore and Lemos 1999; Simmons 2002).

Figure 2 illustrates the influences of interacting forces across geographic scales that have created conditions of land scarcity and conflict in the study region. The basic argument is that conflicting national development policies, influenced by global concerns and interregional effects of development, have resulted in increased land concentration and resource scarcity within the region (Wallerstein 1979, 1984; Foweraker 1981; Branford and Glock 1985; Hall 1989; Schmink and Wood 1992). At the local level such patterns of concentration can lead to conflict, although outcomes are influenced by local circumstance that may mitigate (or exacerbate) conditions. Many have described in elaborate detail the evolution of development in Amazonia since the mid-1950s (See for example Mahar 1979; Smith 1982; Moran 1983; Hecht 1985; Browder 1988; Hall 1989; Foresta 1991; Santana 1997); consequently, this paper only touches on the scope of development. The discussion that follows highlights the predominate feature at each level of analysis.

**Global Influences.** Figure 2 indicates that at the global scale conflicting international interest in economic
development, on the one hand, and concern for indigenous and environmental protection, on the other, influenced the pattern of land distribution in the Brazilian Amazon (Simmons 2002). In the 1960s and early 1970s, donor agencies and the international business community (e.g., the World Bank, Inter-American Development Bank, and Food and Agriculture Organization [FAO], among others) were interested in the Third-World livestock sector, and, as a result, invested heavily in cattle ranching. In the late 1970s and early 1980s, development interest shifted to the exploitation of mineral resources, particularly exploration of the Carajás Mountains in eastern Pará. Investments for these endeavors came from a wide range of international actors, such as U.S. Steel, Japan, the former USSR, the EEC, World Bank, and many U.S. financial institutions (Hall 1989; Hurrell 1992).

In the mid- to late 1980s, the environmental crisis brought on by alarming rates of deforestation in Amazonia became a focal point in the international environmental debate, and influenced the course of development and environmental policy in Brazil (Wetterberg, Prance and Lovejoy 1981; Plumwood and Routley 1982; Ledec 1985; Pallemaerts 1986; Hurrell 1992; Thacher 1992). In a similar fashion, international interests began to consider the rights of indigenous peoples to land (Turner 1996; Moore and Lemos 1999). As a result, many Amazonian development projects have an environmental and indigenous rights focus, and much international aid has been tied to programs that emphasize appropriate remedies (e.g., the G7 Pilot Program to Conserve the Brazilian Rainforest financed by the Rainforest Trust Fund with contributions from the G7 nations, Germany, the World Bank, and the United Nations Environmental Program).

**National Scale.** Aside from international pressure, Figure 2 suggests that conflicting national interests influenced the course of development. Three important concerns for the Brazilian government during the past
four decades have been to secure the national borders, increase economic growth, and appease the growing landless population. Geopolitical concerns necessitated the settlement of the Amazonian frontier to secure the nation’s borders (Foresta 1992). The rhetoric surrounding social goals involved agrarian reform measures, indigenous rights to land, and environmental protection. Consequently, colonization schemes in the Amazon were elaborated, social and environmental legislation was enacted, and vast tracts of land were designated for indigenous reserves and conservation areas. At the same time, programs emphasizing economic development provided fiscal incentives, tax exemptions, and subsidized credit for land acquisition, agricultural expansion, and mineral exploitation (Browder 1988; Hall 1989; Mahar 1979). Although later economic incentive programs emphasized the inclusion of small farmers, development in Amazonia remained focused primarily on the exploitation of natural resources and has served primarily to benefit large commercial interests (See Santana et al. 1997; Toni 1999).

**Interregional Scale.** Figure 2 indicates that events and circumstances in other parts of the country influenced the process of development in the study region. In particular, agricultural modernization in the Northeast resulted in the displacement of many farm laborers and the creation of a landless peasantry (Aguiar 1979; Fearnside 1989). This transformation, combined with the northeastern drought in the early 1970s, led to intensified out-migration to both urban centers in the South and the Amazon (Schmink and Wood 1992). The plight of the *Nordestinos*, or Northeasters, forced the government to take action on agrarian reform. Part of their solution was population resettlement and infrastructural development in the Amazon designed to provide land and job opportunities (Browder 1988; Browder and Godfrey 1997; Hall 1987, 1989; Santana et al. 1997). To this day, Northeastern immigrants continue their move into the Amazon region (Perz 2000; Fearnside 2001).

**Regional Development and Land Allocation.** In general, as the figure reflects, national development strategies have conflicted, with intended priorities vacillating between commercial interests on the one hand and populist concerns on the other. The overwhelming recipient of aid during this period was the commercial sector. From 1960 to 1994 cattle herds in Pará grew by an estimated 792%, and pastures expanded twofold to 75,000 km$^2$ in 1995 (IBGE 1996). In addition, as of 1991, more than 40,000 km$^2$ of land was set aside for government-owned economic activities such as the Grand Carajás Program (PGC) and hydroelectric operations (IDESP 1992). An additional concern was national security (Foresta 1992), and, consequently, nearly 70,000 km$^2$ was designated for the military (IDESP 1992).

A clear consequence of the emphasis on environmental and indigenous concerns in the late 1980s and 1990s has been expansion of natural conservation units and indigenous reserves. As of 1999, over 110,000 km$^2$ of land in the State of Pará had been set aside for natural areas conservation (ISA 1999), and currently, there are 41 indigenous reserves encompassing nearly 310,000 km$^2$ an area greater than 23% of the state (ISA 2000). Although land has been declared for natural areas conservation, the actual fate of the environment is of concern to many who are skeptical of Brazil’s capability and willingness to protect these areas (Pallemears 1986; Guimaraes 1991). Likewise, the security and integrity of indigenous lands are questionable, and it is estimated that some form of encroachment (i.e., small farmers, miners, loggers) has impacted 80% of the indigenous reserve areas.

By way of contrast, the small-farmer sector received comparatively little benefit from development efforts. Although land was made available along the development highways for small farmers, and the roads opened the region to millions of spontaneous colonists (Walker 2003), the majority of colonization projects remain isolated, lack essential infrastructure, rural credit, and technological assistance, and suffer from land titling disputes (O Liberal). Despite the expressed intent of development efforts to promote agrarian reform, land concentration patterns in other parts of the country appear to have been replicated in the Brazilian Amazon (Almeida 1992; McCracken et al. 1998). Contrary to earlier positions that land accumulation was unsustainable without government subsidies (Cleary 1993; Hecht and Cockburn 1993), land accumulation involving small, medium, and large operations has continued (Walker, Moran, and Anselin 2000).

In general, land concentration at the national level has worsened over the years, as indicated by the increase of the gini-coefficient from .836 in 1967 to .843 in 1998 (See Table 1). The gini-coefficient gauges equality in the distribution of resources, in this case land, with values ranging from 0, perfect equality, to 1, complete inequality. A comparison of land distribution data in Table 1 show that conditions have improved slightly in most parts of the country with the exception of the Northeast, where the gini-coefficient increased from .809 to .811 over the same period. The North, representing six Amazonian states, has witnessed some improvement since 1978, yet its inequality measure of .871 in 1998 is greater than elsewhere in the nation. In Pará, the gini-coefficient indicates that land concentration increased from .871 in
Table 1. Regional Comparison of Land Distribution in Brazil: Gini-Coefficient Indices 1967 to 1998

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Note: The data for 1967 came from the Brazilian Institute for Agrarian Reform (IBRA), whose responsibility for land reform later fell within the National Institute of Colonization and Agrarian Reform (INCRA) charge. Data for the remaining years came from INCRA.

