Historical Occupation and Modern Deforestation: Evidence from Indigenous Extinctions in the Amazon*

Bruno Barsanetti† Alípio Ferreira‡

June 3, 2024

Abstract

This paper studies the long-run relationship between historical Indigenous extinctions and modern deforestation in the Brazilian Amazon. We use information on the historical location of Indigenous groups, their extinction status, and the likely underlying extinction causes. We find that modern deforestation is substantially higher in the proximity of historically extinct Indigenous groups. This association holds for violent and disease-related extinctions, but not if the likely extinction cause is assimilation. Historical extinction events are also associated with more cities and private land tenure, but only after the onset of large-scale deforestation circa 1970. Our findings suggest that historical occupation patterns affected deforestation in the long run, plausibly by removing a deterrence force by Indigenous peoples against the expansion of large-scale agriculture.

JEL Classification Codes: R11, Q23, J15, N56.
Keywords: deforestation, Indigenous populations, persistence, history dependence.

*We appreciate the excellent research assistance provided by Alan Gayger, Matheus Dutra, Lilian Kingston Freitas, and Alexandre Portugal. We are grateful for the feedback of seminar audiences at FGV EPGE, the 2023 SSUN Annual Conference, SMU, Insper, CPI-RJ, the 2023 LACEA-EHN Workshop on Historical Development, MAP, UFRJ, the 2023 LACEA-LAMES Meeting, UFPE, the 2023 Ridge Forum Workshop in Environmental Economics, the TrEnCE Working Group, and UFRGS. We thank Jennifer Alix-Garcia, Rafael Araújo, Mario Cannella, Jeffrey Lin, Ömer Özak, and Marcos Salgado for excellent comments. Bruno Barsanetti appreciates funding for this study by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brasil (CAPES) - Finance Code 001. All errors are our own.

†EPGE Brazilian School of Economics and Finance. E-mail: bruno.barsanetti@fgv.br
‡Southern Methodist University. E-mail: alipioferreira@smu.edu

1 Introduction

The expansion of large-scale agriculture is a major driver of tropical deforestation, threatening important carbon reserves and biodiversity-rich ecosystems in forested regions such as the Amazon and Indonesia. While many short-term determinants of deforestation are well-known, particularly economic incentives that directly impact the profitability of land use change, long-term determinants still need to be better understood. The human presence in tropical forests dates back thousands of years, and its history is filled with conflicts, colonialism, and economic cycles, often with tragic consequences for many Indigenous populations. These historical events may explain part of the long-run patterns of land use, particularly by influencing the geography of occupation and the development of local institutions like land tenure.

This paper examines the connection between historical extinctions of Indigenous groups and modern deforestation of the Brazilian Amazon. The Amazon is the largest rainforest in the world, and its fast large-scale deforestation is a recent phenomenon that took off in the 1970s with the expansion of modern agriculture. We combine a novel and rich ethnohistoric dataset on the historical location of Indigenous groups with remote-sensing measurements of deforestation and other geographic data. We show that deforestation is substantially higher in the proximity of historically extinct Indigenous groups. We extensively test the robustness of our findings to rule out that the correlation we document is due to reverse causality, geographic selection, or measurement error. This positive and robust association between historical Indigenous extinctions and deforestation indicates the existence of long-run determinants to modern land use. We investigate potential mechanisms by analyzing other historical data on land occupation, and conclude that the most plausible explanation for our results is that the extinctions removed a deterrence force exerted by Indigenous presence against non-Indigenous occupation and deforestation.

We construct a data set of historical Indigenous locations and extinctions by georeferencing and cataloging the 1944 Ethnohistoric Map of Curt Nimuendajú (2017). This comprehensive map, based on roughly a thousand sources, records the historical locations of over two thousand South American Indigenous groups. In addition, the map indicates whether the group was extinct by 1944, although it does not contain information on the cause of extinction. We complement the map data with an extensive review of historical sources to identify three common causes of extinction – assimilation, violence and diseases –, which reflect different forms of historical occupation of the Amazon by non-Indigenous settlers. We then overlay the ethnohistoric map with a remote-sensed map of accumulated deforestation in the Brazilian Amazon. We investigate the relationship between these two maps on a fine grid of 4 km $\times$ 4 km cell size, for which we also compute measures of land use, distance to population centers, land tenure, and geographic fundamentals.

Our empirical investigation consists in estimating regressions of accumulated deforestation by 2010 on proximity to the historical locations of Indigenous peoples recorded between 1800 and 1944. We find that deforestation is consistently higher in the proximity of extinct Indigenous groups, even accounting for several relevant determinants of deforestation. In our preferred specification, accumulated deforestation in a grid cell increases by 68.3 ha, on average, for each extinct group within a 20 km neighborhood of the grid cell. This coefficient represents a 26% increase over the average cumulative deforestation in the sample. This large coefficient holds only for extinct groups, whereas the historical Indigenous presence by itself is associated with a statistically insignificant decrease of 6.6 ha in deforestation. This finding suggests a long-term connection between modern deforestation and historical events that resulted in Indigenous extinctions.

We carefully consider three potential sources of endogeneity – reverse causality, selection, and measurement error –, and argue that our results cannot be entirely explained away by biases stemming from them. First, the time gap between the extinctions and modern deforestation rules out reverse causality. Since the 1944 Ethnohistoric Map records only extinctions that occurred before that year, whereas deforestation only took off only after the 1970s, the recorded extinctions precede deforestation by several decades.

Second, we show that the positive correlation between extinct groups and deforestation is robust to including a long list of geographic control variables, including latitude, longitude, relief, climate, agricultural suitability, malaria suitability, proximity to rivers, water bodies, the natural incidence of rubber trees, and distance to São Paulo. This robustness suggests that our findings do not merely reflect the suitability of different sites for deforestation. To further address concerns of potential correlation with omitted variables, we show with methods of sensitivity analysis that the degree of selection in omitted variables would have to be implausibly large to overturn our results. Finally, we use the information in the Nimuendajú map about linguistic families and the historical periods each group was recorded to test for selection in Indigenous group characteristics. We show that our findings are robust to accounting for observable characteristics of the extinct peoples that could make them different from non-extinct groups.

Third, we perform several robustness exercises to assess the importance of measurement error to our analysis. For instance, some Indigenous groups are poorly documented in the sources, and their locations could have been misrepresented on the map. We leverage the rich structure of the Nimuendajú map, including the historical sources used by Nimuendajú, to address these concerns. Our estimates are remarkably stable across many robustness exercises.

Besides accumulated deforestation, we consider a variety of outcomes. We find that proximity to historically extinct groups is correlated with more pasture (but not with cropland) and with more urbanization in 2010. These estimates show that the higher deforestation we document occurs along the expansion of agricultural and settlement frontiers. Moreover, proximity to extinct Indigenous groups predicts higher incremental deforestation from 2010 to 2020, meaning that the extinctions also predict the locations of ongoing deforestation. Indeed, the locations of extinct groups present local economic conditions that enable deforestation, such as more proximity to cities, more road connectivity, fewer protected Indigenous areas, and more private land ownership than areas close to non-extinct Indigenous groups.

Finally, we investigate two mechanisms that could explain our findings: Indigenous deterrence and non-Indigenous occupation persistence. Indigenous deterrence posits that Indigenous extinctions increase long-run deforestation by resulting in ethnic and demographic voids, thus facilitating future occupation by non-Indigenous settlers due to less intense land disputes over the area. Occupation persistence postulates that Indigenous extinctions reflect historical occupation patterns by non-Indigenous settlers, whose persistent presence in that area would influence the later expansion of agriculture and deforestation. Whereas the Indigenous deterrence mechanism emphasizes potential disputes with traditional communities as a cost to large-scale deforestation, the persistent occupation mechanism emphasizes early non-Indigenous settlements as inception points for later economic development.

To assess these mechanisms, we turn to historical data to uncover likely extinction causes and to document historical non-Indigenous occupation in the Amazon. To uncover extinction causes, we thoroughly investigate the sources used by Nimuendajú and categorize the likely extinction causes for each group, as described by these documents. The three most commonly cited reasons for extinction are violence, diseases, and assimilation. While violence and disease extinctions usually led to the demographic decline or disappearance of the Indigenous populations, assimilation extinctions may occur even if the populations remained in the area under a new cultural identity. We find that the correlation between extinctions and deforestation is positive and strong for violent or disease-related extinctions but not for assimilation extinctions. This result supports the Indigenous deterrence mechanism by suggesting that demographic presence is a crucial aspect of our main results and that the physical removal of traditional communities favors deforestation.

Our second exercise investigates the association between Indigenous extinctions and historical non-Indigenous occupation. We find that extinctions are correlated with cities settled after 1944, potentially several decades after the extinctions recorded in the Nimuendajú map, but not with historically settled cities. Moreover, we find no correlation between extinctions and historical private land ownership using data from the 1920 and 1940 agricultural censuses. These findings suggest that the correlation with land tenure patterns (more private land ownership and less Indigenous land rights) arose recently, contradicting the idea of an occupation persistence mechanism. As further evidence for a recent settlement, we show that historical extinctions predict a substantially higher share of migrants from outside the Brazilian Amazon and of non-ethnically Indigenous inhabitants in 2010, especially whites. In sum, these additional empirical exercises suggest the Indigenous deterrence mechanism as the most plausible explanation for our findings.

The remainder of this paper is structured as follows. The rest of this section discusses the related literature. Section 2 provides historical background on the Brazilian Amazon. Section 3 explains the empirical framework and the data used in the analysis. Section 4 discusses the main results on the relationship between historical Indigenous extinctions and deforestation. Section 5 presents empirical findings that help understand the historical nexus behind our main results. Section 6 summarizes and concludes.

1.1 Related Literature

This paper contributes to a growing literature that documents the importance of history in explaining long-run development and, in particular, the spatial distribution of economic activity; see Spolaore and Wacziarg (2013), Nunn (2020) and Lin and Rauch (2022) for surveys of the literature. Some papers have shown that modern outcomes in the Americas relate to the historical locations and characteristics of Indigenous populations; see Angeles and Elizalde (2017), Maloney and Valencia Caicedo (2016), Alix-Garcia and Sellars (2020), Elizalde (2020), Barsanetti (2021), and Franco, Galiani, and Lavado (2021). Differently from these papers, which examine the effects of history on population density or socioeconomic outcomes, we consider deforestation and agriculture. Carlos, Feir, and Redish (2022) argue that injustices against Indigenous populations have impacted the historical development of the United States economy, a similar point as the one we make for the Brazilian Amazon. Many other papers examine the long-run consequences of extractive institutions imposed on Indigenous peoples; see Dell (2010), Summerhill (2010), Naritomi, Soares, and Assunção (2012), Waldinger (2017), Valencia Caicedo (2019), Carpio and Guerrero (2021), Lowes and Montero (2021), and Silva (2023). To the extent of our knowledge, we are the first to quantitatively examine how historical variables, in particular the fate of Indigenous groups, relate to modern tropical deforestation. Our point is that, although relatively recent, Amazon deforestation was influenced by historical events.

Our paper also contributes to the literature on the role of Indigenous presence in forest conservation. Some studies have found that the demarcation of Indigenous reserves reduces deforestation (BenYishay et al. 2017, Baragwanath and Bayi 2020, Assunção and Gandour 2018).[1] All these studies have assessed the role of Indigenous presence together with a specific land-tenure policy that guarantees property rights to Indigenous communities. Our analysis differs by considering historical Indigenous presence, which precedes the assignment of legally protected Indigenous lands.

We contribute to the broader literature on the determinants of deforestation. Most studies focus on short-run factors, such as infrastructure (Pfaff 1999), commodity prices (Assunção, Gandour, and Rocha 2015), enforcement of conservation policies (Assunção, Gandour, and Rocha 2023, Assunção et al. 2023, Burgess, Costa, and Olken 2019, Ferreira 2022), local politics (Bragança and Dahis 2022), and contemporaneous violence (Fergusson, Romero, and Vargas 2014, Burgess, Miguel, and Stanton 2015, Prem, Saavedra, and Vargas 2020). However, our paper highlights that long-run factors may also determine deforestation.

Amazon deforestation relates to the expansion of agriculture into the rainforest (Fearnside 2005). Hence, we contribute to the literature on the causes and consequences of agricultural and settlement frontiers (Alston, Libecap, and Schneider 1996, Allen 2019, Nagy 2023) and on path dependence from frontier conditions (Bazzi, Fiszbein, and Gebresilasse 2020, Oto-Peralías 2020, Allen and Leonard 2021, Barsanetti 2023). The Brazilian Amazon is an interesting setting to study these questions because frontier expansion in the region is relatively recent, still ongoing, and well measured by remote-sensing data.

Finally, we contribute to a large literature in economics that explores ethnographic data. Commonly used datasets include the *Ethnographic Atlas* (Murdock 1967) and folklore motifs (Berezkin 2015, Michalopoulos and Xue 2021). We introduce the Ethnohistoric Map of Curt Nimuendajú (2017) to economics. Though restricted to South America, the Nimuendajú map provides spatially detailed data that presents a rich picture of South American (and especially Brazilian) Indigenous history.

[1] There is evidence that the demarcation of Indigenous land impacts outcomes other than deforestation: Mueller (2022) examines the effect on violence, and Dippel (2014) identifies negative development consequences of forced coexistence of different groups within Indigenous reserves.

2 Historical Background

The human occupation of the Amazon dates back to at least 11,000 years ago (Roosevelt et al. 1996). Small-scale agriculture has been practiced for at least 2,500 years, and its intensification allowed for populous and complex societies in the pre-Columbian period (Cleary 2001), with some studies estimating the Amazon population in 1492 ranging from 5 to 6 million (Denevan 2003, Denevan 2014). The European conquest led to a drastic decline in the Indigenous populations of the Amazon and other regions of the Americas. The demographic collapse in the Amazon, concentrated in the 17th and 18th centuries, occurred later than in other parts of the continent, likely because its peripheral status in the colonial empires shielded Indigenous groups from the frequent contact with non-Indigenous settlers (Cleary 2001).

Portugal began a more consistent colonial effort in the Amazon by the 17th century (Souza 1994), initially relying on religious orders who established missions throughout the Amazon lowlands. Indigenous groups were assembled in *aldeamentos*, villages close to religious missions or other colonial outposts, where they were subjected to forced labor and assimilated into the colonial society (Cleary 2001). These assimilation attempts contributed to the demographic decline of the Indigenous population (Livi-Bacci 2016, Raminelli 2016, Fonseca 2017), in part by exposing them to diseases (Chambouleyron et al. 2011). Moreover, European colonizers often subjugated Indigenous groups violently through slave raids and wars (Livi-Bacci 2016). The European colonization disrupted local trade networks and may have also exacerbated conflict within Indigenous peoples (Whitehead 1993, Harris, Bailão, and Amoroso 2015). From 1760 onwards, Portugal undertook reforms to modernize and secularize the economy of the Amazon, expelling religious orders and establishing incentives for cacao plantations (Souza 1994, Cleary 2001). These reforms also sought to integrate and acculturate Indigenous populations. As a result, assimilated descendants of Indigenous populations, referred to as *caboclos* or *tapuios*, were the largest ethnic group in the Brazilian Amazon at the time of Brazilian independence in 1822 (Moreira Neto 1988, Cleary 2001).

The first decades after independence were of economic decline in the Brazilian Amazon: from 1800 to 1850, per capita income in the region declined by 30% (Souza 1994). From 1835 to 1840, a popular revolt, the *Cabanagem*, engulfed the region and killed 20% of the local population in conflict, famine, and diseases. Some Indigenous peoples were targeted by the repression to the rebellion (Moreira Neto 1988, Souza 1994).

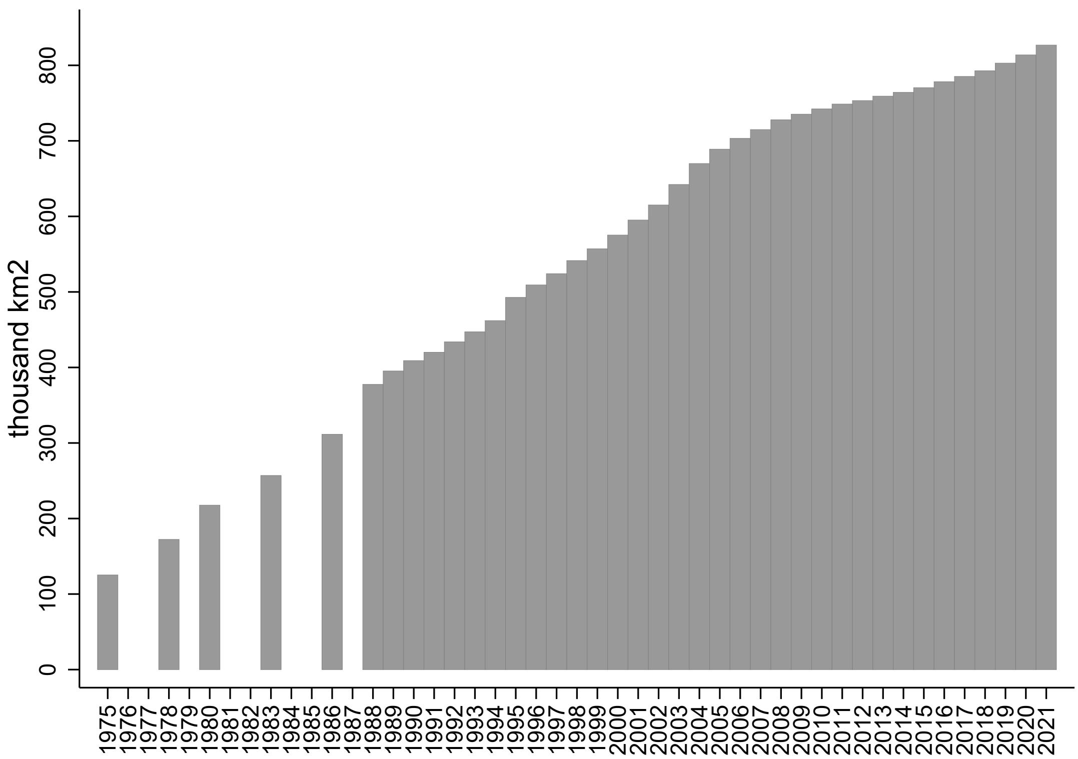
By the late 19th century, the Amazon experienced a new wave of settlement and economic growth, spurred by the introduction of steamboats (Gregório 2009) and the rubber boom (Dean 2002). Yet, this period was a dark period for many Indigenous populations, suffering from violence and forced labor under rubber barons. The rubber boom faded in the 1910s due to competition with plantations in Asia, starting a new period of decline for the Brazilian Amazon economy. By 1970, only 3.6 million of the 93.1 million Brazilian inhabitants were in the Amazon region. Such sparse population and low economic development implied that, until the early 1970s, most of the original forest remained preserved (Pádua 2015).