1967 to .889 as of 1998. The recent agricultural census shows that nearly 18% of the land in the state is in agriculture. Of this area, an estimated 51% is in holdings greater than 1,000 hectares, and nearly half of that land is in extremely large holdings greater than 10,000 hectares (IBGE 1996). To the contrary, small farmers with less than 100-hectare plots, representing 82% of all establishments, occupy a limited 19% of the agricultural land.

Although the Brazilian Amazon is commonly considered an agricultural frontier, the rapid pace of urbanization has possible implications for land conflict in the region. In fact, land concentration and consolidation has initiated the movement of small farmers from the countryside to nearby urban centers, and many recent immigrants seeking land have instead opted to stay in frontier cities. Indeed, urban population in the Amazon increased from 35.5% in 1970 to 55% in 1991, with more than one-third of the population made up of migrants (Perz 2000). However, a substantial number of urban dwellers are still connected to the countryside through employment in rural extractive activities (Simmons and Perz, unpublished manuscript), and some see the city as a temporary place to live as they wait for opportunities enabling their return to the land (Becker 1996).

Local Factors and Circumstances. The final component of the analysis depicted in Figure 2 suggests that the articulation of interacting forces across geographic scales results in land scarcity at the local level. Such scarcity was created, in part, by the expansion of large ranching operations, which, due to its land demanding production system, frequently resulted in land concentration (Walker and Homma 1996; Faminow 1998; Walker, Moran, and Anselin 2000). Ranching may also aggravate conditions for the rural poor because of the limited job opportunities it generates (Mattos and Uhl 1994; Faminow 1998). Intensifying these effects is the creation of conservation units and the demarcation of indigenous reserves, which further reduce the supply of land available for small farmer settlement. As the case of land conflict illustrates, landless farmers do not always passively accept their loss of access to land, and they often react to these circumstances.

The actual outbreak of conflict, however, is influenced by the presence and activism of social movements organized around the issue of land reform. In Pará, influential organizations involved in these efforts include the Comissão Pastoral da Terra (Pastoral Land Commission [CPT]), the Sindicato dos Trabalhadores Rurais (Rural Workers Syndicate [STR]), the Federação dos Trabalhadores da Agricultura do Estado do Pará e Amapá (Federation of Rural Agricultural Workers of Pará and Amapá [FETAGRI]), and the Movimento de Trabalhadores Rurais Sem Terra (Movement of the Landless Rural Workers [MST]). Each of these will now be considered in turn.

Organizational Responses at the Local Level. The CPT, formally established in 1975 and linked with the Brazilian National Conference of Bishops, actively supports rural workers, their organizations, and their movement for agrarian reform and economic development. Since its inception, the CPT has monitored land struggle, collected details of conflict, and reported victims on an annual basis to the national and international community. The STRs, gaining independence from the corporatist state in the 1970s with CPT support, provide local, state, and national representation for small farmers, sharecroppers, permanent and temporary employees, and day labor (Toni 1999). This group, and its state representation FETAGRI, have organized to improve conditions for rural workers on important issues such as access to agricultural credit, infrastructure development and improvement (i.e., roads and schools), wages and benefits, and agrarian reform (Toni 1999). In fact, these rural worker unions have orchestrated numerous occupations of large properties by poor individuals and farmers in the State of Pará (Fearnside 2001).

A particularly powerful social force in Brazil at the present time is the MST, which was officially established in 1984 when various leaders of independent landless movements joined forces. Although originally based in Southern Brazil, the MST has become a nationwide organization with representatives from 22 of Brazil’s 27 states and an organizational structure extending to regional and local levels (Covert 1998). In 1989 the MST began to coordinate efforts in Pará with assistance from the CPT and the STRs, and today there are three defined operational regions concentrated in the southeastern part of the state and one in the vicinity of Belém, the state capital (Fernandes 2000; Campos 2002).
Approximately 60% of participants in the MST are displaced farmers and farm laborers, unemployed manual workers, and disillusioned civil servants (Kelson 1997).

The main objective of the MST is to mobilize the landless and force government to follow through on land reform promises (See Kelson 1997; Stedile 1997; Fernandes 2000). To do so, the MST organizes encampments on public land with around 1,000 to 1,500 landless families and assists the community in selection of target properties for “land invasions,” usually large private holdings. Immediately following such an invasion, MST officials petition the local and federal government for legalization of squatters’ claims, and for food and supply provisions. Frequently, property owners, usually living elsewhere, are not aware that the invasion has occurred until the camp is established and a legal process is underway. Often, government intervenes by purchasing land deemed unproductive and distributing it to the claimants. However, when intervention is not forthcoming, the occupation may evolve into confrontation and violence, involving, among others, fazendeiros (ranchers), pistoleiros (gunmen), peões (unskilled wage laborers), and posseiros (squatters).

An additional player in the land struggle is the União Democrática Ruralista (UDR), an association of large landowners who have united in defense of private property rights. The UDR was established in 1985 in the state of Goiás, but today has representation across the country, including Pará. Although the official objective for organizing was to defend the rights of rural producers, some suggest the actual motivation was to stop the MST’s aggressive pursuit of land reform through the use of political power and repression (Payne 2000). At the extreme, this group has allegedly hired private militia to assassinate MST leaders and expel landless families from invasion sites (Covert 1998).

At the local level the outcome of competition for land may be greatly influenced by the presence and activism of these groups. In areas where there is inequality in strength of organization, domination of one group over the other may result in preemptive clashes. When organizations on both sides are well organized, the strength in numbers may raise the stakes of violent action and reaction, and, consequently, may provide incentives for nonviolent negotiation. The low land-conflict-related mortality rates in the late 1990s may suggest overall effective political mobilization on both sides, despite extreme events such as the massacre in Eldorado do Carajás (Simmons et al. 2002).

In sum, the conceptual design reflects the manner by which international interests influenced the direction of national development, which attempted to address social, environmental, and economic problems. Nevertheless, at the regional level, conflicting strategies resulted in inequitable allocation of development benefits, and, in some cases, land scarcity. At the local level, resulting land conflict may be mitigated or exacerbated depending on the strength and activism of numerous social organizations with local, national, and international representation.

**Land Conflict in Pará State**

**Geography of Land Conflict**

In the Brazilian case, land conflict is well defined by human rights groups, such as the CPT, to include verbal confrontation, vandalism, expulsion, physical altercations, and murders (Barata 1995), and such clashes have been pervasive. In 1996, a year for which there is an elaborate data set and conflict census, there were 581 land-conflict-related deaths between 1980 and 1989. Figure 5 shows that land conflict may be mitigated or exacerbated depending on the strength and activism of numerous social organizations with local, national, and international representation.
and related murders during this time period run parallel to Almeida’s record, with rates peaking in the mid-1980s and tapering off at the end of the decade. The spatial pattern, as with the Almeida data, reveals greatest violence in the southern part of the state and least in the north and west (See Figures 4a,b and c).

Both Almeida (1994) and Barata (1995) record land-conflict-related murders committed to make political points, and should not be confused with homicide rates (Veja 1996). Also, although the spatial pattern for both of these data sources is similar, time span and number of deaths reported vary significantly. The Almeida record appears to be seriously underreported, which may be due to the fact that the CPT, the data source, has little or no formal presence in parts of the state. One example of underreporting is the exclusion of casualties from the so-called War of Araguaia in southern Pará, involving a confrontation between the military police and an urban-based Maoist group from São Paulo that used land reform as the basis for peasant mobilization. This incident resulted in the death of all 70 activist guerillas and an unknown number of local residents (IstoÉ 2000).