Beginning in the late 1960s, the Brazilian military dictatorship enacted policies to occupy the Amazon territory out of national security considerations (Souza 1994). The government granted land to newly-arrived farmers, invested in large-scale infrastructure projects, and provided subsidies for manufacturing and mining (Fearnside 2005). The 1970s thus saw the onset of large-scale Amazon deforestation with the expansion of agricultural frontiers into the region (Brondizio and Moran 2012, Pádua 2015). By 1975, the earliest year with reliable satellite estimates, deforestation had destroyed only 3% of the Brazilian Amazon forest (roughly 125 thousand square kilometers); see Figure 1 for the series of accumulated deforestation. Annual deforestation oscillated around a rate of 18 thousand square kilometers until the early 2000s, reaching almost 30 thousand square kilometers in 1995 and 2005. Deforestation rates declined during the mid 2000s, only to accelerate again after 2012. 85% of the Brazilian Amazon's deforestation happened after 1975.[2]

As the Amazon became increasingly occupied and deforested in recent decades, Indigenous peoples also acquired more rights and protection from the state (see Mueller 2022 for a review of Indigenous policy in Brazil). The first Indigenous protection agency, created in 1910, was the Indigenous Protection Service (*Serviço de Proteção aos Índios*, SPI), which was replaced in 1973 by the National Indigenous Foundation (*Fundação Nacional do Índio*, Funai). The 1988 Constitution unleashed a wave of Indigenous reserve assignments throughout the 1990s and 2000s. By 2022, 23% of the Brazilian Amazon was within protected Indigenous lands.

[2] See Online Appendix A.1 for details on how we construct these figures.

Figure 1: Accumulated Deforestation in the Brazilian Amazon since 1975



Note: Each bar shows the accumulated deforestation of primary forest up to the year on the horizontal axis, in hectares, for the Brazilian Amazon. Data from INPE; see Appendix A.1 for details on how we construct this figure.

3 Data and Empirical Framework

3.1 Ethnohistoric Data

We use the Ethnohistoric Map of Curt Nimuendajú (2017) to measure historical Indigenous locations. Curt Nimuendajú (1883-1945) was a German-born, self-taught ethnographer who migrated to Brazil in 1903. In 1911, Nimuendajú joined the SPI, the recently created federal agency to conduct government policies toward Indigenous populations, and wrote influential studies.[3] At the end of his career, Nimuendajú worked on large-scale handmade maps recording Indigenous peoples' contemporaneous and historical locations. The last and most complete map was prepared in 1944 for the Brazilian National Museum (*Museu Nacional*). A printed version of the map was published in 1981, and a digital, high-resolution edition was published

[3] See Grupioni (1998) for details on Curt Nimuendajú's career.

in 2017. We use the 2017 map as our primary source of historical Indigenous presence and extinctions. Appendix Figures A.1, A.2, and A.3 show, respectively, the 1944 handmade map, the 2017 edition, and details of the latter.

Nimuendajú's map covers most of lowland South America, including all of Brazil. The map contains 2,124 entries and 1,156 unique ethnic group names. The map is accompanied by a dictionary of groups and a list of 973 references used to establish the groups' locations and, whenever available, the year in which the group was recorded in that location. Nimuendajú also classified most Indigenous groups according to 40 linguistic families, which he indicated through the color of a line on the group location. Finally, Nimuendajú used a specific calligraphic font to designate groups that were considered extinct around 1944.[4]

The extinction status of the group is a crucial piece of information for our study. Although Nimuendajú does not describe what he understood by extinction in the map, his other works (such as Nimuendajú's contributions to Steward 1946) suggest a view of extinction as the disappearance of a socially distinct community, what Nimuendajú sometimes refer to as "extinction as a tribe." Hence, extinction denotes not necessarily physical disappearance but also the dispersion of the group or its assimilation into other (Indigenous or non-Indigenous) communities. As discussed below, we draw from the historical sources used by Nimuendajú to understand better what happened to the extinct groups in our sample.

Despite its extraordinary level of detail, Nimuendajú's map has its limitations. First, the geographic and time coverages of the historical sources used by Nimuendajú likely reflect not only Indigenous presence but also historical European and Euroamerican presence, and they are limited for early historical periods (Moraes et al. 2021). Second, the map does not record extinction dates or what caused the extinctions. Third, the map records the Indigenous locations, but it contains no information about group sizes, cultural attributes, or social organization. Given the varied sources used by Nimuendajú, which are often silent about these group attributes, there is no natural way to assign such additional information. Fourth, the map is vague about the identity of some groups, for example, by recording the entries under river names or even the highly generic word *índios*. Such imprecision is especially true for groups with unknown language, low documentation in historical sources, or recorded only in the earlier centuries of European occupation. As discussed in Section 4 and Appendix A.2, we propose robustness tests to document the impact of these limitations on our findings.

To obtain our dataset of historical Indigenous locations, we georeference the entries of Nimuendajú's

[4]Besides using a specific calligraphic font to designate extinctions, Nimuendajú also used a dashed line for the extinct groups with a known linguistic family.

map and carefully record all the rich information Nimuendajú expressed through colors, calligraphic font, and text. Each entry in the map is a line segment, indicating a range for the Indigenous group; we identify the two extreme points of each entry. We thus obtain a georeferenced dataset of entries containing the entry's ethnic group name, the years in which the group was recorded, the linguistic family, and whether the group is extinct. Appendix B.1 details how we georeference and catalog the information in the map.

Our baseline empirical investigation considers the Indigenous groups in the Nimuendajú map recorded after 1800, a period in which the sources used by Nimuendajú were more numerous, covered a wider geographic area, and were more reliable than in earlier periods. For example, Moraes et al. (2021) point out that the coverage of the Nimuendajú map is scarce during the early colonial period. In Appendix A.2, we further discuss this choice and present estimates using alternative restrictions on the map entries. We show that our main findings are robust to alternative historical cuts and hold when considering groups with a known linguistic family, which we interpret as entries for which Nimuendajú had better information. Our findings do not hold for extinct groups recorded before 1800. This difference between the results for post-1800 and pre-1800 groups plausibly reflects both the more limited coverage and quality of the map for earlier historical periods and the possibility that the mechanisms at play become weaker over a longer time horizon.

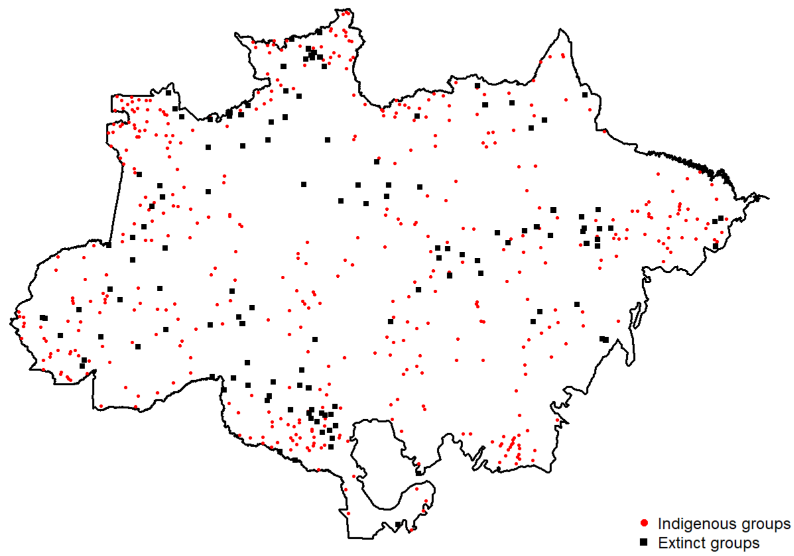
Table 1 displays summary statistics on the map entries. Panel A displays statistics for the 599 post-1800 groups within the Brazilian Amazon biome.[5] Nimuendajú used an average of 10.3 sources for each entry. Regarding the dates of the entries, 36% refer to historical (i.e., before 1944) locations for which Nimuendajú assigned a date based on the sources. Conditional on having a date, the average year for the entry is 1882.[6] Language information is available for 84% of the entries. Finally, 22% refer to groups recorded on the map as extinct. Hence, 130 post-1830 map entries in the Brazilian Amazon refer to extinct groups; Panel B of Table 1 displays the statistics about these groups, including the information we collect about their likely extinction causes by consulting the map sources (discussed below). Panel (a) of Figure 2 is a map of the historical locations of Indigenous groups in the Brazilian Amazon. Although not uniformly distributed across space, historical group locations, both extinct or not, are distributed throughout the Brazilian Amazon.

[5]These groups comprise 28% of the entries in the entire Nimuendajú map. We report the statistics for the 2,124 entries across the entire map in Appendix Table A.1.

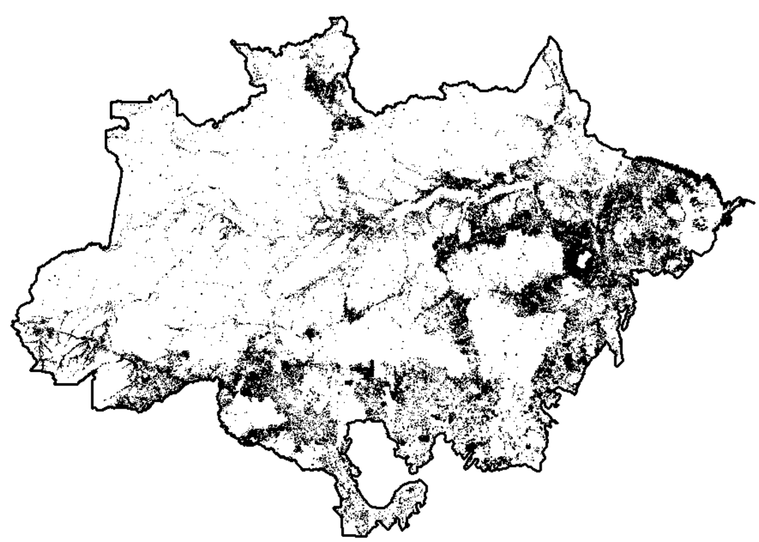
[6]Sometimes Nimuendajú assigns more than one date for an entry. In this case, we consider the oldest year recorded for the computations on Table 1. In a few cases, the date is not precise but indicates only the century; in this case, we assign the midpoint year in the century (e.g., 1850 for 19th century).

Figure 2: Indigenous presence and deforestation in the Amazon

(a) Historical Indigenous group locations in the Nimuendajú map



(b) Accumulated deforestation in 2010 (PRODES)



Note: The points in the map in Panel (a) indicate the midpoints of the Indigenous group entries in the Nimuendajú map for the Brazilian Amazon, which is the region defined by the black solid line, and that were recorded with dates after 1800. Black squares indicate groups assigned as extinct Nimuendajú. Since the Nimuendajú map was produced in 1944, these extinctions occurred before 1944. Panel (b) displays, for the Brazilian Amazon, the area of accumulated primary forest clearing by 2010, as computed by the PRODES measurement program of the Brazilian Spatial Research Agency (INPE 2022).

Table 1: Summary statistics of Nimuendajú's map entries in the Brazilian Amazon

	Obs.	Mean	Std. Dev.
Panel A: information on all group entries			
Latitude	599	-4.78	5.06
Longitude	599	-60.42	7.25
Group entry range (km)	599	74.55	64.50
Number of sources	599	10.33	12.60
Dated entry	599	0.36	0.48
Oldest year of record of the entry	216	1881.94	35.39
Known linguistic family	599	0.84	0.37
Extinct	599	0.22	0.41
Panel B: information about extinct group entries			
Latitude	130	-4.67	4.85
Longitude	130	-60.60	6.50
Group entry range (km)	130	70.13	58.63
Number of sources	130	4.64	4.22
Dated entry	130	0.66	0.48
Oldest year of record of the entry	86	1875.36	34.75
Extiction likely related to assimilation	130	0.33	0.47
Extiction likely related to violence	130	0.28	0.45
Extinction likely related to disease	130	0.11	0.31
Extinction confirmed in the sources	130	0.48	0.50

Note: Each observation is a group entry in the Nimuendajú map. The table displays information only for the groups with centroids inside the Brazilian Amazon biome and that were recorded after 1800. Panel A displays variables prepared for all groups, while Panel B refers to variables collected for extinct groups. Online Appendix Table A.1 displays the statistics for all groups in the map, regardless of location or record dates.

3.2 Classification of Extinction Causes

Besides the information directly available on the map, we are also interested in the circumstances that led to the extinctions. We thus complement the ethnographic data by systematically reading the sources listed by Nimuendajú in search of the likely extinction causes for the extinct groups in the Brazilian Amazon. We also systematically search entries in the Handbook of South American Indians (Steward 1946) and in the Ethnohistoric Dictionary of Colonial Amazon (Porro 2007). Appendix B.3 details our procedure and presents, for each extinct group, a description of the likely extinction causes according to these sources.

The sources frequently report events that explain or suggest the causes of the groups' extinction, usually due to assimilation, violence, or diseases. We construct dummy variables for these three likely causes of extinction, allowing for overlaps when the sources mention more than one potential cause. Figure 3 is a map showing the spatial distribution of extinct groups according to the likely extinction causes. Of the 130 post-1800 extinct group entries within the Brazilian Amazon, we assign assimilation to 43 (33%), violence to 37 (28%), and disease to 14 (11%).[7]

We consider an extinction as *likely due to assimilation* when the sources mention that the group inhabited a non-Indigenous town or that there were attempts by missionaries or authorities to bring the group to settlements (usually called *aldeamentos*), which were meant to culturally assimilate the group into the non-Indigenous society and often also to provide a source of coerced labor. Since the colonial period, religious missionaries and European colonizers ventured into the Brazilian Amazon, establishing contact with Indigenous peoples and creating several *aldeamentos* (Bombardi 2014). Such assimilation efforts by religious entities or secular organizations like the state have continued well into the 20th century.

We consider an extinction as *likely due to violence* when the sources mention that the group experienced conflicts, such as war, violent deaths, and slave raids. The historical evidence is filled with records of slave raids, of wars between Indigenous groups, and of conflict with non-Indigenous settlers. Sometimes, land conflict and slave raids were behind the targeting of entire populations: the Kanakateyé, a Gê group in Tocantins, became extinct after its last village was attacked in a enslavement raid in 1814 (Ribeiro 1841). The rubber boom unleashed a wave of violence against Indigenous peoples living in areas rich in rubber: the Ararawa became extinct after violent raids by Brazilian and Peruvian rubber tappers (Tastevin 1928). Inter-group conflict also resulted in the extinction of Indigenous groups: Nimuendajú (1921) asserts that the Juruna exterminated the Arupay, a rival group, in a war.

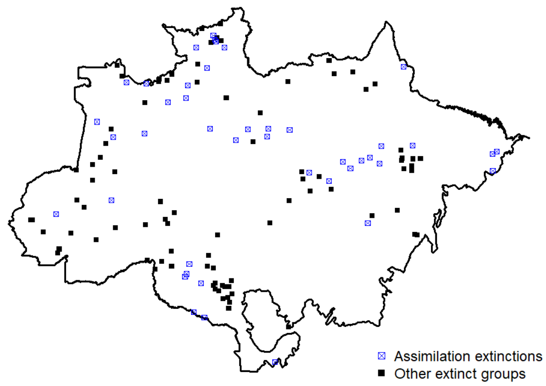
We consider an extinction as *likely due to disease* when the sources mention epidemics or the death of many individuals due to illnesses. In general, the sources are not very precise and merely record the occurrence of illnesses by referring to "fevers", though sometimes the sources explicitly mention a specific disease. For instance, the Boanarí, a Karib people in the Middle Amazon, became extinct in the 19th century after several disease outbreaks following missionary attempts by Catholic priests (Souza 1875).

Sometimes, we cannot assign an extinction cause because the sources provide no clear indication. We believe that violence and disease causes were more likely to be under-reported by the sources than assimilation cases for three reasons. First, violent events were often perpetrated by disorganized groups and were seen as morally reprehensible even in the past, which may make them less likely to appear on the historical record. Second, diseases were widespread throughout the region and many outbreaks would have occurred

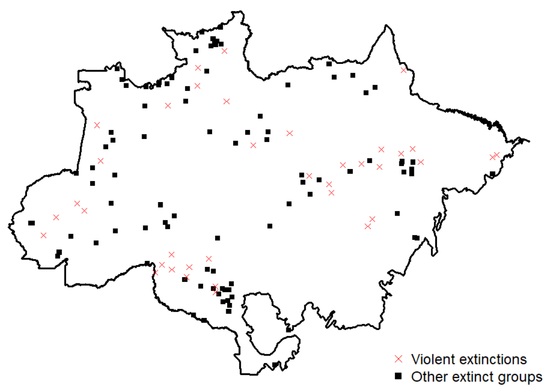
[7] Among the 200 pre-1800 extinct groups entries in the Brazilian Amazon, we assign assimilation to 88 (44%), violence to 48 (24%), and disease to 10 (5%).

Figure 3: Extinct groups by type of extinction

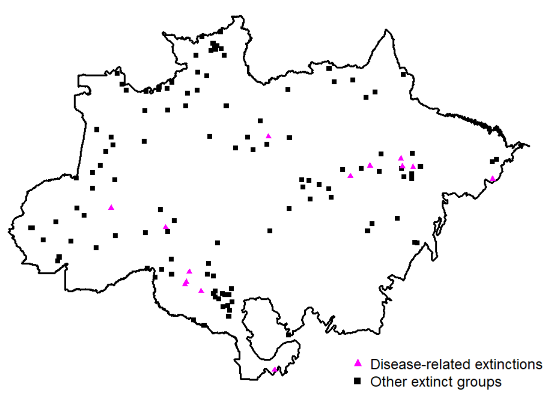
(a) Assimilation



(b) Violence



(c) Disease



Note: The maps display, for the Brazilian Amazon, the centroid of map entries that Nimuendajú indicated as extinct, categorized by the likely extinction causes (when the information was available in the sources).

far from the presence of Europeans, thus not appearing on the written record. Third, assimilation was probably better recorded in the historical sources because it involved explicit efforts by organized entities such as religious or state actors. Hence, it is plausible to conjecture that, for the groups we record with unknown extinction causes, their extinctions were more likely to be related to violence or disease than to assimilation.