The Human Side of Violence

A disaggregation of detailed accounts provided by both Almeida (1994) and Barata (1995) allows for an assessment of the individuals involved in the Amazonian conflict. On first glance the struggle may appear to be a clear-cut battle between large landowners and landless peasantry; to the contrary, the actual myriad of actors involved is quite complex. In discussions and published accounts of the Brazilian conflict, the landless farmer is identified as a posseiro (squatter), colono (colonist), pequeno produtor (small producer), lavrador (agriculturist), and trabalhador rural (rural worker). In accounts of conflict, terms are often used interchangeably to describe the same victim, despite the distinct definitional differences, as outlined in Table 3. In addition to the farmer,

<table>
<thead>
<tr>
<th>Region</th>
<th>Land Invasions</th>
<th>Families Involved</th>
<th>Incidents of Conflict</th>
<th>Participants</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>North:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pará:</td>
<td>53</td>
<td>13%</td>
<td>6,898</td>
<td>11%</td>
<td>114</td>
</tr>
<tr>
<td>Acre:</td>
<td>3</td>
<td>8%</td>
<td>5,215</td>
<td>8%</td>
<td>72</td>
</tr>
<tr>
<td>Amazonas:</td>
<td>0</td>
<td></td>
<td>1</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Rondônia:</td>
<td>1</td>
<td></td>
<td>7</td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>Roraima:</td>
<td>0</td>
<td></td>
<td>0</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Tocantins:</td>
<td>9</td>
<td></td>
<td>304</td>
<td></td>
<td>14</td>
</tr>
<tr>
<td>Northeast</td>
<td>157</td>
<td>40%</td>
<td>n/a</td>
<td></td>
<td>256</td>
</tr>
<tr>
<td>Southeast</td>
<td>68</td>
<td>17%</td>
<td>n/a</td>
<td></td>
<td>142</td>
</tr>
<tr>
<td>South:</td>
<td>52</td>
<td>13%</td>
<td>n/a</td>
<td></td>
<td>85</td>
</tr>
<tr>
<td>Centerwest</td>
<td>68</td>
<td>17%</td>
<td>n/a</td>
<td></td>
<td>153</td>
</tr>
<tr>
<td>Brazil:</td>
<td>398</td>
<td>100%</td>
<td>63,080</td>
<td>100%</td>
<td>759</td>
</tr>
</tbody>
</table>

Source: CPT, 1996.

Note: The murder count for Pará includes the 19 peasants murdered in Eldorado do Carajás on April 19, 1996; excluding this incident, Pará would still have the highest degree of land-conflict-related murders for the nation.


Table 3. Definitions for Landless Farmers

<table>
<thead>
<tr>
<th>Name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posseiro</td>
<td>someone without legal title to the land they occupy</td>
</tr>
<tr>
<td>Colono</td>
<td>person who migrated into the region from another part of the country</td>
</tr>
<tr>
<td>Pequeno</td>
<td>small producer using traditional technology and family labor</td>
</tr>
<tr>
<td>Produtor</td>
<td>small farmer focused on agriculture as opposed to ranching</td>
</tr>
<tr>
<td>Lavrador</td>
<td>agricultural worker that may or may not work for wages</td>
</tr>
<tr>
<td>Trabalhador</td>
<td>rural</td>
</tr>
</tbody>
</table>

Source: Personal interview with MST representative.
many advocates for the landless have been caught up in the conflict, most notably, lawyers, clergymen, and rural syndicate leaders.

The actors involved in the conflict on behalf of the large landed interests are likewise various, and encompass large landowners and their families, ranch managers, administrators, employees, and hired gunmen. Included within the employee classification are *peaões*, who are unskilled ranch hands who frequently serve as bodyguards for the ranchers. The position of the military and police is also a complicated matter because it is believed there are factions organized around both sides of the issue. Finally, there are a variety of other categories for victims including *garimpeiros* (gold-miners), *pescadores* (fishermen), and, tragically, children. Although not immediately recognizable as agents of conflict, the vast majority of gold miners listed as victims had in fact squatted on land when their mining efforts proved unsuccessful (Godfrey 1992).

Table 4 presents the disaggregation of the Almeida data by victim, revealing that most were landless farmers accounting for 67%, and those sympathetic to their cause, an additional 4%. Nevertheless, in the 1980s, there was a distinct rise in the number of casualties from the large landed interests category. Of the 19% representing this group, nearly three-fourths were ranch hands acting as bodyguards and hired gunmen for the ranchers. Finally, an
additional 10% were individuals not easily identified as actors in the land conflict. Most of these victims were gold miners on disputed land (6%), followed by children caught in the crossfire (2%).

Overall, the data presented show that violent land struggle in Pará has persisted since the late 1960s, and intensified after a remission in the wake of peak violence in the late 1980s (Oliveira 1988; Americas Watch 1991; CPT 1992, 1995; Figueira 1992; IstoÉ May 19, 1993; Almeida 1994; Carvalho 1994; Barata 1995; Stedile 1997). The spatial pattern of land conflict highlights the key regions of violence commonly referred to as the South of Pará and Beak of the Parrot (Kotscho 1981; Americas Watch 1991); these areas lie in the eastern part of the state where Pará, Maranhão, and Tocantins share borders. Notorious events here include the widely publicized murder of five homesteaders (O Liberal March 15, 1996) and the El Dorado do Carajás massacre of 19 peasants, both in 1996 (New York Times April 21, 1996; Economist April 13, 1996; IstoÉ April 24, 1996; O Liberal April and May 1996; Veja April 24, 1996).

The account of land conflict here omits discussion of the War of Araguaia. Although clearly linked to the issue of agrarian reform, it may be regarded in some respects as an exotic political insurrection. It should also be noted that although most of the conflict is in Pará, Rondônia and Acre have both experienced incidents. The best-known case, of course, was the assassination of Chico Mendes, an international symbol of social and ecological justice (Hecht and Cockburn 1989). Another publicized incident was the confrontation between police and 500 squatter families in Rondônia that left 15 dead and over 100 wounded in 1995 (New York Times September 19, 1995).

Research Methodology

As a means to empirically examine elements from the proposed analytical framework, this paper combines quantitative techniques, in particular regression, with case study narrative. A regression approach provides insight into county-level factors driving conflict, which can be deductively linked to broad scale forces. There is precedence for employing such statistical methods in studies of land conflict. In one of the first applications of spatial regression, Doreian (1980, 1981) demonstrated a significant relationship between land concentration, export economy, and insurgency during the Huk rebellion in the Philippines. Another study, by Alston, Libecap, and Mueller (1997), used tobit regression techniques to examine the role of inefficient property institutions in Amazonian land conflict. In light of these previous studies, regression analyses, and spatial statistics are performed with data at the county level for the state of Pará. Specifically, the regressions consider the link between policy-driven land scarcity and land conflict outcomes. Nevertheless, it is not possible to address hierarchical interactions across spatial scales with such a methodology or explain the impact of local-level forces on conflict outcomes. To complete the analysis, a case study is presented, focusing on the county of Eldorado do Carajás, where confrontation between military police and landless peasantry in 1996 left 19 dead.

Regression Analyses

Following Doreian (1980, 1981) and Alston et al. (1997), a statistical model may be stated as:

\[ Y = X \beta + \varepsilon \]

where \( Y \) is a vector of observations on land conflict (e.g., assassinations, land conflict rates); \( X \) is a matrix of independent variables (e.g., land concentration, cattle density) and important controls (e.g., population density); \( \beta \) is the regression coefficient vector; and \( \varepsilon \) is a vector of random disturbances (error terms). The research hypothesis is that consequences of conflicting policies, such as
land concentration, will be statistically linked (in terms of significant regression coefficients) to the various dependent variables reflecting land conflict. The unit of observation is the county as of 1985, which provides a sample size of 87 for the state of Pará. Although there are currently in excess of 140 counties in Pará, data for analysis purposes for each have been reaggregated to the 1985 boundaries to correspond to the period of analysis.4

The regression models presented here incorporate lessons learned from Doreian (1980, 1981) and Alston, Libecap, and Mueller (1997), and they include expanded variables allowing for improved explanatory potential. The approach begins with ordinary least squares (OLS) in order to test for spatial autocorrelation and correct for it as necessary. Since studies by Doreian (1980, 1981) revealed that violent conflict is subject to this pathology, it is essential to perform spatial diagnostics and to correct estimators as necessary, using the method of maximum likelihood. In addition to spatial diagnostics, tests for conformity to normality assumptions revealed that the dependent variables were nonnormally distributed. Consequently, power transformations were performed on the dependent variables prior to regression analysis.5 Finally, tobit regressions were conducted, similar to that performed by Alston, Libecap, and Mueller (1997), due to the fact that the values of the dependent variables are always positive.6

**Model Variables**

A significant contribution of the present analysis is that it uses three land conflict indicators derived from both the Almeida (1994) and Barata (1995) data. Alston, Libecap, and Mueller (1997) limit their analysis to the CPT data, which seems to underestimate land-conflict-related assassinations. The **dependent variables** used here include: (1) land conflict (conflicts between 1980 and 1989 divided by rural population); (2) violence intensity-B (murders between 1980 and 1989 divided by rural population) published by Barata (1995); and (3) violence intensity-A (CPT-documented murders between 1964 and 1992 divided by rural population) as reported in Almeida (1994). Descriptive statistics for the model variables (Table 5) show that the violence intensity indicators have similar values despite the differing time spans, with averages ranging from 15 to 17 deaths per 100,000 people, minimums of 0, and maximum death rates of 251 and 261, respectively. The conflict intensity indicator had an average of 25 conflicts per 100,000 people, a minimum of 0, and a maximum of 226.

The frontier variable presented in this analysis is different from that of Alston, Libecap, and Mueller (1997), who use percent land area held by squatters from the 1985 IBGE Agricultural Census. Instead, this paper uses a **road indicator** to represent the frontier environment; this indicator is derived from visual inspection of a regional highway map, which should be highly correlated with percent squatters, rising land values, and INCRA jurisdiction.

The road indicator is a categorical variable reflecting whether one of the major development highways passes through the county. The roads considered in this analysis are (1) the Belém-Brasilia Highway, BR-10, designed to connect the capital of the State of Pará with the Federal Capital, Brasília; (2) the Cuiabá-Santarém Highway, BR-163, in the western portion of the state; (3) the Trans-Amazon Highway, BR-230, traversing the Amazon basin east to west; (4) the PA 150, linking the southeast part of the state with the northeast; and (5) BR-316, which serves as the major artery connecting Pará to the northeast (See Figure 6).7 Overall, about 23% of the counties have road access.

Additional independent variables are included to provide a more nuanced explanation of land conflict derived from the analytical framework presented. In particular, a **cattle density indicator** (number of cattle per km²) is included to detect direct effects of ranching, the sector receiving the bulk of development aid. As suggested, the cattle economy may exacerbate conflict by depressing the local labor market. The cattle density data came from the 1990 Annual Statistics for Pará published by the Institute for Socio-Economic Development of Pará. On average there were 11 head per km², with a minimum of .973 and maximum of 100.

Two land allocation variables, **land concentration** (percent county in holdings greater than 10,000 hectares) and **land

---

**Table 5. Descriptive Statistics**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>N = 87</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Dependent Variables:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Violence Intensity (A)</td>
<td>17</td>
<td>38</td>
<td>0.00</td>
<td>261</td>
</tr>
<tr>
<td>Violence Intensity (B)</td>
<td>15</td>
<td>37</td>
<td>0.00</td>
<td>251</td>
</tr>
<tr>
<td>Conflict Intensity</td>
<td>25</td>
<td>43</td>
<td>0.00</td>
<td>226</td>
</tr>
<tr>
<td><strong>Explanatory Variables:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cattle Density</td>
<td>11</td>
<td>15</td>
<td>0.973</td>
<td>100</td>
</tr>
<tr>
<td>Land Concentration</td>
<td>8</td>
<td>15</td>
<td>0.00</td>
<td>95</td>
</tr>
<tr>
<td>Land Distribution</td>
<td>.52</td>
<td>.16</td>
<td>.405</td>
<td>.953</td>
</tr>
<tr>
<td>Indigenous Land</td>
<td>6</td>
<td>15</td>
<td>0.00</td>
<td>75</td>
</tr>
<tr>
<td>Conservation Area</td>
<td>14</td>
<td>29</td>
<td>0.00</td>
<td>100</td>
</tr>
<tr>
<td><strong>Control Variables:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Population Density</td>
<td>24</td>
<td>45</td>
<td>3.53</td>
<td>357</td>
</tr>
<tr>
<td>Frontier - Road</td>
<td>23</td>
<td>77</td>
<td>0.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>
distribution (gini-coefficient) calculated from the IBGE 1996 Agricultural Census, are used to gauge the impact of land concentration and distribution on land conflict. Two indicators are used because the land concentration indicator does not reveal anything about the allotment of properties less than 10,000 hectares. Although a county has a large proportion of land in holdings greater than 10,000 hectares, the remainder of the area may be evenly distributed among its population. For this reason, gini-coefficients were calculated at county scale and used as land distribution indicators for the analyses. The descriptive statistics in Table 5 show that on average land concentration is 8% and land distribution is .52. The land concentration indicators range from a minimum of 0% to a maximum of 95%, and the distribution measures from .405 to .953.

The indigenous reserve (as a percent of the county) and conservation land (as a percent of the county) variables represent the percentage of a county dedicated to these purposes and, consequently, imply a reduction in the supply of land available for small farmer settlement. These indicators were created from a GIS with coverages representing the spatial extent of Indigenous Reserves reported by FUNAI 1999 and State and Federal Conservation Units reported by IBAMA 1999 (See Figure 6). A county boundary coverage for the State of Pará was layered with the reserve coverages, which enabled the calculation of land area in reserve for each county. On average, 6% of a county’s land was classified as indigenous reserves with a variation across the study region from 0% to an estimated 75%. Conservation areas averaged about 14% of a county’s land, and ranged from no land to almost 100% in certain counties.

Finally, the population density (number of people per km²) is included as a control variable, accounting for any neo-Malthusian effects. This variable was calculated from...
population and county land size data reported in the 1990 Annual Statistics for Pará by IDESP. The population density averaged 24 people per km², with a minimum of 3.53 and a maximum of 357.