3.3 Other Sources and Data Preparation

The main outcome of our analysis is modern accumulated deforestation by 2010, as measured by the PRODES program, the official source of deforestation maps in Brazil. The PRODES data measure primary deforestation based on the interpretation of imagery from Landsat satellites of 1 arcsec $\times$ 1 arcsec (roughly 30 m $\times$ 30 m) resolution.[8] We select 2010 as our benchmark year to allow us to merge the deforestation data with other spatial data relative to the Brazilian 2010 Census. However, we also consider deforestation in different years.[9] Panel (b) of Figure 2 maps accumulated deforestation by 2010.

In addition to deforestation, we use the following data sources as outcomes: land use categories from MapBiomas, nightlights from DMSP-OLS, maps of cities, Indigenous villages, non-Indigenous settlements, and roads from IBGE, shapefiles of protected Indigenous lands from Funai, private land tenure information from the Agricultural Atlas by Imaflora, shapefiles of land distribution projects from Incra, and data on migration and ethnicity from the 2010 Demographic Census. We also use historical data on the year each city in the Amazon was originally settled, which we obtain from the municipality histories in the website *IBGE Cidades*, and on the area within private farms in the past, which we obtain by digitizing tables from the 1920 and 1940 Agricultural Census. Finally, we incorporate a long list of data sources on geographic fundamentals, which we use as controls in our econometric analysis. These fundamentals are altitude, ruggedness, water coverage, original natural non-forest vegetation, malaria suitability, climate (average temperature, precipitation, and relative humidity), proximity to main rivers, the range of rubber trees, the potential yields for cassava, cacao, soybeans, the potential calories that can be produced in a terrain (Galor and Özak 2016), and the distance to São Paulo. Appendix B.2 describes the data sources.

[8]The PRODES maps have been prepared every year since 1988 by the Brazilian National Institute for Spatial Research (*Instituto Nacional de Pesquisas Espaciais*, INPE). The PRODES classification does not consider regeneration; that is, deforestation is irreversible in this dataset (see INPE 2022 for details). One of the major advantages of this dataset is that each polygon of deforestation is validated through an expert's visual inspection.

[9]PRODES is available in a harmonized corrected methodology starting in 2007. For this reason, we only consider maps starting in 2007 from this source.

To carry out our analysis, we create a grid of the portion of the Amazon biome within Brazil with a cell size of approximately 4 km $\times$ 4 km.[10] In what follows, we refer to our study area as the Brazilian Amazon. Next, we compute each cell's accumulated deforestation in 2010 by aggregating the deforestation data at this level. Aggregating the pixels reduces the computational burden of the estimation since it reduces the number of observations from billions of pixels to roughly 260 thousand grid cells. We aggregate all other spatial data at the grid cell. Finally, we compute the nearest distance from the grid cells' centroids to the straight line formed by the two extreme points of the georeferenced location of Indigenous groups.[11] We then calculate the number of Indigenous group entries and the number of extinct group entries located up to 20 km from each grid cell. The number of extinct Indigenous groups in the neighborhood of the grid cell is our measure of proximity to the historical location of Indigenous extinctions.

Table 2 displays summary statistics of our sample. On average, there are 0.59 map entries and 0.12 extinct-group map entries in a distance of up to 20 km of each grid cell. The standard deviation of the total number of extinct group entries is 0.38; hence, an increase of one in $ExtinctGroups_i$ is equivalent to almost three standard deviations. In a grid cell of roughly 1,640 ha, mean accumulated deforestation up to 2010 accounts for 260.7 ha, according to the PRODES data. The land use data from MapBiomas indicate that most of the deforested area has been converted to pastures, which average 206.8 ha per grid cell. The Brazilian Amazon is sparsely populated, as indicated by the low nightlight luminosity and the small area occupied by cities. Moreover, 25% of the grid cells overlap with Indigenous land (i.e., officially recognized Indigenous territories). Appendix Table A.2 contains summary statistics on geographic fundamentals.

3.4 Empirical Strategy

Estimation. Our primary goal is to estimate the association between the historical Indigenous extinctions recorded in the Nimuendajú map and remote-sensed measures of modern deforestation. To do so, we examine ordinary least squares estimates of the equation below:

$$y_i = \beta\ ExtinctGroups_i + \eta\ Groups_i + X_i'\theta + u_i \tag{1}$$

[10]Each grid cell contains 18,225 pixels of the PRODES map, is a square of 0.036 degrees in size, and has an area of approximately 1,640 ha.

[11]In Appendix A.2, we show that our findings are robust to using distance to the midpoint of the Nimuendajú entry instead of the distance to the straight line.

Table 2: Summary statistics of sample grid

	Mean	Std. Dev.
Panel A: proximity to Indigenous groups in Nimuendajú map		
Distance to closest map entry (km)	33.79	29.68
Distance to closest extinct group map entry (km)	76.09	48.46
Map entries within 20 km	0.59	0.85
Extinct group map entries within 20 km	0.12	0.38
Panel B: deforestation, land use, and economic activity		
Cumulative deforestation area (ha) in 2010	260.72	487.26
Additional deforestation area (ha), 2010-2020	26.15	97.67
Primary forest area (ha), 2010	1351.19	475.27
Farming area (ha), 2010	218.45	408.02
Cropland area (ha) 2010	10.78	82.71
Pasture area (ha), 2010	206.75	395.36
Urban area (ha), 2010	1.43	25.87
Distance to nearest city (km), 2010	83.75	64.73
Distance to nearest settlement (km), 2010	61.17	54.01
Nighlight intensity, 2010	0.20	2.11
Road extension (m), 2011	720.30	1933.41
Main road extension (m), 2011	153.52	787.43
Protected indigenous land, 2010	0.25	0.43
Distance to nearest indigenous village (km), 2010	99.03	68.34
Privately owned farms (ha), 2020	390.97	602.11
Land reform projects (ha), 2010	1.14	3.80
Observations	259,574	

Note: Each observation is a 4 km $\times$ 4 km grid cell within the Brazilian Amazon. The area of each grid cell is approximately 1,640 ha. There are 259,574 grid cells in the sample.

Each observation i is a 4 km $\times$ 4 km grid cell. Our sample consists of 259,574 grid cells within the Brazilian Amazon. Our primary dependent variable y_i is accumulated deforestation up to 2010 within each grid cell i, in hectares, as measured by PRODES. We also consider other measures of deforestation, land use, or economic activity as dependent variables. Our main coefficient of interest is β, which relates our measure of proximity to extinct Indigenous groups with modern deforestation. We also include two sets of control variables. First, we control for $Groups_i$, our proximity measure to any Indigenous group (including extinct groups), which helps to account for non-observable site characteristics associated with historical Indigenous presence. Second, we control for a vector X_i of observable characteristics at the grid cell level. In our preferred specification, X_i consists of longitude, latitude, and a long list of geographic fundamentals that could correlate with deforestation or extinctions. In the results, we show how our results change with more parsimonious or extended sets of controls.

The variables $ExtinctGroups_i$ and $Groups_i$ measure proximity to Indigenous groups in the Nimuendajú map. As discussed above, we include in our analysis all groups recorded after 1800. For each grid cell i, we define $ExtinctGroups_i$ ($Groups_i$) as the number of extinct (total) Nimuendajú groups within 20 km from the centroid of i. This cutoff choice implies that roughly half (49%) of our sample cells have at least one Nimuendajú group in their neighborhood and that one in ten is in the neighborhood of some extinct Indigenous group. As we show in Online Appendix A.2, our findings are robust to alternative distance cutoffs, alternative measures of proximity to the historical Indigenous locations, or alternative year cutoffs when restricting the groups used in the analysis.

When performing inference, we account for spatial correlation in the errors by estimating standard errors robust to heteroskedasticity and spatial correlation within clusters defined by grids of 1° of latitude by 1° of longitude. To allow for spatial correlation between *any* pair of observations that are sufficiently close to each other, we use multi-way clustering (Cameron, Gelbach, and Miller 2011) by considering four interlaced $1° \times 1°$ grids: the first grid follows the 1° latitude and longitude lines, while the other three grids are horizontal, vertical, and diagonal translations of the first grid by $0.5°$.[12]

Interpretation of the estimates. Our coefficient of interest is β, which captures the correlation between proximity to historically extinct Indigenous groups and deforestation. Note that since we control for proximity to any Indigenous group in the Nimuendajú map and for a large set of geographic variables, this correlation is conditional on recorded historical Indigenous presence and geographic fundamentals. Therefore, the coefficient β measures the different levels of accumulated deforestation between cells near extinct versus geographically similar cells near non-extinct groups.

To measure the differences in deforestation between cells close to extinct groups and cells without any nearby historical Indigenous group, we need to compute $\beta + \eta$. In practice, as discussed below, our estimates for η are usually close to zero, so our conclusion on the long-run association between historical extinctions and modern deforestation also holds for $\beta + \eta$.

We highlight that all our estimates for β are correlational. Given the history of the Amazon, there is no reason to expect that past Indigenous extinctions were exogenous. Nevertheless, our empirical analysis

[12] In Appendix Table A.15, we show that, for our main findings, the standard error estimates using the method of Conley (1999) are similar to what we estimate with multi-way clustering. However, due to our large sample, the estimation of Conley (1999) standard errors is computationally burdensome. Each regression takes hours to be estimated.

carefully discusses, assesses, and addresses the main concerns about biases to β, giving us confidence that our findings suggest the existence of long-run determinants for modern deforestation. However, our estimates for β must be interpreted cautiously because they lack an evident exogenous variation. We consider the following three concerns that could give bias our estimates away from a causal relationship:

1. The first concern is reverse causality, that is, the possibility that Indigenous group extinctions are a consequence of deforestation or the intent to deforest. The large time difference between the extinction events and deforestation can rule out this concern. Given the date of the map, the extinction events necessarily predate the 1940s, whereas large-scale Amazon deforestation started in the 1970s. Therefore, it is not plausible that the extinctions of the Indigenous group in our data occurred due to the goal to deforest.[13]

2. The second concern is selection. Neither the historical locations of Indigenous peoples nor their extinctions are random, and these locations may have characteristics that make them more or less likely to be deforested. To study the sensitivity of our findings to these selection concerns, we estimate our coefficients conditional on an extensive list of geographic fundamentals. We also use the approach from Oster (2019) to examine how strong selection in omitted geographic fundamentals would have to be to explain away our findings. Moreover, we note that since β is estimated conditional on $Groups_i$ (i.e., the count of all groups in the neighborhood of a grid cell), our econometric design is robust to some selection in omitted geographic fundamentals. As long as the correlation between proximity to Indigenous groups and an omitted variable is the same for both extinct and non-extinct groups, this omitted variable will not bias β. Finally, we leverage the information from the Nimuendajú map to account for selection on Indigenous groups' characteristics.

3. The third concern is potential nonclassic measurement error in the explanatory variables due to the historical nature of the information used by Nimuendajú. To assess the impact of potential measurement error on the results, we leverage many features of the ethnohistoric data, such as the number of historical sources per group or whether we could confirm the extinctions in our reading of the sources. We run our regressions with subsamples of map entries for which we have greater confidence, given

[13]Note that this concern would be relevant in the case of the deforestation of other Brazilian biomes, such as the Atlantic rainforest. The large-scale deforestation of this rainforest was already ongoing by the 19th century (Dean 1997), and it is possible that Indigenous extinctions in this biome were motivated by the goal to deforest.

the abundance of sources and our own assessment of what the sources said. We discuss these tests in detail in Appendix A.2.

4 Empirical Findings

Main results. In comparison with other areas of the Brazilian Amazon, modern deforestation is on average considerably higher in sites near extinct historical Indigenous groups. In contrast, there is no correlation between deforestation and proximity to non-extinct groups. These patterns are robust to a long series of robustness tests aimed at addressing concerns over selection in geographic or group characteristics, measurement errors in the historical data, or specific choices with respect to model specification and estimation. The robust correlation between the historical location of extinct groups and modern deforestation is the main finding of this paper.

Table 3 presents estimates of equation 1 using accumulated deforestation by 2010, in hectares, as the outcome variable. Column 1 presents the estimated results in a specification without any geographic controls. Column 2 presents the estimates in a parsimonious specification which includes latitude and longitude coordinates as controls. In column 3, we control for additional geographic variables, which we specify and justify below. This is our preferred specification, and we always include the geographic fundamentals as controls in the results that we report later. In column 4, we enrich our set of controls by adding interaction terms of the geographic control variables with the count of Indigenous groups, $Groups_i$. In columns 5 and 6, we include controls based on information about the groups that Nimuendajú recorded in the map: the number of groups recorded in specific historical periods (Column 5) and the number of groups for each linguistic family (Column 6). These latter two variables absorb the variable $Groups_i$ ("Indigenous groups" in the table). Finally, in column 7, we control for both the geographic variables and the characteristics of the map entries.

The coefficient on proximity to extinct groups, which we report in the first row of Table 3, is positive and large across all specifications. It is statistically significant as long as we control for latitude and longitude. In our preferred specification (column 3), one additional extinct group in a radius of 20 km of the grid cell is associated with an additional 75.0 ha of deforestation by 2010, conditional on observable geographic fundamentals and on proximity to any Indigenous group in the Nimuendajú map. This coefficient is substantial

Table 3: Extinct Indigenous groups and accumulated deforestation by 2010

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Extinct groups	45.233	82.470**	74.959***	61.205**	76.344***	89.012***	98.064***
	(46.932)	(32.573)	(26.120)	(23.770)	(27.931)	(24.173)	(25.938)
Indigenous groups	-12.404	16.196	-6.640	-8.172			
	(22.254)	(19.072)	(13.479)	(11.782)			
Coeff. extinct vs. no group ($\beta + \eta$)	32.829	98.666	68.319	53.033			
p-value $\beta + \eta = 0$	0.499	0.001	0.006	0.019			
Coordinates?		Y	Y	Y	Y	Y	Y
Geographic fundamentals?			Y	Y	Y	Y	Y
Fundamentals interacted with $Groups_i$?				Y			Y
Year of record?					Y		Y
Language family?						Y	Y
R-squared	0.001	0.261	0.436	0.442	0.436	0.444	0.452
Sample mean	260.722	260.722	260.722	260.722	260.722	260.722	260.722
Observations	259574	259574	259574	259574	259574	259574	259574

Note: The table displays estimates of the coefficients in equation 1. The dependent variable is accumulated deforestation by 2010, in hectares, measured by PRODES. Column 1 does not include control variables; column 2 includes latitude and longitude as controls; column 3 includes latitude, longitude, and the geographic fundamentals (altitude, ruggedness, water coverage, non-forest coverage, malaria index, temperature, rainfall, relative humidity, proximity to main river, *Hevea br.* range dummy, potential yields of soybeans, cassava and cacao, caloric suitability, distance to São Paulo); column 4 includes latitude, longitude, the geographic fundamentals, and each fundamental interacted with the number of Indigenous groups in the Nimuendajú map within 20 km of the grid cell; column 5 includes latitude, longitude, the geographic fundamentals, and the count of groups within 20 km of the grid cell by historical period (from 1800 to 1850, from 1850 to 1900, from 1900 to 1944, and undated); column 6 includes latitude, longitude, the geographic fundamentals, and the count of groups in each linguistic family recorded by Nimuendajú within 20 km of the grid cell; column 7 includes all the controls above. The table also shows the p-values for the F-test of the sum of the coefficients on "Extinct groups" (β_2) and "Indigenous groups" (β_1). Since the latter variable is not included in columns 5 to 7 due to multicollinearity, we do not perform this test for these specifications. Standard errors in parentheses are multi-way clustered according to four interlaced grids of $1° \times 1°$. Statistical significance: * 10%, ** 5%, *** 1%.

considering that each grid cell is roughly 1,640 ha and that average accumulated deforestation is 260.7 ha. It indicates that sites close to historical Indigenous groups that were extinct by 1940 are 4.6 p.p. more likely to be deforested than geographically similar sites close to non-extinct Indigenous map entries.

Note that, in contrast, the simple proximity to historical locations of Indigenous groups does not correlate with deforestation unless the groups were extinct. The coefficients on the second row of Table 3, which are estimates of η in equation 1, are never statistically significant and always small. Hence, sites near extinct groups also feature more deforestation than sites with no recorded historical Indigenous presence, as deduced from the sum of the coefficients on "Indigenous groups" and on "Extinct groups", β and η in equation 1, which we report at the bottom of the table (68.3 ha in our preferred specification).

Selection in geographic characteristics. Differences in geographic fundamentals across grid cells do not seem to explain the correlation between deforestation and proximity to extinct groups, as we show by considering a long list of geographic fundamentals. We expect these fundamentals to be confounding variables that could have historically affected deforestation, Indigenous presence, and group extinctions. We include variables that account for relief (altitude and ruggedness), water (surface covered by water and a dummy indicating a distance of less than 10 km to a major river), the natural incidence of non-forest vegetation like savannas (surface covered by original non-forest formations), climate (average temperatures, rainfall, and relative humidity), agricultural suitability (indices for the potential yields of soybeans, cacao and cassava, and caloric suitability), a dummy for the natural incidence of the rubber tree *Hevea brasiliensis*, a malaria suitability index, and distance to the city of São Paulo. There is a rationale to the consideration of each of these variables: relief may affect the probability to deforest a site, and so may flood-prone lowlands covered by or close to water; Amazon rivers have historically been used for transport, fishing, and more recently, energy production; non-forested areas mechanically constraint the deforestation potential; climate affects the amenities and agricultural productivity of the site, influencing human settlement and the economic benefits of modern deforestation; the potential yield of soybeans, the main cash crop in the agricultural frontier, indicates the suitability to modern agriculture; cacao was an important crop for the historic Amazonian economy; caloric suitability and the potential yield of cassava, the main staple of the Amazonian diet, measure the agricultural suitability for food production under traditional agriculture; as the most productive variety of rubber trees, *Hevea brasiliensis* fueled the rubber boom of the 1890s to the 1920s; malaria has historically been a deterrent to human settlement in the Amazon; and distance to São Paulo proxies for remoteness and exposure to the agricultural frontier that has expanded from the southern fringes of the Amazon.

We carefully assess selection in the variables above by testing their balance and including them as control variables. In Appendix Table A.3, we report the associations between each fundamental and historical Indigenous extinctions by estimating equation 1 with the geographic variables as dependent variables. Most fundamentals do not feature a statistically significant correlation with Indigenous extinctions, but the balance in the fundamentals is not perfect, since altitude and temperature correlate with the extinctions.[14] Yet, we show that the correlation between historical Indigenous group extinctions and modern deforestation remains

[14]Note that the fundamentals are less balanced with respect to all Indigenous groups, as many fundamentals differ as we compare regions close to non-extinct groups with regions far from Indigenous groups. This suggest a higher degree of selection for historical Indigenous presence relative to the degree of selection for extinctions conditional on Indigenous presence. Indeed, our estimates for η in Table 3 are unstable to the inclusion of controls.

large and significant after the inclusion of these controls in column 3 of Table 3. Hence, our findings cannot be explained by differences in these geographic variables.