**Regression and Spatial Statistics Results**

The regression strategy was to apply ordinary least squares, test for normality of the dependent variables, and then perform diagnostics for spatial autocorrelation. In the event that nonnormality was detected, Box-Cox power transformations were performed on the dependent variables, and then regressions and tests for spatial autocorrelation were conducted. Subsequently, spatial regressions were performed as appropriate (See Doreian 1980, 1981 for relevant applications). Table 6 (a–c) shows the regression results for all of the models tested and their corresponding diagnostics. The tests for normality (Jarque-Bera) indicate that all three original models were non-normally distributed. Consequently, power transformations were performed, and new OLS regressions run with the transformed data. The spatial diagnostics reveal that all three models, the violence intensity-A (log-transformed), violence intensity-B, and conflict intensity, are subject to spatial autocorrelation, as indicated by the appropriate significance probability for the Moran’s I statistic. In addition, the more highly significant results for the Lagrange Multiplier–Lag statistic calls for the use of a spatial lag model (Anselin and Rey 1991). Also note, once power transformations were performed on each of the models the significance level of the Lagrange Multiplier–Error diminished.

The lag model used for violence intensity-A (log-transformed), violence intensity-B, and conflict intensity, is specified as:

\[
Y = \lambda W Y + X\beta + \varepsilon,
\]

where \(Y, X, \beta, \) and \(\varepsilon\), are defined as before. The \(\lambda\) introduces the autoregressive effect of the dependent variable on itself, and \(W\) is a spatial weights matrix (see Anselin 1988, 1995; Anselin and Rey 1991). Note that the spatial weights were normalized to one for counties with shared boundaries.

Table 6 (a–c) gives results of OLS and spatial lag regressions using maximum likelihood estimation for both the original and log transformed data. Overall, as shown in Table 6 (a–c), the \(R^2\) statistics for all the models are substantial, with values ranging from 41% for the log transformed conflict intensity model, to 71% for spatial regression on the original conflict intensity model. Of greater importance for this paper is the statistical significance of the independent variables, each of which represent an important element in the overall analytical argument presented. The cattle density, land concentration, and road variables proved to be robust, revealing statistically significant results for all three models. The direction of the estimators suggests that increased land concentration and road accessibility may result in increased land conflict. The cattle density variable, likewise, intimates that ranching may directly impact and increase land conflict. Another statistically significant finding was the conservation variable in the violence intensity-B and conflict intensity model. However, increased land in conservation appeared to reduce land conflict, which is counter to the argument presented in the analytical framework. In contrast, land distribution, indigenous land, and population density results were not statistically significant for any of the models.

Finally, tobit regressions using maximum likelihood estimation, similar to those performed by Alston, Libecap, and Mueller (1997), were conducted. The tobit regression is appropriate given that land conflict does not occur in every county, so the value of the dependent variable is often zero, creating a left censored data set. As with the above models, the tobit results in Table 6(d) show that cattle density, land concentration, conservation, and road, are all statistically significant. These results provide further strength to the analytical argument presented in the paper.

**Eldorado do Carajás: The Local Articulation of Land Conflict**

The regression analyses demonstrate a link between road access, land concentration, and cattle ranching, and the occurrence of violent land conflict at the county level. Nevertheless, such modeling techniques only provide insight into general processes at work at the regional scale. To fully understand violent struggles, it is necessary to focus on place, considering the spatiohistorical circumstances that created conditions conducive to conflict, and the manner by which endogenous and exogenous forces came together to mitigate or exacerbate violent outcomes. In an effort to explore the articulation of land conflict in place, this section considers the historic economic, political, and social circumstances that led to the massacre at Eldorado.

The history of Eldorado do Carajás is the history of the “South of Pará,” a region endowed with valuable resources and plagued with violent struggle. This region, as with much of the Amazon, remained isolated from the political, cultural, and economic core of Brazil due to its inaccessibility until the turn of the 20th century. Initial political and economic linkage to the area came in a series of boom and bust cycles tied to extractive resources, in particular...
rubber and brazil nuts, that attracted massive immigration and instigated resource-driven competition. To accommodate land demands, the state provided long-term leases on large tracts of forests for rubber extraction and later amended its land legislation in 1920, and again in 1954, providing long term leases (aforamento perpetuo) on large tracts of brazil nut forest (Schmink and Wood 1993). The collapse of these economies freed labor who either migrated out of the region, or turned to subsistence agriculture creating a substantial small-farmer population (Foweraker 1981).

In addition, steps taken to develop Amazonia, initiated with the Brazilian Constitution of 1946, which called for a Comprehensive Plan for development, brought radical changes to the South of Pará. In particular, the construction of the Belém-Brasilia highway that began in 1956 opened the region, instigating a new wave of in-migration. As highway construction proceeded north from Brasilia through southern Pará, large ranching interests followed, staking claim to vast tracts of land, converting forest to pasture, and evicting small farmers in their path (Foweraker 1981; Schmink and Wood 1992). In 1964, the state began construction of PA150, which provided additional access.

Development efforts were hastened under the military government's initiative Operation Amazonia in 1966.

Table 6a. Regression Results—Coefficients (Significance Level)

<table>
<thead>
<tr>
<th>Violence Intensity (A)</th>
<th>Nontransformed</th>
<th>Log Transform Data</th>
<th>Log Transform Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimation Procedure</td>
<td>OLS</td>
<td>OLS</td>
<td>MLE-Spatial Lag</td>
</tr>
<tr>
<td>Entitlement:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cattle Density</td>
<td>1.71 (.00)</td>
<td>0.05 (.00)</td>
<td>0.04 (.00)</td>
</tr>
<tr>
<td>Land Concentration</td>
<td>58.02 (.01)</td>
<td>1.68 (.18)</td>
<td>1.4 (.20)</td>
</tr>
<tr>
<td>Land Distribution</td>
<td>−13.39 (.52)</td>
<td>0.01 (.99)</td>
<td>−0.04 (.96)</td>
</tr>
<tr>
<td>Indigenous Land</td>
<td>−0.11 (.58)</td>
<td>−0.01 (.61)</td>
<td>−0.004 (.63)</td>
</tr>
<tr>
<td>Conservation Area</td>
<td>−0.17 (.09)</td>
<td>−0.01 (.17)</td>
<td>−0.01 (1.7)</td>
</tr>
<tr>
<td>Population Density</td>
<td>−0.05 (.39)</td>
<td>−0.00 (.69)</td>
<td>−0.00 (.91)</td>
</tr>
<tr>
<td>Road</td>
<td>17.98 (.01)</td>
<td>0.9 (.02)</td>
<td>.61 (.08)</td>
</tr>
<tr>
<td>Jarque-Bera (Normality)</td>
<td>96.6 (.00)</td>
<td>5.36 (.07)</td>
<td>n/a</td>
</tr>
<tr>
<td>Moran's I</td>
<td>−0.12 (.90)</td>
<td>1.34 (.17)</td>
<td>n/a</td>
</tr>
<tr>
<td>Lagrange Multiplier—Error</td>
<td>0.24 (.61)</td>
<td>0.76 (.38)</td>
<td>n/a</td>
</tr>
<tr>
<td>Lagrange Multiplier—Lag</td>
<td>1.20 (.27)</td>
<td>5.65 (.01)</td>
<td>n/a</td>
</tr>
<tr>
<td>R²</td>
<td>.59</td>
<td>.44</td>
<td>.37</td>
</tr>
</tbody>
</table>

Table 6b. Regression Results—Coefficients (Significance Level)