A more flexible way to include the fundamentals is to include them as interactions with the variable "Indigenous groups", which allows the fundamentals to matter differently for deforestation conditional on the presence of historical groups. This would occur, for instance, if the availability of rubber trees had affected settlement differently depending on the existence of local Indigenous groups which could be exploited as a source of labor. So the estimates for the coefficient on Indigenous groups remain comparable, we demean all fundamentals before interacting with $Groups_i$. The results in column 4 of Table 3 show that the coefficient of extinctions on deforestation slightly decreases to 61.2 after the inclusion of the interaction terms relative to the specification without the interactions (column 3).

Naturally, it is possible that, despite our attempts to include a comprehensive list of geographic fundamentals, there are still some geographic variables which may determine both extinctions and deforestation and are not accounted for in our specification. In Appendix A.2, we report estimates from a sensitivity analysis following the methods by Oster (2019) and Masten and Poirier (2022) to assess if these omitted geographic fundamentals could plausibly threaten our findings. We show in the appendix that this seems unlikely, since the degree of selection between the omitted fundamentals would have to be twice as large and in the opposite direction as the selection in the large list of fundamentals already included in our specification.

Selection in Indigenous group characteristics. A second selection concern is that extinct and non-extinct groups may not be fully comparable, so the coefficient on extinctions could be picking these differences instead of the extinction status. To show that our main findings are also robust to differences in characteristics of the neighboring Indigenous group entries, we leverage the rich information on the groups recorded in the Nimuendajú map. We account for two concerns about possible differences between extinct and non-extinct groups.

The first concern is that extinctions may indicate historical Indigenous group locations at specific historical periods. In this case, the coefficient on proximity to extinct groups would be capturing heterogeneity in the association between past Indigenous presence and modern deforestation according to the historical period in which the group was recorded. To test whether that is the case, column 5 of Table 3 shows a specification which replaces the variable $Groups_i$ with measures of proximity to Indigenous groups recorded in the following historical periods: from 1800 to 1850, from 1850 to 1900, and from 1900 to 1944. We also include proximity to undated entries, which generally refer to groups which were contemporary to the Nimuendajú map. In comparison with our baseline estimates from column 3, the coefficient on extinctions in column 5 remains similar (76.3), suggesting that time differences across groups do not explain our findings.

The second concern is that extinct Indigenous group entries may refer to culturally distinct populations, for which their historical locations may be associated with different historical occupation patterns than for groups not assigned as extinct. Since linguistic differences plausibly reflect social and cultural differences among groups, we use the linguistic information Nimuendajú included in the map to address this concern.[15] Whenever the information allowed for such identification, Nimuendajú recorded the linguistic family of the group; there are 40 linguistic families on the map. In column 6, we include the count of groups within 20 km for each linguistic group; due to multicollinearity, we do not include the variable $Groups_i$. The coefficient on proximity to extinct groups remains statistically significant and is now larger, indicating that, on average, each extinction increases deforestation in the grid cell by 89.0 ha, conditional on linguistic differences across Indigenous groups.

In column 7 of Table 3, we show that our findings survive the joint inclusion of the geographic fundamentals (including the interactions with groups) and the group entry characteristics. The estimated coefficient suggests that, conditional on differences in geographic fundamentals, Indigenous group language, and map entry historical period, one additional extinct group within 20 km of the grid cell increases deforestation in the grid cell by 98.1 ha. This larger coefficient suggest that differences in Indigenous group characteristics do not explain our findings; if anything, their absence in the model biases the coefficient downwards.

Deforestation over time. We have thus far discussed results for estimates that use accumulated deforestation in 2010 as the dependent variable. However, in Panel (a) of Figure 4, we display the coefficients on the number of extinct groups within 20 km for deforestation in different years. We find that the coefficient increases over time, from 72.3 in 2007 to 87.4 in 2021, which suggests that past extinctions predict not only the stock of deforestation but also the flow of new deforestation. We investigate this hypothesis in Table 4, which reports the estimated coefficients of equation 1 when the dependent variable is incremental deforestation from 2010 to 2020. In the baseline specification, one additional extinct group in the neighborhood of the grid cell is associated with additional 11.0 ha of deforestation in the 2011-2020 period. Moreover, the coefficient remains sizable, significant and positive after we control for accumulated deforestation up to

[15] Other ethnographic datasets commonly used to measure cultural attributes, such as the Ethnographic Atlas (Murdock 1967), have small coverage of the groups in the Nimuendajú map.

2010 in column 2, which shows that the findings on ongoing deforestation are not due to new deforestation occurring near already deforested areas. This finding suggests that historical extinctions relate to enduring local conditions that continue to favor deforestation, such as institutions or infrastructure.

Table 4: Extinct Indigenous groups and additional deforestation from 2010 to 2020

	(1)	(2)
Extinct groups	10.967**	9.926**
	(5.057)	(4.902)
Indigenous groups	-4.558**	-4.465**
	(1.829)	(1.772)
Accumulated deforestation, 2010		0.014***
		(0.005)
R-squared	0.046	0.048
Sample mean	26.146	26.146
Observations	259574	259574

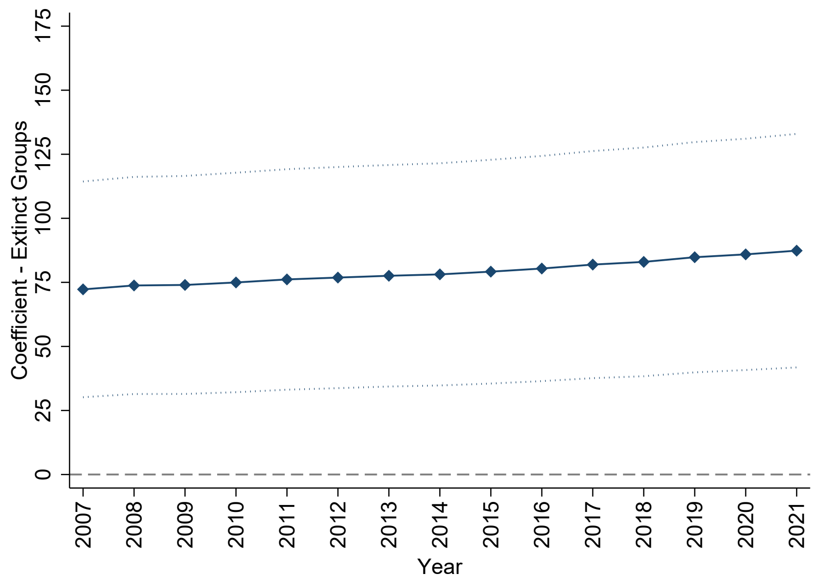
Note: The table displays estimates of the coefficients in equation 1. The dependent variable is the change in accumulated deforestation from 2010 to 2020, in hectares, measured by PRODES. The estimated equation includes latitude, longitude, and all geographic fundamentals from column 3 of Table 3. In column 2, the estimated equation also includes the accumulated deforestation up to 2010, in hectares, measured by PRODES. Standard errors in parentheses are multi-way clustered according to four interlaced grids of $1^\circ \times 1^\circ$. Statistical significance: * 10%, ** 5%, *** 1%.

Finally, we use the primary forest cover measure from MapBiomas as a mirror image of deforestation from an alternative source to Prodes, which shows the robustness of our findings to the remote-sensing data source.[16] These data allow us to examine if our findings hold in even earlier periods. Panel (b) of Figure 4 shows the estimates of equation 1 when the dependent variable is primary forest cover, measured in several years since 1986. The estimates show that proximity to an extinct group (conditional on historical Indigenous presence) decreases primary forest cover by 35.6 ha in 1986, although this coefficient is statistically different from zero only at the 10% level. The primary forest cover difference between areas with nearby extinctions and areas with Indigenous presence monotonically increases over time and it is already significant at the 5% level by 1990. In 2020, each additional extinct group is associated with an average reduction in primary forest cover of 104.4 ha in the neighboring cells. Our estimates suggest that, already in the first decades of agricultural expansion into the Amazon (which took off in the 1970s), deforestation was higher in the

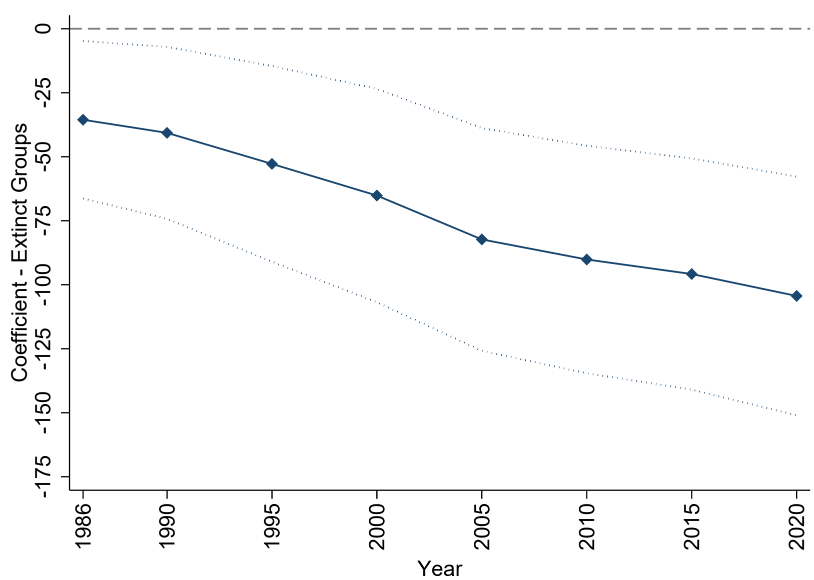
[16] Like Prodes, MapBiomas also uses Landsat imagery to classify land cover, but does so with a different procedure. The two measures tend to coincide for most pixels, although the interpretation of the data and classification may vary in some cases. Prodes is usually more conservative in measuring deforestation, and so are our estimates using Prodes in comparison with the estimates using MapBiomas.

Figure 4: Extinct Indigenous groups and deforestation over time

(a) Accumulated deforestation, PRODES, 2007–2021



(b) Forest cover, MapBiomas, 1986–2020



Note: The solid navy line and the markings display the estimates of the coefficient on $ExtinctGroups_i$ in equation 1. The dependent variable is accumulated deforestation (top panel) and primary forest cover (bottom panel) at the year indicated on the horizontal axis. The equation also includes the variable $Groups_i$ and controls for latitude, longitude, and all geographic fundamentals used in column 3 of Table 3. The dotted lines indicate the upper and lower bounds of the 90% confidence interval, based on multi-way clustered standard errors according to four interlaced grids of $1^\circ \times 1^\circ$. The dashed gray line indicates a horizontal line at zero.

proximity of historical Indigenous extinctions. Moreover, the increased magnitude of the coefficients over time indicates that the subsequent deforestation also concentrated near historical Indigenous extinctions.

Land use. The results presented so far focus on deforestation as the dependent variable. In Appendix Table A.4, we investigate the land uses which have replaced the forest by using land cover categories from MapBiomas as dependent variables. We consider the following land cover categories: farming (which includes both cropland and pasture), cropland, pasture, and urban areas. We also use nightlight intensity from DMSP–OLS as an alternative measure of urbanization and economic activity. The estimates indicate that the presence of extinct groups is associated with less 90.1 ha in primary forest cover and more 84.5 ha in pastures, the most common alternative land use to the forest. We see no association between the historical extinctions and the area covered by cropland but a positive association with urbanization: each additional extinct group in the neighborhood is associated with an additional 1.0 ha of the urban sites and 0.2 units of nightlight intensity; these are substantial effects, given the sample means of 1.4 and 0.2 for the two variables.

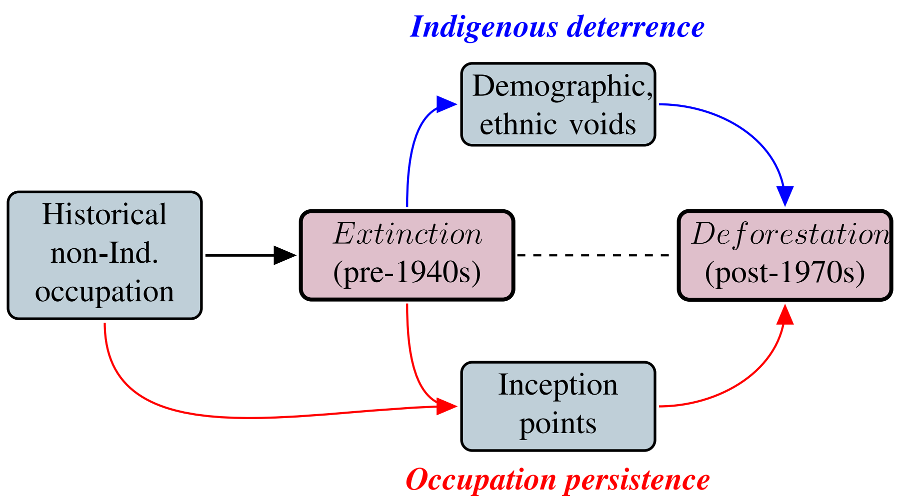
Other robustness tests. We summarize below other robustness exercises further described in Appendix A.2. We show that the results are robust to alternative measures of proximity to the map entries, such as the use of dummies or linear distances. We also include additional control variables, such as the locations of pre-colonial archaeological sites or of colonial religious missions. In a series of tests, we examine the robustness of our findings to concerns of measurement error in the Nimuendajú map. We restrict our analysis to map entries that are better documented, control for non-Indigenous settlements at the time Nimuendajú prepared the map, account for possible map distortions by exploiting the map markings used to georeference the map, and show that our findings hold for extinction events we could confirm in the historical sources listed by Nimuendajú. We also report and discuss the robustness of our findings to a focus on different subsamples of map entries, such as by using alternative year cutoffs or restricting the analysis to known-language groups. We show that our findings hold when we do not control for the historical Indigenous presence, or when we control more flexibly for it. We examine extensive (more gridcells are deforested) and intensive (more deforestation within deforested grid cells) margins of deforestation, showing that both are part of our findings. We consider alternative methods to estimate standard errors, such as allowing for spatial correlation as in Conley (1999) or within municipalities, or the estimation of a tobit model which accounts for the fact that deforestation cannot be negative. We also run a permutation test in which we randomly draw simulated extinctions, showing that our estimated coefficient is at the extreme of the distribution of coefficients on these randomly drawn extinctions. Finally, we report similar estimates if using an alternative empirical strategy at the Indigenous group level.

5 Mechanisms

5.1 Two Potential Explanations

This paper's main finding is that locations near historically extinct groups became more likely to be deforested than locations near non-extinct groups. Two plausible potential mechanisms help explain our findings and imply testable predictions, which we apply to the data. We illustrate them graphically through a directed acyclic graph in Figure 5.

Figure 5: Mechanisms relating historical extinctions to modern deforestation



Note: The graph displays two mechanisms that could explain a positive association between Indigenous extinctions and modern deforestation (the dashed line in the center of the graph). Connections in red refer to the occupation persistence mechanism, while connections in blue refer to the Indigenous deterrence mechanism.

We refer to the first mechanism as **Indigenous deterrence**. It is illustrated by the upper half of Figure 5. Deterrence in this context means that Indigenous presence deters the development of deforestation-related activities, which in our context have been performed mostly by non-Indigenous populations. We conceptualize the Indigenous deterrence mechanism as the existence of Indigenous claims over the land they historically occupied, making it costly for non-Indigenous settlers to occupy areas in the proximity of Indigenous groups. The contact between Indigenous and non-Indigenous groups oftentimes led to violent conflicts and to the Indigenous groups' expulsion or decimation. Hence, the extinctions frequently led to demographic and ethnic voids in the area, which effectively removed these competing Indigenous claims to the area. Non-Indigenous settlers could then occupy these areas, either shortly or long after the Indigenous extinction, to develop other activities, including large-scale agriculture. In contrast, areas with continuing Indigenous presence entrenched their land claims over time. Eventually, the Brazilian state recognized many of these claims in the form of Indigenous reserves, making it even harder for non-Indigenous settlers to claim them legally. In the long run, areas with expelled or decimated groups were suitable, due to legal and practical reasons, for agricultural projects that implied deforestation.

The Indigenous deterrence mechanism has two testable predictions. First, it implies that Indigenous extinctions would affect long-run deforestation only to the extent that it involved the physical elimination of the Indigenous population from the area but not necessarily if extinctions consisted of cultural assimilation into the non-Indigenous society. In the latter case, their land claims would not necessarily disappear as the traditional population may have remained in the region, albeit no longer identifying as Indigenous. Second, Indigenous deterrence implies that historical extinctions would reduce the probability that their regions would be recognized later as Indigenous land reserves and have a positive effect on the probability that they would turn into urban areas, private farms, or rural colonization programs.

The second potential mechanism is the **persistence of non-Indigenous occupation**, illustrated in the bottom half of Figure 5. Given that Indigenous extinctions usually resulted from non-Indigenous contact - by violence, disease, or assimilation -these non-Indigenous groups could plausibly have established settlements that persisted over time near where the extinct Indigenous group formerly existed. From the 1970s onward, economic conditions favored the use of Amazon land for extensive agriculture, and these already settled locations were the natural inception points for the expansion of agriculture areas due to market access, better infrastructure, or the existence of private land ownership. The occupation persistence mechanism has one testable implication: areas with historical extinctions would have been occupied historically, possibly tracing back to the extinction events, in the form of population centers or land claims. This implication can be tested using the age of settlements or cities near the extinction events. The occupation persistence mechanism does not directly contradict the Indigenous deterrence mechanism, and the two could be true simultaneously. Indeed, both are consistent with a higher long-run incidence of modern population centers and non-Indigenous land ownership in areas with historical extinctions. However, each mechanism is associated with its own testable predictions, which we tackle in this section.

In the exercises described below, we focus on the estimated coefficient of extinction groups (β from Equation 1), which captures the change in outcome variables for areas with historical Indigenous presence that faced an extinction event, instead of the coefficient of Indigenous groups (η from Equation 1), which compares areas with Indigenous presence and areas with no recorded Indigenous presence in the Nimuendajú map. The mechanism of Indigenous deterrence would predict a negative η, suggesting that areas with non-extinct Indigenous presence would present less deforestation than areas with no Indigenous presence. Consistently with that, we find a negative η in our preferred specification, but the coefficient is small and not statistically significant.[17] However, η is plausibly more prone to omitted variable bias and measurement error than β, thus making its analysis less fruitful to the understanding of mechanisms explaining why the extinction of Indigenous populations is associated with more long-run deforestation. The balance tests reported in Appendix Table A.3 show that the location of Indigenous presence seems to be more selected on geographic characteristics than the location of extinctions (conditional on historical presence), and the coefficient η is more unstable than β to the inclusion of control variables. Moreover, a correct estimation of η requires that areas with no Indigenous groups are indeed not historically occupied, whereas some areas were still poorly known by 1944, when the map was created. The estimates for β seem less susceptible to these problems, in part because they capture the association with extinctions conditional on historical Indigenous presence. Therefore, we focus our analysis below on β, by directly examining the predictions of the mechanisms with respect to historical data.

In what follows, we show that the evidence consistently favors the mechanism of Indigenous deterrence but not the mechanism of occupation persistence. To conduct these exercises, we collect data on the types of Indigenous extinctions, dates of creation of settlements, land tenure, internal migration, and ethnic composition in the Brazilian Amazon.

5.2 Heterogeneity by Type of Extinction

The circumstances behind the historical extinctions of Amazon Indigenous peoples are varied and complex, and extinction causes include violent conflict, diseases contracted through contact with non-Indigenous

[17] We find a statistically significant and negative η for the association between Indigenous presence and ongoing deforestation shown in Table 4.

populations, and assimilation into the non-Indigenous society. Whereas violence and diseases often implied the physical displacement or death of the local population, assimilation potentially allowed for a continued presence of Indigenous groups in the region under a new cultural identity. If Indigenous presence indeed deters non-Indigenous land use, the correlation between extinctions and deforestation should be stronger for violent or disease-related extinctions than for assimilation.

Using our categorization of extinction causes based on historical sources (see Section 3.2 for details), we conduct a heterogeneity analysis of the relationship between extinctions and deforestation. We augment equation 1 by including the number of groups likely extinct by assimilation, violence, or disease within 20 km of the grid cell. The coefficient on "extinct groups" thus estimates the association between deforestation and proximity to extinct groups with no mentions of violence, assimilation, or disease, while the coefficients on "extinct groups (violence)", "extinct groups (assimilation)", and "extinct groups (disease)" indicate the estimated difference in the outcome for each likely type of extinction in comparison with extinct groups with no mention of these causes. Table 5 reports the results for specifications augmented by these likely extinction causes, included separately (columns 1, 2, and 3) or jointly (column 4) in the regressions.

The results reveal that violent or disease extinctions drive the correlation between historical extinctions and deforestation. The coefficients in column 1 show that, unlike other extinctions, assimilation extinctions are not positively correlated with modern deforestation. The coefficient on the number of groups extinct by assimilation is negative, large, and statistically significant, fully offsetting the positive coefficient on "extinct groups" in column 1. In contrast, the coefficients on the number of groups extinct by violence (column 2) or disease (column 3) are positive and large, although not statistically significant for the case of violence. These estimates remain qualitatively similar when we include all three interactions in column 4.

The heterogeneity results above suggest that removing Indigenous presence alleviates competing claims to an area and facilitates forest conversion to other land uses. To the extent that violent or disease-related extinctions physically eliminated Indigenous populations from an area, they facilitated non-Indigenous land claims, ownership, and development. In contrast, assimilation does not necessarily lead to population removal, and traditional communities may remain in an area, effectively deterring the arrival of new settlers.

In sum, our heterogeneity estimates suggest that population removal is a key aspect of the long-term relationship between extinctions and deforestation. To further distinguish between the mechanism of Indigenous deterrence and occupation persistence, we need to investigate historical evidence on the dates of

Table 5: Heterogeneity by extinct group information

	(1)	(2)	(3)	(4)
Extinct groups	98.714***	64.425**	61.051**	78.857***
	(29.419)	(26.534)	(25.767)	(28.416)
Indigenous groups	-7.411	-6.437	-6.637	-7.566
	(13.376)	(13.486)	(13.482)	(13.362)
Extinct groups (assimilation)	-69.257			-112.014***
	(43.532)			(38.842)
Extinct groups (violence)		43.188		67.718
		(53.927)		(49.194)
Extinct groups (disease)			158.373**	205.032**
			(71.942)	(83.589)
P-value (extinct + assimilation)	0.423			0.306
P-value (extinct + violence)		0.042		0.006
P-value (extinct + disease)			0.002	0.001
R-squared	0.437	0.436	0.437	0.439
Observations	259574	259574	259574	259574

Note: The table displays estimates of the coefficients in equation 1. The dependent variable is accumulated deforestation by 2010, in hectares, measured by PRODES. The estimated equation includes latitude, longitude, and all geographic fundamentals from column 3 of Table 3. Standard errors in parentheses are multi-way clustered according to four interlaced grids of $1^\circ \times 1^\circ$. The p-values indicate the statistical significance of the sum of "Extinct groups" and "Extinct groups (assimilation)", "Extinct groups" and "Extinct groups (violence)", or "Extinct groups" and "Extinct groups (disease)". Statistical significance: * 10%, ** 5%, *** 1%.

settlements. If sites near violent extinctions were settled immediately after the extinction events, this would support the idea that these settlements became inception points for future agricultural development. We turn to this question next.

5.3 Occupation and Land Tenure

Non-Indigenous settlements. The persistent occupation mechanism implies that the historical Indigenous extinctions are connected to the establishment of settlements that developed in the past, likely dating back to the extinction events, and which may have become inception points for agricultural expansion since the 1970s. To test this hypothesis, we use historical data on the establishment dates of Brazilian settlements scraped from *IBGE Cidades* and information from historical censuses to assess whether sites near extinctions were also settled earlier than other sites.

We estimate the relationship between proximity to historical extinctions and the current location municipality seats (henceforth: cities) based, or any non-Indigenous settlements (which includes cities) on the 2010 Brazilian Census. Then, we estimate this relationship for cities whose earliest settlement date is recorded before or after 1944. The group of cities settled before 1944 includes all of the colonial period, the first decades of Brazilian independence, the Amazon rubber boom and World War II, whereas the group after 1944 refers to the post-war period and the phase of agricultural frontier expansion into the forest. The 1944 cut-off reflects the maximum date for extinctions in the Nimuendajú maps, so that settlement events after 1944 occurred, by definition, after any recorded Indigenous group extinction on the map.[18]

Table 6 shows the results of these regressions. In columns 1 and 2, the dependent variables are dummies indicating if a grid cell is within 20 km of a city or any non-Indigenous settlement. The coefficients are positive and statistically significant, suggesting a strong association between historical extinctions and modern population centers. For each additional extinct group near the grid cell, the probability of being near a city (settlement) increases by 4.4 (6.9) p.p., over a mean of 11.2% (22.2%).[19]

Columns 3 and 4 of Table 6 show the estimates for the association between extinctions and proximity to municipality seats of municipalities settled before or after 1944. Proximity to the historical locations of extinct groups is not associated with proximity to cities settled before 1944 but strongly correlated with cities settled after 1944. The coefficient on column 4 indicates that each extinct group is associated with 3.6 p.p. higher probability of being near a city settled post-1944, over a mean of 6.1%. Therefore, the positive association between historical extinctions and non-Indigenous population centers is mostly due to recent settlements established long after the extinctions and during the latest settlement wave of the Amazon. This finding is consistent with the Indigenous deterrence explanation and inconsistent with the hypothesis of a persistent occupation mechanism.

In Figure 6, panel (a), we present estimates from a second exercise which also shows that the positive association between extinction and cities is mostly due to modern cities. Instead of using the location of municipality seats in 2010, we use the location of historical municipality seats available for eleven different years from IBGE (2011). The coefficients are statistically significant and large only for 2010.

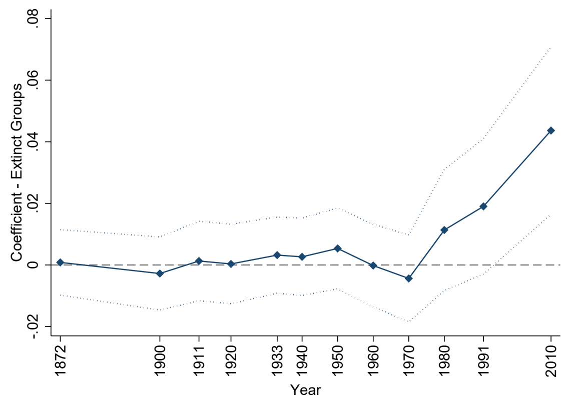
Land tenure. To provide another piece of evidence to test the two proposed mechanisms, we study how

[18]For this exercise, we use the earliest available year at which the municipality was settled, which predates year of incorporation of the municipality.

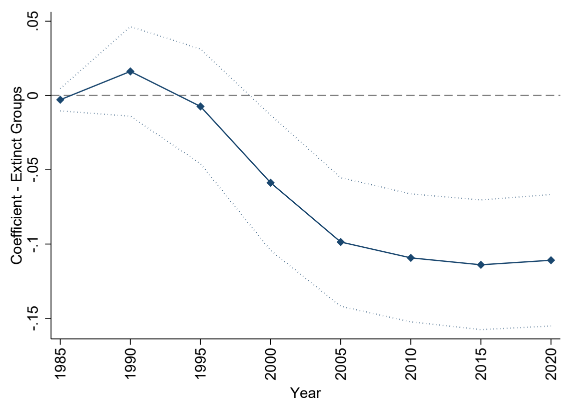
[19]In Appendix Table A.17, we show that the estimates are robust to the use of cutoffs different than 20 km when defining proximity to cities or settlements.

Figure 6: Extinct Indigenous groups and cities, Indigenous lands, or land projects by year

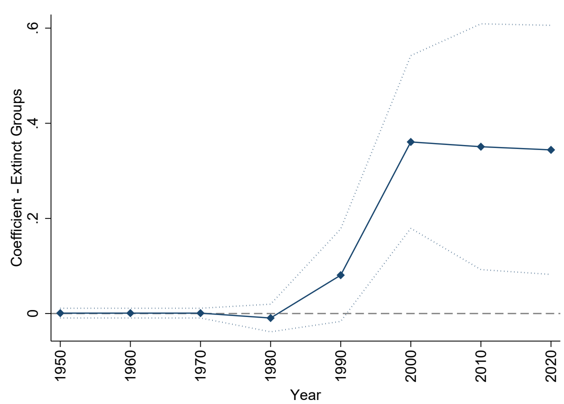
(a) Municipality seats by census year



(b) Indigenous lands



(c) Land distribution projects



Note: The solid navy line and the markings display the estimates of the coefficient on $ExtinctGroups_i$ in equation 1. The dependent variable is a dummy indicating if the grid cell is within 20 km of a city (municipality seat) in the year shown on the horizontal axis (top panel), a dummy equal to one if the grid cell overlaps with a homologated Indigenous land by the year on the horizontal axis (medium panel), and the area of the grid cell covered by land redistribution projects created up to the year on the horizontal axis (bottom panel). The equation also includes the variable $Groups_i$ and controls for latitude, longitude, and all geographic fundamentals used in column 3 of Table 3. The dotted lines indicate the upper and lower bounds of the 90% confidence interval, based on multi-way clustered standard errors according to four interlaced grids of $1^\circ \times 1^\circ$. The dashed gray line indicates a horizontal line at zero.

Table 6: Association with non-Indigenous settlements

	Proximity to: city	settlement	By year of settlement: ≤ 1944	> 1944
	(1)	(2)	(3)	(4)
Extinct groups	0.044***	0.069***	0.014	0.036***
	(0.017)	(0.024)	(0.014)	(0.011)
Indigenous groups	-0.004	-0.002	-0.003	-0.000
	(0.009)	(0.012)	(0.006)	(0.007)
R-squared	0.170	0.260	0.137	0.124
Sample mean	0.112	0.222	0.059	0.061
Observations	259574	259574	259574	259574

Note: The table displays estimates of the coefficients in equation 1. In columns 1 and 2, the dependent variable is a dummy indicating if the grid cell is within 20 km of a settlement or city; the location of settlements and cities is from IBGE. In columns 3 and 4, the dependent variable is a dummy indicating if the grid cell is within 20 km of a city (in 2010) which was first settled in the historical period indicated on the top. Information on the settlement dates of each city is from *IBGE Cidades*. The estimated equation includes latitude, longitude, and all geographic fundamentals from column 3 of Table 3. Standard errors in parentheses are multi-way clustered according to four interlaced grids of $1° \times 1°$. Statistical significance: * 10%, ** 5%, *** 1%.

historical extinctions relate to the modern and past land tenure in the Brazilian Amazon. We consider both Indigenous land rights and private land ownership, plausibly held by mostly non-Indigenous landowners.

The presence of non-extinct Indigenous groups became gradually protected by the Brazilian state throughout history, particularly through the creation of Indigenous reserves in the second half of the 20th century. Legally recognized territories could thus have been a mechanism through which Indigenous presence deterred the establishment of agricultural enterprises. We estimate the relationship between historical Indigenous extinctions and modern Indigenous land rights. The dependent variable is a dummy variable for the overlapping of an Indigenous land (in 2010) with a grid cell. Column 1 of Table 7 shows that each extinct group in the neighborhood of the grid cell decreases the probability that the cell is within an Indigenous reserve by 11.0 p.p (out of a mean of 25.1%), conditional on the historical Indigenous presence. This negative association is in contrast with the positive association between historical Indigenous presence by itself and modern Indigenous reserves, as shown by the positive and statistically significant coefficient of 8.1 p.p. on "Indigenous groups". Furthermore, column 2 of Table 7 shows negative coefficients when using dummies of proximity to Indigenous villages recorded in the 2010 Census.[20] These results are consistent with the process of designating protected Indigenous land since the legal process requires proof of the historical occupation

[20] Proximity to Indigenous villages is an imperfect measure for modern Indigenous presence, as many individuals do not inhabit in the villages and the IBGE data only records villages with more than 20 inhabitants.

by the Indigenous community. These results suggest that the extinctions favored long-run deforestation by foreclosing the possibility of legal recognition of the land by Indigenous groups, which can be a deterrent against deforestation.

Table 7: Association with Indigenous lands and private land ownership

	Grid intersects Indig. reserve	Proximity to Indig. village	Private farm area (ha)	Land projects area (ha)	Share of mun. in farms: 1920	1940
	(1)	(2)	(3)	(4)	(5)	(6)
Extinct group	-0.109***	-0.037**	59.379**	0.351**	-0.009	-0.038
	(0.026)	(0.018)	(27.343)	(0.158)	(0.028)	(0.034)
Indigenous groups	0.081***	0.038***	-27.264	-0.278***	-0.023	-0.021
	(0.017)	(0.009)	(20.087)	(0.078)	(0.015)	(0.026)
R-squared	0.168	0.070	0.279	0.055	0.389	0.283
Sample mean	0.251	0.086	390.970	1.142	0.058	0.067
Observations	259574	259574	259574	259574	117	116

Note: The table displays estimates of the coefficients in equation 1. In column 1, the dependent variable is a dummy equal to one if the grid cell overlaps with a homologated Indigenous land in 2010; these shapefiles are from Funai and the homologation dates are from *Terras Indígenas no Brasil*. In column 2, the dependent variable is a dummy indicating if the grid cell is within 20 km of an Indigenous village; the location of Indigenous villages is from the list of localities for the 2010 Census. In column 3, the dependent variable is the area of private farms in the grid cell, in hectares, obtained from the datasets SIGEF and CAR compiled by Imaflora for 2020. In column 4, the dependent variable is the area of government-sponsored land distribution projects in the grid cell, in hectares, obtained from INCRA data for 2010. In columns 5 and 6, the dependent variable are the shares of the 1920 or 1940 municipality area that was inside a surveyed farm in the 1920 or 1940 Agricultural Census. The estimated equation includes latitude, longitude, and all geographic fundamentals from column 3 of Table 3. In columns 1 to 4, the sample consists of the grid cells. In columns 5 and 6, the consists of all the municipalities from 1920 or 1940 with municipality seats within the Brazilian Amazon. For these samples, the count of extinct and Indigenous groups is done within a 20 km radius around the municipality seat, and each observation is weighted by the municipality area; see Appendix A.4 for details. Standard errors in parentheses are multi-way clustered according to four interlaced grids of $1^\circ \times 1^\circ$. Statistical significance: * 10%, ** 5%, *** 1%.

Conversely, we might expect more private land tenure and non-Indigenous agricultural settlements in areas with historical extinctions. Using land tenure data compiled by Imaflora for 2020 and information from Incra on the location of land distribution projects created by 2010, columns 3 and 4 of Table 7 show that extinctions positively correlate with privately owned farms and agricultural land projects sponsored by the Brazilian government. Hence, historical Indigenous extinctions predict not only less Indigenous land rights, but also more modern non-Indigenous land ownership.

To better distinguish between the Indigenous deterrence and occupation persistence mechanisms, it is important to examine if these patterns on land tenure are historically recent or if they already existed in the past. With this goal, we first use data on the dates of creation of the Indigenous reserves and of the government-sponsored land distribution projects. Panel (b) of Figure 6 uses the dummy of overlap with Indigenous lands as the dependent variable, as in column 1 of Table 7, but using instead only Indigenous lands homologated up to the year shown on the horizontal axis. The figure shows that the negative correlation between extinctions and Indigenous lands holds only since 2000, being driven by Indigenous lands officially protected at the turn to the 21th century. In Panel (c) of of Figure 6, the dependent variable is the area of government-sponsored land settlement projects created up until the year on the horizontal axis. The positive association with the land settlement projects is again recent, appearing only since 2000.[21] Finally, we go back farther in time and examine the correlation between Indigenous extinctions and the area of farms in 1920 and 1940, as surveyed by the agricultural censuses of those years. Unlike the data on modern farms, the agricultural census information is not spatially fine for a grid cell analysis, and so we use it instead in municipality-level regressions; see Appendix A.4 for details. The estimates, reported in columns 5 and 6 of Table 7, show once more that the extinctions do not correlate with historical land tenure patterns.