<table>
<thead>
<tr>
<th>Violence Intensity (B)</th>
<th>Nontransformed</th>
<th>Nontransformed</th>
<th>Log Transform Data</th>
<th>Log Transform Data</th>
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<tbody>
<tr>
<td>Estimation Procedure</td>
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<td>MLE-Spatial Lag</td>
<td>OLS</td>
<td>MLE-Spatial Lag</td>
</tr>
<tr>
<td>Entitlement:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cattle Density</td>
<td>.74 (.00)</td>
<td>.22 (.25)</td>
<td>0.03 (.001)</td>
<td>0.02 (.01)</td>
</tr>
<tr>
<td>Land Concentration</td>
<td>64.9 (.02)</td>
<td>53.1 (.01)</td>
<td>0.7 (.54)</td>
<td>0.46 (.66)</td>
</tr>
<tr>
<td>Land Distribution</td>
<td>1.7 (.94)</td>
<td>8.12 (.69)</td>
<td>0.08 (.93)</td>
<td>0.21 (.82)</td>
</tr>
<tr>
<td>Indigenous Land</td>
<td>−0.14 (.55)</td>
<td>−.23 (.25)</td>
<td>0.01 (.26)</td>
<td>0.00 (34)</td>
</tr>
<tr>
<td>Conservation Area</td>
<td>−0.21 (.09)</td>
<td>−.17 (.08)</td>
<td>−0.014 (.007)</td>
<td>−0.01 (007)</td>
</tr>
<tr>
<td>Population Density</td>
<td>−0.04 (.56)</td>
<td>.02 (.70)</td>
<td>−.002 (.24)</td>
<td>−.002 (.27)</td>
</tr>
<tr>
<td>Road</td>
<td>25.7 (.00)</td>
<td>15.7 (.02)</td>
<td>1.23 (.0009)</td>
<td>0.85 (.01)</td>
</tr>
<tr>
<td>Jarque-Bera (Normality)</td>
<td>783.0 (.00)</td>
<td>n/a</td>
<td>4.0 (.13)</td>
<td>n/a</td>
</tr>
<tr>
<td>Moran's I</td>
<td>3.32 (.0008)</td>
<td>n/a</td>
<td>2.01 (.04)</td>
<td>n/a</td>
</tr>
<tr>
<td>Lagrange Multiplier—Error</td>
<td>7.43 (.006)</td>
<td>n/a</td>
<td>2.25 (.13)</td>
<td>n/a</td>
</tr>
<tr>
<td>Lagrange Multiplier—Lag</td>
<td>18.68 (.00001)</td>
<td>n/a</td>
<td>7.52 (.006)</td>
<td>n/a</td>
</tr>
<tr>
<td>R²</td>
<td>.34</td>
<td>.44</td>
<td>.37</td>
<td>.41</td>
</tr>
</tbody>
</table>
South of Pará received the lion’s share, by far, of government investment in the form of SUDAM projects, which provided fiscal incentives to large ranching ventures, and facilitated land accumulation. In 1970, the government’s National Integration Program (PIN) expanded road building with the construction of the TransAmazon Highway, BR230, which brought the poor northeastern part of the country into direct connection with the south of Pará. Between 1960 and 1970 the population in the region more than doubled, and land concentration intensified.

In response to the social turmoil created by the influx of poor Northeasterners, numerous social movements, most notably the CPT and the STR, began to mobilize around the plight of this new landless peasantry. A myriad of activists were attracted to their cause, from the Paraense Society for the Defense of Human Rights (SPDH) that founded an office in the south of Pará in the early 1970s, to a militant Maoist student group from São Paulo that attempted to instigate a revolution in the countryside (Campos 2002). Largely in reaction to these activities, the military government declared the county of Marabá, which at the time included Eldorado do Carajás, a national security zone, eradicated the communist element in the region, and established the Executive Group for the Araguaia—Tocantins Lands (GETAT) to defuse the violent land conflict.12 Despite the military government’s absolute authority over land distribution, critics suggest that conditions for the landless worsened (Hall 1989; Schmink and Wood 1993).

The late 1970s witnessed a second social upheaval triggered by new resource discoveries, namely mineral riches in the Carajás Mountains and gold in the Serra Pelada. The primary development effort of the 1980s was the Grand Carajás Program (PGC), the focus of which was a large-scale iron-ore mine operated by the government-owned Companhia Vale do Rio Doce (CVRD). To support mining operations, the Carajás railway was constructed, a 900 km line connecting the region to the port in São Luis, Maranhão, effectively providing a mode of transportation for iron ore and immigrants to the region (Hall 1987). With the gold strike in Serra Pelada, a new onslaught of immigration impacted the region, and a new source of contention emerged (Godfrey 1990, 1992; Cleary 1990). Miners descended on the region, and local residents, small farmer and large rancher alike, took up mining for gold found in river beds throughout the Tocantins watershed. In 1983, there were an estimated 80,000 to 100,000 miners, extracting nearly 1 metric ton of gold per month. By the late 1980s, 89 tons of gold had been extracted, an amount greater than that discovered in the 19th century.

### Table 6c. Regression Results—Coefficients (Significance Level)

<table>
<thead>
<tr>
<th>Estimation Procedure</th>
<th>Conflict Intensity</th>
<th>Nontransformed</th>
<th>Nontransformed</th>
<th>Log Transform Data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>OLS</td>
<td>MLE-Spatial Lag</td>
<td>OLS</td>
</tr>
<tr>
<td><strong>Entitlement:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cattle Density</td>
<td>1.76 (.000)</td>
<td>1.05 (.00)</td>
<td>0.04 (.00004)</td>
<td></td>
</tr>
<tr>
<td>Land Concentration</td>
<td>54.3 (.03)</td>
<td>36.37 (.04)</td>
<td>0.08 (.94)</td>
<td></td>
</tr>
<tr>
<td>Land Distribution</td>
<td>1.09 (.96)</td>
<td>7.04 (.67)</td>
<td>1.7 (1.2)</td>
<td></td>
</tr>
<tr>
<td>Indigenous Land</td>
<td>0.09 (.67)</td>
<td>.05 (.73)</td>
<td>0.01 (.25)</td>
<td></td>
</tr>
<tr>
<td>Conservation Area</td>
<td>−0.27 (.01)</td>
<td>−0.18 (.03)</td>
<td>−0.01 (.03)</td>
<td></td>
</tr>
<tr>
<td>Population Density</td>
<td>−0.01 (.87)</td>
<td>.01 (.84)</td>
<td>0.00 (.27)</td>
<td></td>
</tr>
<tr>
<td>Road</td>
<td>26.8 (.001)</td>
<td>11.89 (.04)</td>
<td>1.35 (.0004)</td>
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</tr>
<tr>
<td>Jarque-Bera (Normality)</td>
<td>43.9 (.000)</td>
<td>n/a</td>
<td>4.4 (.10)</td>
<td></td>
</tr>
<tr>
<td>Moran’s I</td>
<td>4.21 (.00002)</td>
<td>n/a</td>
<td>0.72 (.47)</td>
<td></td>
</tr>
<tr>
<td>Lagrange Multiplier—Error</td>
<td>12.61 (.0003)</td>
<td>n/a</td>
<td>0.08 (.77)</td>
<td></td>
</tr>
<tr>
<td>Lagrange Multiplier—Lag</td>
<td>36.01 (.000000)</td>
<td>n/a</td>
<td>1.16 (.20)</td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td>.58</td>
<td>.71</td>
<td>.41</td>
<td></td>
</tr>
</tbody>
</table>