5.4 Weighing the Evidence for the Two Mechanisms

The empirical exercises conducted above consistently confirm the predictions of the Indigenous deterrence hypothesis but less so for the prediction of the occupation persistence hypothesis. In other words, the correlation between historical extinctions and deforestation seems associated with the availability of non-disputed land as a long-term consequence of the decimation of its former Indigenous inhabitants, and not due to a continuous non-Indigenous presence in those locations. Appendix A.3 provides evidence that extinctions are also associated with higher density of roads (Table A.18), and that jointly controlling for settlements, land tenure and infrastructure makes the coefficient on extinct groups small and insignificant (Table A.19).[22]

The conclusion that Indigenous extinctions affects deforestation by removing a deterrent factor is supported by several pieces of evidence. First, the fact that violent and disease-related extinctions are associated with more deforestation, but not assimilation-related extinctions. Second, the historical Indigenous extinctions are associated with post-1945 settlements, more privately owned land today, state-sponsored agricul-

[21] Such recent correlation is consistent with the historical evidence: after colonization projects promoted by the military dictatorship led to conflict with Indigenous and *caboclo* communities, the government changed the land distribution policies in the Amazon to avoid such conflicts (Kohlhepp 2015).

[22] Appendix A.3 also presents: heterogeneity of occupation and land tenure to the likely causes of extinction; heterogeneity analyses according to geographic characteristics; and associations with ethnic composition and migration.

tural land projects, and less legal recognition of Indigenous land, with no statistically significant evidence connecting Indigenous extinctions with historical settlements or land tenure patterns.[23] In Appendix A.3, we also present additional evidence from modern Census data which indicates a stronger presence of migrants (from other Brazilian regions) in areas with historical extinctions, as well as a larger population of non-Indigenous people, particularly whites; see Appendix Table 5. These additional results concur with the fact that Brazilian agriculture started expanding into the Amazon in the 1960s, bringing with it a wave of migrants from other states and clearing large areas of forest, and are useful to understand why extinctions are associated only with recent settlement and private land ownership.

In sum, our findings in this section are broadly consistent with the Indigenous deterrence mechanism. Two additional points about this hypothesis are worth discussing. First, it implicitly assumes that traditional populations, especially Indigenous, are less likely to deforest.[24] Since we usually do not observe who is responsible for deforestation, this assumption cannot be directly checked. However, as suggestive evidence for this assumption, we examine the correlation between accumulated deforestation and the ethnic composition at the level of census blocks in Appendix A.3. We find that, while 19.2% of the surface of the census blocks in our data have been deforested up to 2010, an increase in 10 p.p. in the share of the Indigenous population predicts 1.4 p.p. less in deforestation; see Appendix Table A.22. Second, our results suggest that Indigenous deterrence occurs not simply due to the official assignment of Indigenous reserves. As a comparison of the graphs in panels (b) of Figures 4 and 6 shows, the positive association of extinctions with deforestation precedes in time the negative association with protected Indigenous lands. Moreover, the estimates from the "horse-race" exercise in Appendix Table A.19 show that the association between extinction and deforestation remains strong after we control for Indigenous reserves. Other factors must also play a role in the deterrence argument, such as the active resistance of traditional populations against encroachment or the importance of social impact considerations in the planning of land colonization projects.

[23] In Appendix Table A.20, we show that the heterogeneity with respect to the likely causes of extinction holds not only for deforestation, but also for many of these variables. Interestingly, we find heterogeneity for cities and private land, but not for Indigenous lands. These contrasting findings are consistent with traditional communities deterring the expansion of agricultural frontiers not only through the assignment of Indigenous land tenure, which requires the self-identification of these communities as Indigenous.

[24] Many different motives may lead Indigenous people to deforest less, including culture, inherited human capital that is specific to modern agriculture, or access to capital. All these motives are consistent with the Indigenous deterrence mechanism, and our investigation does not allow us to distinguish between them.

6 Conclusion

This paper investigates long-run determinants of tropical deforestation. We study the connection between the historical extinctions of Indigenous groups and modern Amazon deforestation, relying on the Ethnohistoric Map of Curt Nimuendajú, remote-sensed measures of deforestation, and other data sources. We find a strong positive correlation between past Indigenous extinctions and modern deforestation. Since our historical information on the Indigenous presence and extinctions predates 1944, whereas deforestation only took off in the 1970s, our analysis guarantees chronological precedence of the extinction events relative to the main outcome, thereby ruling out reverse causality. Moreover, our estimates are robust to a series of tests aimed at addressing a variety of concerns, such as selection in geographical or group characteristics or measurement error in the ethnohistoric data.

We further investigate the mechanisms connecting historical extinctions and modern deforestation, evaluating two possibilities: the deterrent role of Indigenous presence against the development of agricultural activities and the persistence of historical non-Indigenous settlements, which could have served as inception points for future agricultural expansion. We find that only extinctions related to demographic voids, such as violence and diseases, are associated with deforestation, while assimilation extinctions are not. Moreover, areas near extinctions have more cities, lower degrees of legal recognition of Indigenous territories and more private land ownership today, but not in the past. Our analysis favors the mechanism of Indigenous deterrence over persistent occupation.

To the extent of our knowledge, this paper is the first to investigate how historical events have shaped modern deforestation. Our findings indicate that some Indigenous extinction events favored the agricultural expansion into the Amazon rainforest since the 1970s, resulting in large-scale deforestation. An important takeaway is that, beyond economic fundamentals like land quality, history dependence matters for land use change. Hence, a complete understanding of deforestation drivers would include how the history of traditional inhabitants shapes the introduction of extensive agriculture. We hope this paper opens the door for further research on the historical roots of tropical deforestation.

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Online Appendixes for

Historical Occupation and Modern Deforestation: Evidence from Indigenous Extinctions in the Amazon

A Supplementary Discussions and Results

A.1 Descriptive Information on Historical Deforestation

The data on deforestation that we use to prepare Figure 1 is from the *Instituto Brasileiro de Pesquisas Espacias* (Brazilian National Institute for Spatial Research, INPE) and based on satellited imagery in the framework of a project called PRODES. This project was launched in the late 1980s with the aim of providing a reliable measurement of deforestation of primary forest in the Brazilian Amazon forest, and it is still active. Indeed, INPE's website (URL: `http://www.obt.inpe.br/OBT/assuntos/programas/amazonia/prodes`) provides information on yearly deforestation since 1988.

It is tricky to obtain reliable estimates of deforestation prior to 1988. Luckily, INPE had some attempts at estimating deforestation using early satellite imagery from the 1970s and early 1980s. INPE (1989) provides some statistics on deforestation starting in 1975, which we complement with information from INPE (1991). In particular, INPE (1991) explicitly mentions around 100 thousand square kilometers of deforestation prior to 1975 which is omitted in INPE (1989), and corrects upwards the deforestation in several states. We use these documents to draw the years before 1988 in Figure 1. The information mainly stems from INPE (1989), but we linearly correct the values according to the correction obtained for each state from INPE (1991).

The conclusion based on the INPE series is that accumulated deforestation was indeed very low by 1975. Even accounting for the 100 thousand square kilometers of old deforestation, only about 3% of the primary forest cover had been deforested by 1975. Deforestation then picked up at a rate of 18 thousand square kilometers per year on average until the mid-2000s. Consequently, 85% of the deforestation of the Brazilian Amazon happened after 1975.

Since all these estimates are based on remote-sensing measures, and satellite images have been available only since the 1970s, it is even harder to estimate Amazon deforestation prior to 1975. A natural possibility is to examine historical agricultural censuses. Consider the 1940 Agricultural Census, which is roughly contemporary with the Nimuendajú map. It contains the information on the areas used for pastures and cropland; given the low urbanization of the region, most deforestation was likely occupied by these land uses. In 1940, they covered only 0.89% of the total area of the municipalities with seats within the Amazon biome. This number confirms that, at the time the Nimuendajú map was prepared, Amazon deforestation was indeed very low.

A.2 Additional Robustness Tests

In this appendix, we present and discuss a series of additional robustness exercises. All tables and figures referred to in this appendix are shown in Appendix A.5.

A.2.1 Measures of Proximity to Groups

In the results shown in Table 3, the measures of proximity to Indigenous group locations in the Nimuendajú map are the counts of map entries less than 20 km away from the grid cell centroid. We use these counts both to measure proximity to extinct groups, our main variable of interest, and to measure proximity to any group, which we use as a control variable in the baseline specification. Note we compute the minimum distances from the centroid to the straight line segment that connects the two points of the entry. In Table A.5, we show that the results are robust to alternative definitions of proximity.

First, we show in column 1 that the results hold if measuring the distance to a map entry by using the distance to the entry's midpoint instead of the distance to the line segment between the two extreme points of the entry. Note that, by doing so, our measures of proximity do not deped on the range of the group in the map. Although the range of an entry may indicate the actual geographic extent of the group, in many cases a wider range may instead reflect uncertainty on the part of Nimuendajú, a long group name, or a stylistic decision. The estimated coefficient on extinction is qualitatively similar at 82.7.

Second, we show that our results are robust to concerns about how we measure distance to the entries in the Nimuendajú map. Note that we measure the distance between a grid cell and a map entry with the distance to the line segment between the two extreme points of the entry. Most map entries are straight lines, so our procedure does not introduce any distortion in this case. However, a few of the map entries have curved shapes, either semicircles or, less frequently, s-shaped. To examine the robustness of our findings, for each curved entry we input additional points. In the case of semicircle entries, we add one additional point by the middle of the entry. In the case of s-shaped entries, we add two additional points. We then connect these points to form a figure which approximates the shape of the map entry, and calculate the distance to this figure. Column 2 reports the estimates when applying this alternative method of measuring distance to the entries. The estimates are very similar: each extinct group within 20 km of the grid cell, relative to a non-extinct group, increases deforestation in 71.9 ha.

Third, we show that our findings are robust to alternative values for the distance cutoff that we use to count the number of groups in the neighborhood of each grid cell. In columns 3 to 6, we report coefficients with cutoffs ranging from 5 to 40 km. The coefficients on the association with proximity to extinct Indigenous groups remain positive and are strictly decreasing in the cutoff, ranging from 94.7 if using a 5 km cutoff to 54.8 if using a 40 km cutoff. We interpret this decreasing pattern with respect to the cutoff size as reassuring about the relevance of the precise locations of the groups on the map.

Fourth, we measure proximity using dummy variables that indicate if there is any map entry within 20 km of the grid cell. These dummies divide the sample in three regions: the first region consists of the 11% of the cells which are within 20 km of an extinct Indigenous group, the second region of the 41% of the cells which are within 20 km are within 20 km of a non-extinct Indigenous group but not of an extinct group, and the third region consists of the complementary sample with 48% of the cells that are farther then 20 km from any Indigenous group. By doing so, the identifying variation comes from whether a cell belongs to the first region, and not from any additional extinct Indigenous group near grid cells that are already in the it. The estimates, in column 6, shows that, conditional on geographic controls, deforestation in the first region is on average 81.6 ha higher than in the second region and 75.0 ha higher than in the third region.

Fifth, we use the distances, in kilometers, to the nearest extinct group and the nearest group. The results, reported in column 7, confirm the same qualitative patterns. The coefficients imply that, for each kilometer a cell is closer to an extinct group, average deforestation increases by 0.7 ha.

A.2.2 Selection in Omitted Geographic Variables

Selection in geographic variables is one of our main concerns with respect to bias in our estimates. In our main analysis, we carefully address this issue by including a long list of geographic fundamentals as controls. Despite considering a comprehensive list of fundamentals based on the history of the region and of known determinants of deforestation, there could still be other relevant variables that determine both deforestation and extinctions which are missing from these controls. Some of these factors may even be non-observable. Our failure to include them would bias the estimates for the association between deforestation and extinctions. To investigate the severity of this problem, we use the method from Oster (2019), which estimates the minimum degree of selection in the omitted variables, relative to selection in the included variables, so that our positive coefficients would be consistent with a null association between extinctions and deforestation if all the omitted variables were also included. Following Masten and Poirier (2022), we refer to the estimates for this relative degree of selection in omitted variables as the explain-away breakdown point. As we show below, this breakdown point is too high for the selection in omitted variables to be a plausible threat, since it requires a degree of selection in omitted variables that is greater than and goes in the opposite direction of the selection in included controls.

Figure A.4 displays the bias-adjusted coefficients under different values for the ratio between selection in omitted controls relative to selection in included controls. In this exercise, we make the assumption that including the omitted fundamentals in the regression would lead to a model that fully explains the variation in the dependent variable (that is, with an R-squared equal to 1). This is the most conservative assumption we could use with this method (Oster 2019). Each ratio indicated on the horizontal axis is an assumption on the degree of selection in omitted controls relative to the selection in the geographic controls included in column 3 of Table 3, so the bias-adjusted coefficient is an estimate for the "true" association between extinction and deforestation given such assumption. The estimates indicate that, for selection in omitted fundamentals to fully explain away our findings, the degree of selection on the omitted variables would have to be in the opposite direction and, in magnitude, be at least 2.018 times larger than the degree of selection in the long list of included control variables. These estimates indicate that our findings are likely not due to geographic variables we fail to include as controls.

Note that the value of -2.018 refers to the smallest ratio of selection on omitted variables relative to selection on included controls for which the data would be consistent with a zero association between Indigenous extinctions and deforestation. Masten and Poirier (2022) refer to this ratio as the explain away breakdown point. Masten and Poirier (2022) also show that sometimes a lower ratio allows the data to be consistent with a non-zero coefficient of opposite sign; they refer to this alternative ratio as the sign change breakdown point. If we impose no magnitude restriction on the negative coefficient that could be consistent with the data, then the sign change breakdown point is -0.991; note that 1 is the highest possible absolute value for the sign change breakdown point according to Theorem 4 in Masten and Poirier (2022). However, if we impose a magnitude restriction of 1,640 ha (the size of the grid cell) on the absolute value of the coefficient, then the sign change breakdown point becomes equal to the explain away breakdown point, -2.108.

A.2.3 Pre-Colonial Controls

To address selection, we have included many geographic fundamentals as control variables. An additional selection concern would occur if extinct locations correlate with the density of pre-colonial settlement, which would introduce a bias if later occupation (and deforestation) was impacted by the pre-colonial distribution of population and economic activity. Although it is difficult to measure pre-colonial settlement, we consider two proxies for it. First, we consider proximity to any pre-colonial archaeological site in the official records of the Brazilian historical protection agency, *Instituto do Patrimônio Histórico e Artístico Nacional* (IPHAN). Second, we consider proximity to any of the earthworks (geoglyphs or mound villages) of likely pre-Columbian origins that have been documented in the archaeology literature (Jacobs 2023, Walker et al. 2023). Columns 1 and 2 of Table A.6 show that historical indigenous presence does not correlate with proximity to pre-colonial archaeological sites, although it features a negative and marginally statistically significant relationship with proximity to earthworks. Column 3 of the same table also shows that, although proximity to the pre-colonial archaeological sites and to the earthworks correlate with more deforestation, the positive association between extinctions and deforestation is robust to the inclusion of proximity to archaeological sites and earthworks as controls.

A.2.4 Colonial Era Controls

A similar concern with respect to selection also applies to colonial era occupation. The colonial period in Brazil ended in 1808, when the Portuguese king moved to Rio de Janeiro in response to the French invasion of Portugal. Note that, in our baseline analysis, we use Indigenous groups recorded since 1800, so our investigation refers mostly to post-colonial extinctions. Yet, the colonial period settlements and institutions may have persistently impacted later economic development, as shown by the literature (e.g. Dell 2010, Naritomi, Soares, and Assunção 2012, Waldinger 2017, Valencia Caicedo 2019, Silva 2023), correlating both with post-1800 extinctions and modern deforestion. We consider three proxies of proximity to colonial period settlement. First, we consider proximity to a list of 66 religious *aldeamentos* from circa 1730 which were mapped by Bombardi (2014). Religious orders were important components of the Portuguese colonial enterprise in the Amazon, and they established many *aldeamentos* as villages that concentrated Indigenous populations in the process of coversion to Christianity. Second, we consider proximity to any historic (that is, post European arrival) archaeological site in the official records of *Instituto do Patrimônio Histórico e*

Artístico Nacional (IPHAN). Third, we consider proximity to any city in 2010 which was originally settled before 1800.[25] We report the estimates of the association between Indigenous extinctions and proximity to colonial sites in columns 1 to 3 of Table A.7. Neither religious *aldeamentos*, historic archaeological sites, nor colonial-origin cities feature a positive correlation with the extinctions. The correlation between extinctions and archaeological sites is even negative and marginally statistically significant. Moreover, we show in column 4 of the same table that the positive association between extinctions and deforestation is robust to the inclusion of proximity to these colonial sites as control.

A.2.5 Measurement Error

Measurement error is an important concern when using historical data sources such as the Nimuendajú map, as it may bias the coefficient estimates. Measurement error may arise due to the quality of the information in the map, distortions in the group locations, or the selective recording of the Indigenous groups and extinctions by the sources consulted by Nimuendajú. We present four robustness tests below to address these measurement errors concerns.

First, note that Nimuendajú relied on almost a thousand sources to place the groups on the map and to assign the extinction status. Hence, the map quality depends on the sources' quality and quantity, both of which are unevenly distributed across groups. In column 1 of Table A.8, we address such measurement error concern by using the number of sources assigned to each entry as a proxy for its credibility. We restrict the Indigenous groups only to those cited by at least two references. By doing so, our analysis is based only on historically well-documented map entries. The coefficients are robust to this restriction, with proximity to each well-documented extinct Indigenous group associated with additional 73.7 ha of accumulated deforestation by 2010.

Second, map distortions in the production and georeferencing of Nimuendajú's ethnohistoric map are another potential source of measurement error. To address this concern, we exploit the map markings, vertical and horizontal lines forming a $5° \times 5°$ grid, which we use to georeference the map. By construction, there are no distortions near the marks, and the map distortions plausibly increase as a grid cell is farther away from these markings. Hence, we mitigate this measurement error concern if we weigh the observations

[25] For this exercise, we use the IBGE Localities data for 2010, define a city as a municipality seat, and identify the settlement year based on the texts about municipality histories in *IBGE Cidades*.

by the inverse of their distance to the map markings. The estimates, shown in column 2 of Table A.8, are again robust to this procedure, although slightly noisier.

A third measurement error concern is that, since the map is based mainly on European or Euroamerican sources, group locations in the Nimuendajú map may be influenced by the location of non-Indigenous settlements at the time Nimuendajú worked on the map. These settlements may also correlate with modern deforestation, especially if later agricultural expansion followed from pre-existing non-Indigenous settlements. As evidence that our findings are not due to this concern, we consider two variables related to population distribution as measured by the 1940 Census, which is roughly contemporary to the Nimuendajú map (from 1944). First, we use a dummy of proximity to a municipality seat in 1940. Second, we use the population tables in the census to construct a measure of market potential, which averages the population of surrounding towns by the inverse of their distance. In Table A.9, we show that these two variables do not feature strong correlations with Indigenous extinctions and that our findings on deforestation are robust to their inclusion as control variables.