### Table 6d. Tobit Regression Results—Coefficients (Significance Level)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Violence Intensity (A)</th>
<th>Violence Intensity (B)</th>
<th>Conflict Intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Entitlement:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cattle Density</td>
<td>2.12 (.0001)</td>
<td>1.18 (.003)</td>
<td>2.0 (.0001)</td>
</tr>
<tr>
<td>Land Concentration</td>
<td>89.25 (.01)</td>
<td>65.18 (.21)</td>
<td>55.6 (.07)</td>
</tr>
<tr>
<td>Land Distribution</td>
<td>−2.16 (.95)</td>
<td>16.53 (.76)</td>
<td>32.1 (.29)</td>
</tr>
<tr>
<td>Indigenous Land</td>
<td>0.37 (.35)</td>
<td>0.11 (.23)</td>
<td>0.22 (.42)</td>
</tr>
<tr>
<td>Conservation Area</td>
<td>0.17 (.09)</td>
<td>1.02 (.008)</td>
<td>0.49 (.003)</td>
</tr>
<tr>
<td>Population Density</td>
<td>0.03 (.71)</td>
<td>0.32 (.23)</td>
<td>0.03 (.72)</td>
</tr>
<tr>
<td>Road</td>
<td>33.29 (.002)</td>
<td>46.5 (.001)</td>
<td>38.2 (.0001)</td>
</tr>
</tbody>
</table>
gold rush in California and the Klondike (Schmink and Wood 1993, 220).

Essentially, it was the discovery of mineral wealth that brought about the foundation of Eldorado do Carajás, named after the legendary “City of Gold.” Historically, several Amerindian tribes occupied the region that today makes up the county of Eldorado do Carajás. The decade of the 1950s, however, witnessed gradual occupation as a few large ranchers established fazendas (large ranches) in the area, most notably the Fazenda Macaxeira. The discovery of gold and other minerals in the Carajás mountains placed Eldorado at a strategically important spot, on the main transportation artery in the eastern part of the state, PA150, and the route to Serra Pelada. The population explosion that eventually led to the partitioning of the county of Curionópolis in 1988 from Marabá, and the creation of the county of Eldorado do Carajás from Curionópolis in 1991, stemmed from the in-migration of laborers who worked on the Carajás railway, gold miners, and landless farmers arriving by bus, rail, or foot along one of the region’s main transportation links. In the 1980s, private and government initiatives to provide formal land settlement in the vicinity further acted as a pull for immigrants.

As indicated by Figure 3, land conflict peaked in the 1980s with violent land conflict concentrated in the south of Pará. In the wave of political liberation in the 1980s, which culminated in the return to democracy in 1985, political and social mobilization accelerated (Toni 1999). Important in the struggle for land was the growing momentum of the syndicate movement, which founded nine branch offices in the vicinity of Eldorado do Carajás (Campos 2002). By 1989, the MST officially moved into the Amazon, specifically the south of Pará, and today two of its four regional offices are located in the Araguaia area corresponding to the counties of Marabá and São João do Araguaiá, and the Carajás area encompassing the counties of Parauapebas and Eldorado do Carajás. In conjunction with the CPT and STR activists, the MST began its efforts at spontaneous agrarian reform in earnest. The first occupation involving 100 families occurred in January 1990 on Fazenda Ingaí in Conceição do Araguaia, followed by a second involving 150 families on Fazenda Canaraná later that same year.

This growing landless movement did not go unnoticed by government authorities, and in 1991, military, civil, and federal law enforcement attempted to quell the movement by arresting the leadership. The State of Pará also became increasingly concerned with MST actions, and in response, the Secretary of State Public Security (SEGUP) created, in 1995, the Delegation of Land Conflict within the Division of Investigations and Special Operations (DIOE) to investigate land invasions and intervene on behalf of landowners (Fernandes 2000; Campos 2002). In addition, oppositional groups, and in particular, large landowners began to mobilize under the UDR banner. Although there is no official UDR headquarters in Pará, the county of Xinguara, just south of Eldorado do Carajás, is said to be the group’s stronghold and recruitment center (Campos 2002, 57).

In 1995, the MST petitioned INCRA to investigate the Fazenda Macaxeira in Eldorado do Carajás, in an effort to settle some 1,400 families in search of land, and under their leadership. The INCRA investigation concluded that the ranch was in fact productive and instead offered the families land in a settlement project in Tucuruí. Unsatisfied with the outcome, 2,000 MST members began a march on April 10, 1996 to the capital, Belém. When they arrived at Eldorado do Carajás on the 16th of April, a site referred to as the “curva do S” on PA150, they decided to stop and blockade the road in protest. In exchange for clearing the road, the government agreed to provide the protestors with food and transport to the city Marabá, where they were to meet with the superintendent of INCRA. The next morning word came down that the government would not follow through on its promise, so the protestors once again blocked the road. Within a few hours, two military battalions arrived on the scene, one from Parauapebas and another from Marabá, and the events that transpired next are a matter of great controversy. The outcome, however, is well documented—an estimated 19 killed and 69 injured, including women and children.

This incident highlights the atmosphere of violence that has emerged in the region following years of intense resource competition influenced by the interplay of forces from global to local scale. Eldorado do Carajás demonstrates how government development efforts increased demand for land in the region through road building and population resettlement and decreased supply by providing fiscal incentives to large ranching interests, and later by placing substantial tracts of land into reserve. These government actions, in turn, have been strongly shaped by global forces, including early interest in developing a cattle economy, and subsequent federal and state responses to international concerns about the environment and indigenous rights (Simmons 2002).

Indeed, Marabá, the original county from which Eldorado do Carajás was partitioned in 1991, had an estimated 22% of its land in holdings greater 10,000 hectares in 1985, and its land concentration increased from a gini-coefficient of .67 in 1985 to .70 in 1996 (IBGE 1996). Furthermore, nearly 36% of the county area is set aside for conservation and indigenous holdings. Although timber and mining were once important economic sectors here, these activities have pushed westward with resource
Conclusions and Policy Implications

Rural unrest stemming from problems associated with agrarian reform has long been addressed by social scientists (Moore 1969; Johnson 1968; Davies 1971; Gurr 1971; Huntington 1971; Paige 1975, 1996; Prosterman 1976; Midlarsky 1982; Tutino 1986; Brockett 1988, 1994; Homer-Dixon, Boutwell, and Rathjens 1993; Seligson 1995; Diskin 1996; Mason 1998). More recently, others have suggested that resource scarcity, such as that related to land concentration, presents serious concern for national and international security (Myers 1989; Ullmann 1995; Le Billon 2001; Peluso and Watts 2001; Fairhead 2001). In the Brazilian context, land conflict has been viewed as part and parcel of frontier expansion (see Velho 1972; Katzman 1977), stemming from immature tenure institutions (Mueller, Alston, and Libecap 1994; Alston, Libecap, and Schneider 1995; Alston, Libecap, and Mueller 1997, 2000) and the conflictive nature of production and exchange relations (Foweraker 1981; Wood 1983; Schmink and Wood 1992; Walker and Homma 1996; Walker, Moran, and Anselin 2000).

This paper attempts to integrate the literature on land conflict into a political economy approach that considers the role of hierarchical forces interacting across spatial scales in creating conditions of relative land scarcity and conflict at the local level. The primary contention is that resource scarcity and abundance interacted in the Eastern Brazilian Amazon to create conditions conducive for conflict. Early settlement in the Brazilian Amazon was triggered by its abundant resources, including rubber, brazil nuts, timber, gold, and land. Later, the Brazilian government, intending to bring about economic and social development, promoted strategies that led to land conflict. The programs pursued, influenced by international pressure and biased toward corporate interests, promoted a course of development that created relative land scarcity, a prime ingredient to any agrarian problem. On the one hand, the government encouraged immigration by promoting colonization schemes and the construction of a massive highway network, thereby increasing demand for land. On the other, it also decreased the supply by encouraging a land-hungry cattle economy that did little to create jobs.

Regression results provide support for this argument, showing that land concentration is statistically linked to land conflict and conflict-related murders. Likewise, the road indicator was statistically significant in suggesting that land accessibility, which stimulated increased demand, may have been a key factor to land conflict. Furthermore, results indicate that ranching had direct impacts on land conflict, in addition to its indirect contribution through land concentration. This link may be related to the structure of the cattle economy, which does not provide significant employment alternatives for the landless population. Consequently, conditions in areas with extreme land concentration and substantial ranching operations may be difficult for the rural poor, inciting them to action. While a great deal of aid went to ranching activities, progress toward land reform and overall improvement of social conditions in the frontier were not as significant.

The findings from the regressions, however, do not support the proposition that increased land under conservation and indigenous reserves increase land conflict. In fact, results show land conflict is less than expected in counties with land under conservation. Although on first glance this finding may appear counterintuitive, a possible explanation is that most of the conservation units as shown in Figure 6, with the exception of the Tapirape-Aquiri and Carajás Forest reserve, are far removed from the areas of accessible land in the southeastern part of the state. Nevertheless, incursions into conservation areas are occurring, and frequently go undetected or underreported (Simmons 2002).

Unlike conservation units, many indigenous reserves are located near areas of small farmer settlement. Although land set aside for reserves affects land availability at the county level, the regression results showed that it had no impact on conflict between large landholders and landless farmers. However, violent incursion onto indigenous lands has been considerable (Simmons 2002). A particular area of intense conflict is the Parakanã indigenous reserve in Southern Pará, which has been invaded by loggers, squatters, miners, fisher, and large-landed-interests. In fact, in April of 1999 INCRA officials discovered the existence of a 13,000-hectare ranch within
the reserve that had no registration records. Many other indigenous areas lie directly beside main development roads and, consequently, have been subject to invasions as well. For instance, along the TransAmazon highway the Cachoeira Seca do Iriú, Bacajá Trincheira, and the Arara reserves have been severely impacted, and encroachment is also occurring along the Santarém-Cuiabá Highway south of Ruteropolis on the Baú indigenous reserve of the Kayapó. As with conservation units, land conflict on indigenous lands is not considered in the data source used in this study. Nevertheless, it is estimated that 15% of the 980,000 hectares in reserve have been invaded, and violent conflict has been evident (CIMI 1997).

Although the regression analysis provides insight into some influential macroscale processes, it does not address the interaction of scalar forces and the articulation of land conflict outcomes at the local level. The case study of Eldorado do Carajás, however, explores the historic economic, political, and social circumstances that led to the massacre in April 1996. The tragic events that day reflect an atmosphere of violence, culminating from years of intense resource competition that was greatly influenced by the interplay of forces from global to local scale. This region was the target of government development efforts throughout the past five decades, which, in effect, increased demand for land in the region through road building and population resettlement, and decreased supply by providing fiscal incentives to large ranchers. Such efforts were partly influenced by a global interest in cattle. At the same time, the conditions suffered by the rural poor became a rallying cry for social and political mobilization that engaged activists from across the spatial spectrum. Government and opposition groups’ response to the landless movement intensified over the years, creating a volatile environment ripe for conflict. Although this paper argues that local organizing may mitigate land conflict, the events in April 1996 demonstrate that they may have, in fact, exacerbated circumstances that led to the violent response.

Current policy rhetoric in Brazil calls for environmentally, economically, and socially sustainable development. However, in order to meet such objectives, planners and policymakers must consider how individual components of an overall development strategy interact. Cattle ranching exemplifies this problem well. Although it may lead to a certain level of economic development, ranching may not be consistent with agrarian reform goals. This point is of particular importance in regions of ecological significance like the Amazon basin, given the migratory responses of dispossessed peasants, who are likely to seek new land in the absence of local jobs. Many dispossessed peasants, however, migrate to one of the many emerging frontier towns. Despite the movement of people from the countryside to the urban areas, the regional economy is still agrarian based, and the employment opportunities limited. Consequently, a balanced development program must consider opportunities for the rural population, not simply access to land, but also income-generating activities and overall improvement of conditions in the cities. In an effort to impede an urban exodus back to the countryside. Although a comprehensive strategy for developing the Amazon is beyond the scope of this paper, it does seem clear that successful sustainable development in Amazonia will have to bring about social, economic, and environmental justice.

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Notes

1. For accounts of the War of Canudos see Os Sertões by Euclides da Cunha (1985); for the Ronco de Abelha and the Oeubrakilos rebellions see Crise Agrária e Luta de Classes by Monteiro (1980); and for the Contestado Rebellion see Milenarian Vision, Capitalist Reality: Brazil’s Contestado Rebellion, 1912–1916, by Diacon (1991).
2. Many small farmers view indigenous reserves as government land and therefore available for occupation as allowed by the federal constitution. This is especially true in light of the 1997 passage of decree 1775 that opened reserve demarcation for contestation by interested parties.
3. The county, as a geographical unit, is similar to a county in the United States, although Brazilian counties can be substantially larger in terms of land area.
4. This includes data for the county of Eldorado do Carajás, which was created in 1991 from land within the county of Curionópolis, which in turn was created in 1988 from the county of Marabá.
5. Data transformation involved adding a 1 to each value and then performing a Box-Cox power transformation.
6. A tobit model is a regression model for left censored data. Since a significant number of observations had a zero value for their dependent variable, such an approach was appropriate.
8. The coefficients were calculated by combining the 15 standard
land size classifications in the census to 5 categories: (1) 0 to 49
hectares; (2) 50 to 99 hectares; (3) 100 to 999 hectares; (4) 1000 to 9,999 hectares; and (5) greater than 10,000 hectares.
9. Several counties on Marajó Island are completely under some
form of conservation unit.
10. Spatial autocorrelation occurs when variables are correlated
with themselves in space (Odlund 1988). In the regression
test, problems arise when the dependent variables or the
error term are spatially autocorrelated. The first case is
“substantive” and the second is “nuisance” spatial auto-
correlation. When either case occurs, coefficient estimates
from OLS are either biased or inefficient (Anselin and Rey
11. Note in Tables 6a–c, once the power transformations were
performed, the significance of the Lagrange Multiplier Error
for all the models diminished.
12. The war of Araguaia, as it has been termed, was the military
siege on the leftist guerrillas from São Paulo who used land
reform as the basis for peasant mobilization. This group was
viewed as a threat to national security, and consequently all
70 activists, and an undocumented number of peasants, were
killed (IstoE 2000).
13. The violence intensity (A [Almeida 1994]) is 66; violence
intensity (B [Barata 1995]) is 33; and the conflict intensity is
61. The averages for these same variables are 17, 15, and 25,
respectively.
14. The county boundaries are for 1997, but the data is
aggregated to 1985. Consequently, the blank (white) regions
are those counties created since that time.

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