Finally, measurement error could also occur in to the classification of the Indigenous group as extinct by Nimuendajú. Nimuendajú did not detail the exact procedure he used to assign extinction status to the map entries. Based on our own reading of the sources, such assignment could have occurred in two ways. In many cases, the references used by Nimuendajú are quite specific about the extinction, sometimes even containing a historical account of it. For these groups, the extinction assignment is *positive*, that is, based on an explict reference to the extinction of the groups. In many other cases, in contrast, the references used by Nimuendajú do not explicitly indicate that the group was extinct. Nimuendajú may have assigned them an extinct status based on the lack of more recent sources which indicate a group with similar name and characteristics in the region. In particular, this may have been the case for earlier group entries, which were often scarcely recorded in the historical sources and sometimes under unusual or vague names. For these groups, the extinction assignment is *negative*, that is, based on an absence of modern references to these groups. Such difference in the extinction assingment procedure may result in measurement errors, as the extinction information for positively assigned extinct groups is plausibly more reliable than for negatively assigned ones. To address this concern, we use our systematic reading of the historical sources, explained and listed in detail in Appendix B.3, and we show that our findings are indeed driven by proximity to positively assigned extinct groups. Based on our own reading of the sources, we identify whether we could confirm the extinction in the sources. As shown in Table 1, our reading of the sources confirm the extinction of roughly half (48%) of the extinct groups used in our baseline analysis. In Table A.10, we estimate coefficients for proximity to confirmed and unconfirmed extinct groups. In column 1, we include only the proximity to confirmed groups, while in column 2 we include proximity to both types of extinct groups. The estimates show that our findings are mainly due to extinctions which are well documented in the historical sources: the coefficient on confirmed extinct groups (101.9 ha) is twice as large as the coefficient on unconfirmed extinct groups (49.1), and only the former is statistically significant.

A.2.6 Inclusion of Nimuendajú Map Entries as Controls

In the specifications reported so far, we have included the count of all groups in the neighborhood of the grid cell regardless of the extinction information, $Groups_i$, as a control variable. The coefficient on extinctions thus estimates the association between extinctions and deforestation conditional on the historical Indigenous presence. Although the inclusion of the historical Indigenous presence is useful to attenuate concerns over selection, we show in Table A.11 that our findings do not depend on such conditioning and that they also hold when conditioning in a more complicated way or using a restricted subset of Indigenous groups.

In column 1, we report estimates from a specification that does not include $Groups_i$ and the coefficients remain essentially the same. The coefficient on extinct groups, at 86.5, is qualitatively similar and slightly larger than in our baseline estimates. In column 2 , we show instead that our findings hold if we control for the count of all groups in the neighborhood in a more flexible way, with a quadratic polynomial. This latter robustness test shows that our findings are due to proximity to extinct Indigenous groups, instead of reflecting correlation of deforestation with a higher concentration of historical Indigenous groups (which in turn could correlate with extinctions).

We also control instead for a sub-sample of the Indigenous groups. Our main concern here is that the Indigenous groups may not necessarily be comparabale to the extinct ones. We have already addressed this concern by including controls for group-specific characteristics in columns 5 to 7 of Table 3. In column 3 of Table A.11, we further tackle this concern by restricting the map entries only to those which were not not contemporary to the map. Note that extinct groups always refer to extinctions before 1944, so this restricted group may provide a better comparison with respect to record dates. The coefficients remain similar to our main estimates.

A.2.7 Samples of Nimuendajú Map Entries

In our baseline analysis, we consider only group entries in the Nimuendajú map which appear with record dates since 1800. By doing so, our findings on the relationship between Indigenous extinctions and deforestation refer to the extinction of groups which appear in the historic record between 1800 and 1944. Below, we consider alternative restrictions on the map entries used in the analysis, showing the robustness of our findings and better explaining the rationale and consequences of this sample choice.

In Table A.12, we consider alternative restrictions on the Nimuendajú map. In column 1, we report the coefficients that we estimate if we do not impose any restriction on the Nimuendajú map entries. In this case, the coefficient on extinctions is smaller, indicating a statistically insignificant increase of only 12.9 ha of deforestation with each extinct Indigenous group in the neighborhood of the grid cell. In column 2, we show why this wider sample results in a smaller coefficient: when restricting the entries to those recorded before 1800, extinctions feature a null correlation with deforestation. Proximity to a pre-1800 extinct group is associated, on average, with more 7.1 ha of deforestation. Hence, our main findings hold for post-1800 extinctions, but not for pre-1800 extinctions.

There are two explanations to this difference in the correlation between extinctions and deforestation for pre and post 1800 groups. First, it is possible that the mechanisms linking historical extinctions and deforestation were not at play for older extinctions events. Historically, there were large migrations of Indigenous populations in the colonial period, often escaping the European conquest (Whitehead 1993). This high movement of Indigenous peoples imply that the Indigenous deterrence mechanism we explain and find support for in Section 5 is less likely to be at play. Second, as we go back in time, the coverage of the map and the quality of the historical sources used by Nimuendajú become more limited. See Moraes et al. (2021) for a recent anthropological study which makes this point, highlighting that older references often seem geographically restrict and based on less comprehensive references. Such worse coverage of earlier Indigenous groups could then introduce measurement error, biasing the coefficients towards zero. As the robustness tests we report below suggest, both of these reasons seem plausible explanations for the difference between pre-1800 and post-1800 estimates.

In column 3 of Table A.12, we consider an alternative restriction based on the language information in the map: when taking the count of Indigenous groups in the 20 km neighborhood of the grid cell, we use only groups for which Nimuendajú listed a linguistic family, regardless of the year in which the group is recorded. Note that the assignment of a linguistic group suggests that Nimuendajú was well-informed about these groups, particularly since language was a salient information from ethnographic studies and is often associated with cultural characteristics of interest. Therefore, we see the sample of known-language groups as a restriction to groups about which the historical record used by Nimuendajú contained richer information. The estimates show that the extinction of known-language Indigenous groups is strongly predictive of deforestation, which increases by 71.5 ha with proximity to each of these extinct groups.

In Table A.13, we show the estimates when using alternative year cutoffs. We consider cutoffs between 1600 and 1900, which we vary according to 50 year steps. The extinctions feature statistically significant positive correlations with deforestation for all cutoffs since 1750, but not for earlier cutoffs. The largest coefficient refers to the restriction to post 1850 groups. Hence, Table A.13 shows that our findings hold for relatively modern extinctions, including those from the 20th century, in contrast to the null correlation found for 17th and 18th century groups.

A.2.8 Extensive and Intensive Margins of Deforestation

Our main findings refer to the average deforestation in the Brazilian Amazon. The positive correlation between extinctions and average deforestation may occur both due to more grid cells having some deforestation (extensive margin) and due to each grid cell having more deforestation conditional on having some deforestation (intensive margin). In Table A.14 we document these two margins. We first examine the extensive margin by using, as a dependent variable, a dummy equal to one if a grid cell has experienced any accumulated deforestation by 2010; 42% of the grid cells in our sample have been at least partly deforested. The estimates indicate that, for each extinct group in the cell's neighborhood, the cell is, on average, 5.4 percentage points more likely to have any deforestation. Second, we examine the intensive margin by restricting our sample to the cells that have been partly deforested; on average, such cells exhibit 627.1 ha of deforestation. Proximity to extinct groups predicts, on average, more 86.3 ha of deforestation within this sample. Both coefficients are sizable and statistically significant, suggesting that both extensive and intensive margins explain our results.

A.2.9 Estimation Methods

Our findings are also robust to alternative estimation methods, as we show in Table A.15.

We first consider alternative approaches to inference, that is, to the estimation of the standard errors of the equation coefficient. For our baseline estimates, we account for heteroskedasticity and spatial correlation by multi-way clusterig according to the four interlaced grids of $1^\circ \times 1^\circ$. In column 1, we estimate robust standard errors using instead the approach proposed by Conley (1999); although this method is computationally demanding given our large sample and each equation takes many hours to be estimated, the standard error estimates remain similar. In column 2, we show that our findings are robust to clustering standard errors by municipality, the administrative boundaries that define local governments and within which deforestation may be correlated due to local economic shocks.

We also consider an alternative estimation method for the coefficients of equation 1. Note that, by construction, our dependent variable, the area of accumulated deforestation within a grid cell, has values bounded between 0 and 16,040 ha (the size of the grid cell). The linear model we use may lead to predicted values that are outside these bounds. In fact, for 16.8% of our grid cells, our linear model predicts negative values of accumulated deforestation. A natural question is whether our findings hold when estimated in a model that does not allow for out-of-bounds predicted values. In column 3 of Table A.15, we show that our findings hold when we estimate a tobit model in which the dependent variable has the bounds above. Note that the estimated coefficient on extinct Indigenous groups, 147.8, is larger than the ordinary least squares coefficients. This difference may be explained by the fact that, relative to the ordinary least squares, the tobit model gives more weight to variations in deforestation and extinct groups across grid cells for which the geographic fundamentals predict higher deforestation. These are likely to be the regions where the historical Indigenous extinctions may feature a stronger association with modern deforestation.

A.2.10 Coefficients on Simulated Extinctions

A natural concern is whether the large estimated coefficients on extinct groups are effectively due to their extinction status, as recorded in the map, or whether they could plausibly occur for a subset of map entries by random chance. We perform a simulation exercise to assess this concern. In each simulation, we randomly assign synthetic extinction status to the map entries with a probability of 21.7%; this is the share of extinct groups in the Brazilian Amazon. We then re-estimate equation 1 after replacing proximity to actual extinct groups by proximity to simulated extinct groups. We perform 1,000 simulations. The histogram in Figure A.5 shows the distribution of the estimated coefficients. The simulated coefficients are concentrated around zero, and only 1 of the 1,000 coefficients from the simulated extinctions is as large as the coefficient on actual extinct groups.

A.2.11 Group-level regressions

All the estimates presented so far are based on the grid-level regression of equation 1. In Table A.16, we present instead group-level estimates. In comparison with the grid-level estimates, which provide an association that is representative for the average site of the Brazilian Amazon, group-level estimates are representative for the average Indigenous group in our sample. We estimate the following equation by ordinary least squares:

$$\overline{y}_g = \beta Extinct_g + X_g'\theta + u_i, \tag{A.1}$$

where each g is a group, our dependent variable, $\overline{y}_g$, is the average deforestation of all sample grid cells that are within 20 km of the group g, and $Extinct_g$ is a dummy which indicates if the group appears as extinct in the Nimuendajú map. Our sample consists of all post-1800 groups for which there is a sample grid cell within 20 km. There are 697 such groups, of which 149 (21%) are extinct.[26] As controls, we include the geographic coordinates of the group and the average, across grid cells in the 20 km buffer around the group, of all the fundamentals included in column 3 of Table 3.

The estimates, in column 1 of Table A.16, again show a positive and strong association between extinctions and accumulated deforestation in 2010. The magnitude of the coefficient is similar to the grid-level estimates, indicating that average deforestation in cells near an extinct group increase by 80.9 ha if the group was extinct. In column 2, we include the number of other Indigenous groups within 20 km of the group g and the number of extinct Indigenous groups within the same distance as controls. By doing so, we account for the geographic proximity between groups. The coefficient remains large and significant, again suggesting the relevance of Indigenous extinctions as a predictor of modern deforestation.

[26] Note that there are more groups for this exercise than in Table 1, which displays summary statistics only for the 599 groups with midpoints whithin the Brazilian Amazon.

A.3 Additional Results on Mechanisms

In this appendix, we present additional empirical exercises which are useful to test the mechanisms presented in Section 5. All tables and figures referred to in this appendix are shown in Appendix A.5.

A.3.1 Roads

In the main text, we examine the association of historical Indigenous extinctions with settlements and a variety of categories for land tenure. In Table A.18, we investigate the relationship with road infrastructure. We find a sizable positive association between extinctions and road infrastructure in 2010. In column 1, we consider all roads. Each extinct group in the neighborhood increases the road extension within the grid cell by 243 m. In column 2, we consider only federal and state roads, arguably the most important roads in our data, and we find qualitatively similar results. Note that our findings on road infrastructure are consistent with the development of cities and private land tenure that we document in Section 5, clearly indicating the use of sites near Indigenous extinctions for modern agriculture and settlement.

A.3.2 Horse Race Estimates

In Subsection 5.3, we examine the association between extinctions and many measures of modern settlement and land tenure. Although these variables shed light on the mechanisms linking historical extinctions to deforestation, none of these variables comes close to pinning down our estimated relationship. Table A.19 display estimates from "horse race" equations in which we augment equation 1 with proximity to settlements, roads, Indigenous land rights, and private land tenure as controls. Columns 1 to 4 show the coefficients when we include each group of variables separately. The coefficients on extinct groups decreases but always remain large and statistically significant. The largest reduction occurs if we control for proximity to cities and settlements. These estimates suggest that neither proximity to population centers, roads, Indigenous lands, or private farms explain by themselves our main findings. However, the joint inclusion of the variables in column 5 strongly reduces the coefficient on extinct Indigenous groups, which falls from 75.0 to 17.5 and is now statistically insignificant. In this way, proximity to population centers, infrastructure, and land tenure seem to jointly explain (in a statistical sense) the association between Indigenous extinctions and accumulated deforestation.

A.3.3 Heterogeneity of Occupation and Land Tenure by Extinction Type

In Table A.20, we show that the heterogeneity with respect to the likely causes of extinction holds not only for deforestation, but also for many of these variables. Interestingly, we find heterogeneity for cities and private land tenure, but not for Indigenous lands. These contrasting findings are consistent with traditional communities deterring the expansion of agricultural frontiers not only through the assignment of Indigenous land tenure, which would require their self-identification as Indigenous.

A.3.4 Heterogeneity by Geography

As a sanity check of the mechanisms, we examine the heterogeneity of the association between Indigenous extinctions and deforestation according to geographic characteristics. To perform such heterogeneity analysis, we fix a heterogeneity variable and identify whether the grid cell is in the region where this variable is below or above the sample median. We then interact the count of extinct and Indigenous groups within 20 km of the cell with dummies for each region. By doing so, we obtain two estimates for β indicating the associations between Indigenous extinctions and deforestation within each half of the sample. We also obtain two estimates for η, capturing the association between non-extinct Indigenous groups and deforestation in each region. The heterogeneity estimates are reported graphically in Figure A.6.

We first consider the heterogeneity of our results with respect to agricultural productivity. Note that the Indigenous deterrence mechanism posits that the extinctions imply a reduction in the costs of agricultural-related deforestation, as farmers in these areas are less likely to face land disputes with traditional populations, and that the occupation persistence mechanism posits an increase in market access, due to proximity with the inception points. However, farming decisions depend not only on costs and market access, but also on whether land quality allows a profitable use of the land. Hence, according to either mechanism, the association between extinctions and deforestation should be larger in more productive land. In Panel (a), we test this conjecture by examining the heterogeneity with respect to the attainable yield for soybeans, which proxies for the potential of the land for modern agriculture. As a robustness, in Panel (b) we use the attainable yield of cassava, the main staple crop of the Amazon. In either case, the association between extinctions and deforestation is twice as strong and statistically significant only for the most productive half of the sample.

Under a similar argument, both mechanisms suggest that the association between extinctions and deforestation is likely to be stronger in regions that feature better amenities for non-Indigenous settlers. In Panel

(c) of Figure A.6, we use malaria suitability as a proxy for these amenities. We find that the association is indeed stronger in regions that have a lower climactic suitability for malaria.

In Panel (d), we examine the heterogeneity with respect to distance to the São Paulo. We find that the association between extinctions and deforestation is high in the sub-sample that is closer to São Paulo, while there is no association in the region farthest away. Since modern agriculture has been expanding into the Amazon mostly along the southern fringes of the forest, proximity to São Paulo indicates proximity to the agricultural frontier. Hence, the demand for farmland is plausibly stronger in sites which are closer to São Paulo. Since both mechanisms suggest that deforestation would occur near historical Indigenous extinctions only if there is demand for farmland, the heterogeneity results presented in Panel (d) are again consistent with the mechanisms.

A.3.5 Ethnic Composition

As suggestive evidence for the recent settlement of the sites near historical Indigenous extinctions, we examine the ethnic composition of the population in 2010. We use data at the census block (*setor censitário*) level from the Brazilian 2010 Census to compute the share of the population by self-reported ethnicity. In the states which include the Brazilian Amazon, the most commonly reported ethnicity is brown (*pardo*), comprising 65.5%. Whites account for 24.4%, blacks comprise 7.3% and Asians are 1.0%. Only 1.7% of the population self-identifies as Indigenous. In comparison with the rest of Brazil, the Amazon is significantly less white, more brown and more Indigenous.

The census blocks provide spatially fine data on the ethnic composition of our study region. There are almost 25 thousand inhabited census blocks intersecting the Brazilian Amazon. We use this sample to estimate the following equation:

$$y_b = \beta \, ExtinctGroups_b + \eta \, Groups_b + X_b'\theta + u_i \tag{A.2}$$

The dependent variables are the share of each ethnic group in the population of census block b. The variables $ExtinctGroups_b$ and $Groups_b$ are defined as for the grid cells, but using the centroids of the census blocks to identify the number of map entries within 20 km. We also calculate all geographic fundamentals used in column 3 of Table 3 at the census block level. We weight each census block by area and perform inference through the same multi-way cluster robust procedure used for most of our estimates.

The estimates are reported on columns 1 to 5 of Table A.21. Column 1 shows that extinctions are associated with a sizable decline in the Indigenous share, which falls by 9.4 p.p. for each extinct group in the neighborhood. The coefficient in extinctions are in the opposite direction as the coefficient on non-extinct groups, which is large and positive. Note that these estimates provide confirmation that the extinctions led to lower Indigenous presence today.

In columns 2 and 3, we show that the decline in the Indigenous share occurs due to an increase in both the white and brown shares. The share of whites increase by 4.0 p.p., while the share of browns increase by 5.6 p.p.. Note that, relative to the sample mean, the increase in the white population is particularly striking. This findings is suggestive that many areas near Indigenous extinctions feature a more recent settlement. In fact, white individuals in the Amazon are significantly more likely to have migrated from outside the region: while only 9% of the non-white population was born outside one of the states in the Brazilian Amazon, 20% of the white inhabitants were born outside. These findings are consistent with an important role for migrants in the expansion of the agricultural frontier. We investigate the connection between extinctions and migration in a more directed way below.

For completeness, columns 4 and 5 of Table A.21 estimate the association between extinctions and the share of blacks and Asians. We find no correlation with extinctions for these ethnic groups.

A.3.6 Migration

To investigate the relationship between extinctions and recent migration, we use information about the state of birth from the 2010 Census. The state of birth was collected only in an extended questionnaire which was applied to a sub-sample of the Brazilian population. This sub-sample is representative only at the municipality level. Hence, we perform our estimates on migration at the municipality level. We estimate the following equation:

$$y_m = \beta\, ExtinctGroups_m + \eta\, Groups_m + X_m'\theta + u_i \qquad \text{(A.3)}$$

The dependent variable is the share, in municipality m, of the total population which was born outside one of the states in the Brazilian Amazon. To define $ExtinctGroups_m$, $Groups_m$, and the fundamentals X_m at the municipality level, we average the values of these variables across all grid cells in our sample which are within the municipality m. Our municipality sample consists of all 501 municipalities with seats within the Brazilian Amazon. We weight each observation by municipality area and perform inference through the same multi-way cluster robust procedure used for most of our estimates.

We report the estimated coefficients on column 6 of Table A.21. The coefficients indicate a strong positive relationship between extinctions and the share of migrants in the municipality, as each extinct group increases the share of migrants in 8.2 p.p.. This is a large association, corresponding to 70% of the sample mean of 11.7%. This finding is consistent with the estimates on proximity to cities by date of settlement which we report in Table 6, indicating a recent settlement of the sites near historical extinct Indigenous groups.

A.3.7 Modern Indigenous Presence and Deforestation

The Indigenous deterrence mechanism postulates that the association between extinctions and deforestation occurs due to a deterrence effect that Indigenous groups exert against non-Indigenous land occupation and settlement. It implicitly assumes that most of the deforestation is done by non-Indigenous individuals. Since the authorship of deforestation is unclear and usually non-observable, this is not an assumption that may be directly tested. Yet, as a sanity check, we show in Table A.22 that areas with more Indigenous inhabitants are significantly less deforested.

To investigate this, we use the non-zero population census blocks as our sample. For each census block, we measure the share of its surface that has been deforested up to 2010 according to PRODES. We use the deforestation share as our dependent variable, which we regress on the ethnic composition of the census block. As for the estimates of Table A.21, we weight each census block by area and we condition on our baseline geographic control variables.

We report the results in Table A.22. In column 1, the only ethnic explanatory variable we include is the Indigenous share in the population. The coefficients indicate that an increase in 10 p.p. in the Indigenous share is associated with a decrease of 1.4 p.p. in the deforested area. This is a sizable coefficient, given a sample mean of 19.2% in accumulated deforestation. In column 2, we also include the shares of whites, blacks, and Asians. Note that browns (*pardos*) are the reference category. By doing so, the coefficient on the Indigenous share remains negative and statistically significant but falls to -0.08. The share of whites is strongly positively associated with deforestation: an increase in 10 p.p. in the white composition (at the expense of browns) correlates with an additional 3.0 p.p. in deforestation. The share of Asians does not feature a statistically significant correlation with deforestation, while the share of blacks is negatively associated with deforestation.[27]

In sum, these estimates suggest that areas with a higher modern Indigenous population share feature less deforestation. In contrast, deforestation is higher in areas where browns and especially whites comprise a larger share of the population. These estimates are correlations and do not reflect a causal effect. However, they support the implicit assumption in the Indigenous deterrence hypothesis that most deforestation is done by non-Indigenous agents. They also suggest that whites, who are more likely to have migrated in recent decades to the Amazon, are likely to be responsible for a disproportionate share of the deforestation (when compared to their share in the population).

[27]The coefficients on blacks and Indigenous are not statistically different. The Brazilian Amazon contains many *quilombola* communities, descendants of runaway slaves. These are also traditional populations which may plausibly exert a similar deterrence against deforestation as Indigenous populations.

A.4 Regressions on Historical Agricultural Census Data

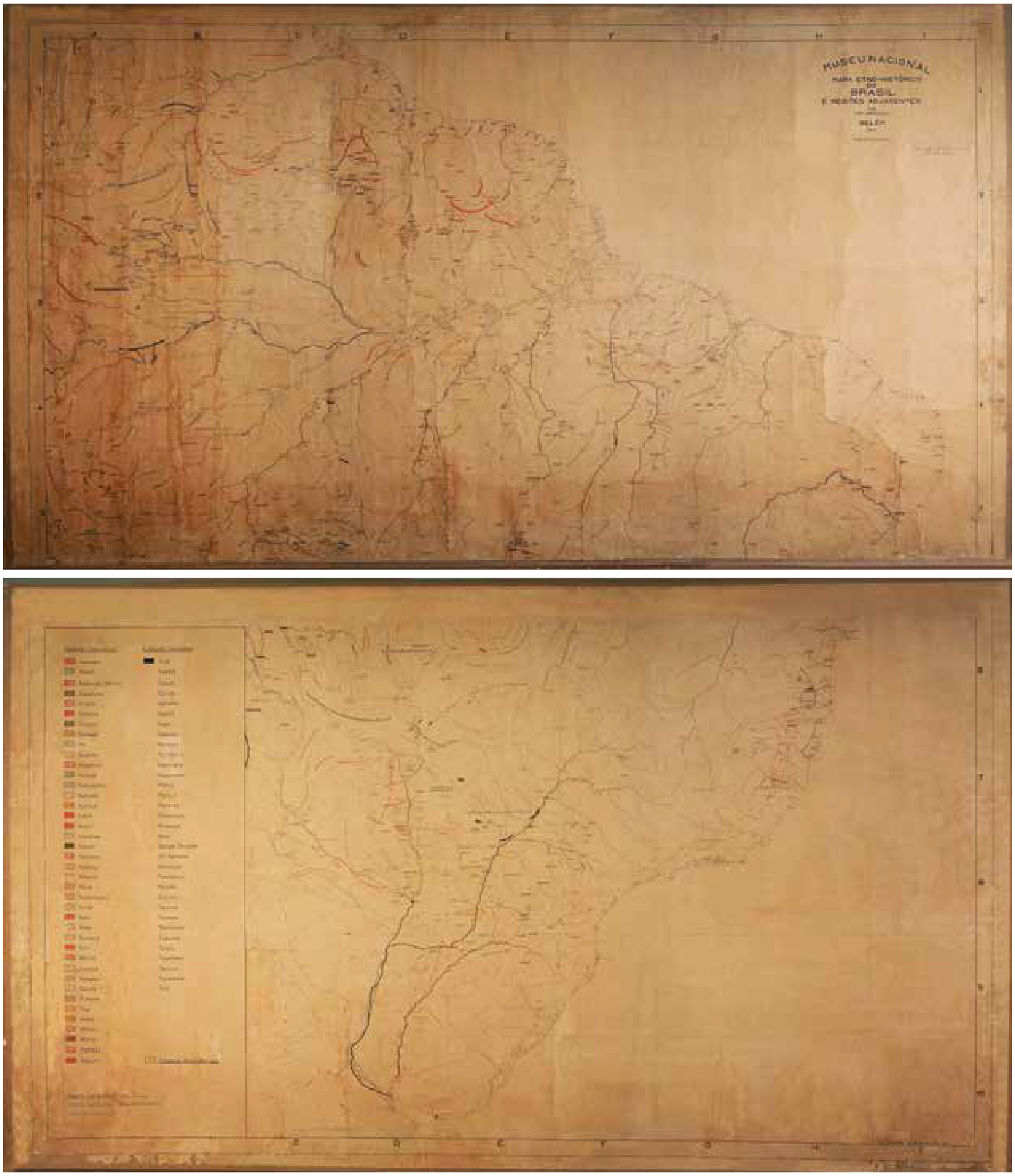
To estimate the association between extinctions and farm ownership in the past, we use municipality-level tabulations from the 1920 and 1940 Agricultural Census. The spatial resolution of these data is too coarse for a regression at the grid cell level. Instead, we estimate municipality-level regressions of the form:

$$y_m = \beta \, ExtinctGroups_m + \eta \, Groups_m + X_m'\theta + u_i \tag{A.4}$$

The dependent variables are the ratios between total farm area or total farming (cropland plus pastures) areas to total municipality area. We manually digitize all these areas from the census tabulations. The variables $ExtinctGroups_m$ and $Groups_m$ are defined as for the grid cells, but using the coordinates of the 1920 or 1940 municipality seats from IBGE (2011) to identify the number of map entries within 20 km of these seats. Note that the census does not allows us to know exactly where the farms are, but it is plausible that the highest concentration of private land occurs near the municipality seats. We also include the geographic coordinates of the municipality seats and the same set of geographic fundamentals as control variables. For each municipality seat, we assign the geographic fundamentals of the nearest 4 km $\times$ 4 km grid cell. We also use the distance to the closest grid cell in our grid sample to define the sample of municipalities by using selecting only the observations for which this distance is up to 4 km. This procedure results in 117 observations for 1920 and 116 observations for 1940. Finally, we weight each observation by municipality area and perform inference through the same multi-way cluster robust procedure used for most of our estimates.

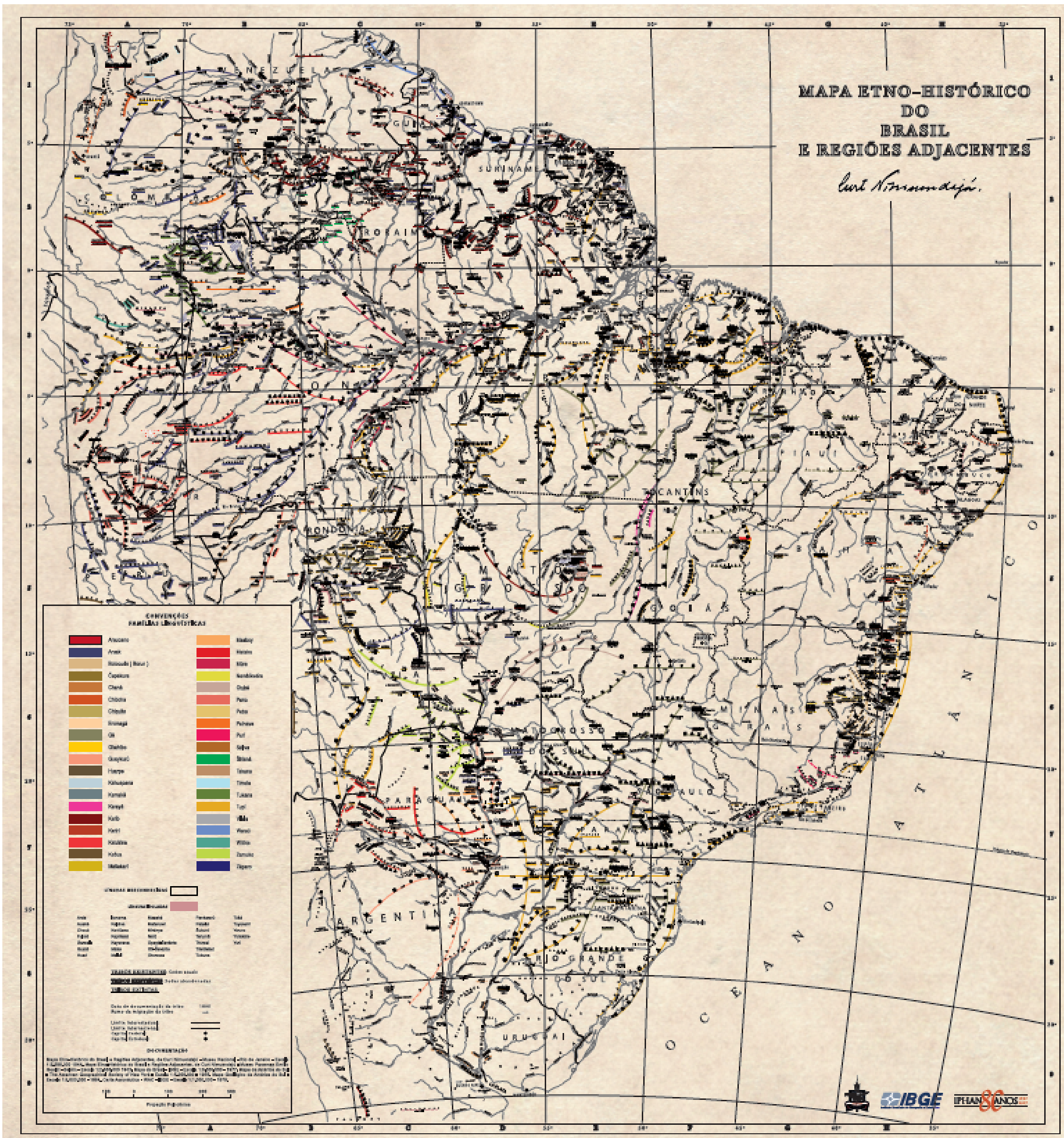
A.5 Additional Figures and Tables

Figure A.1: Nimuendajú map: manuscript, 1944



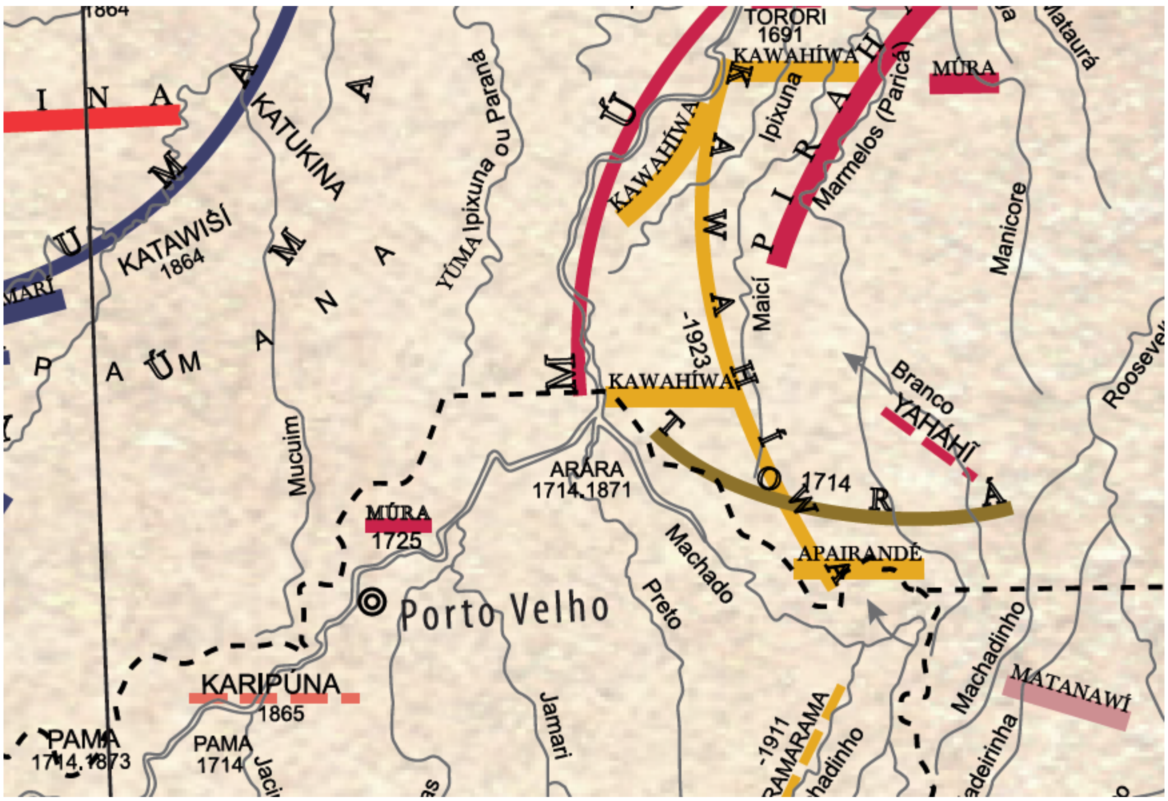
Note: The figure displays a picture of the original 1944 Ethnohistoric Map of Curt Nimuendajú held by *Museu Nacional*, Federal University of Rio de Janeiro. The map dimensions were 1 m × 1.9 m. Source: Nimuendajú (2017).

Figure A.2: Nimuendajú map: digital version, 2017



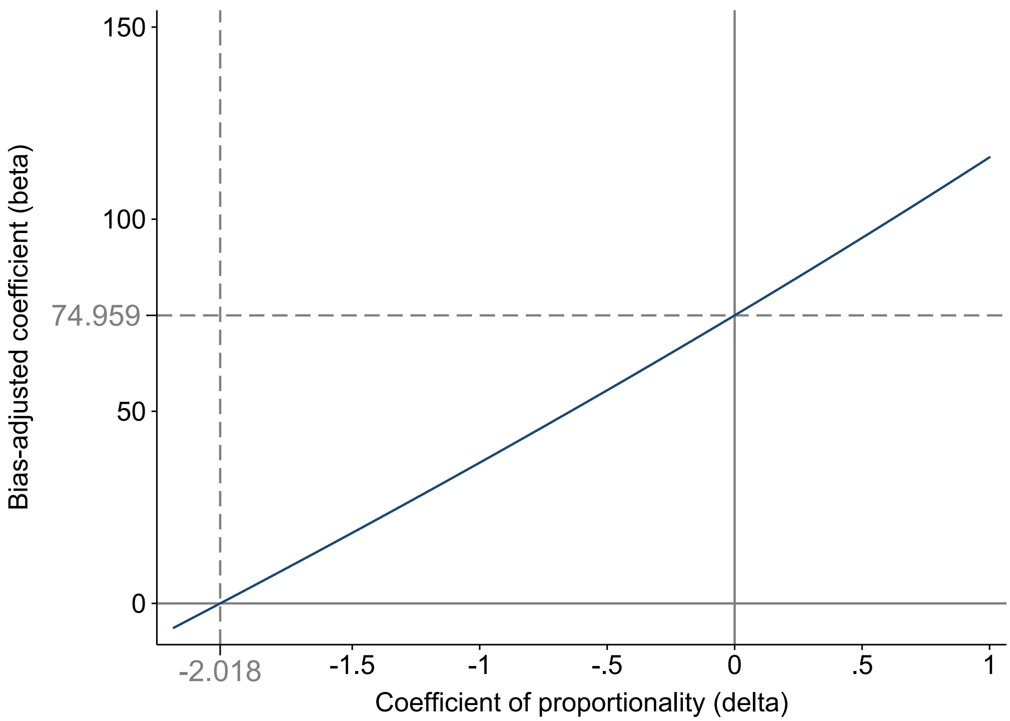
Note: The figure displays the digital version of the Ethnohistoric Map of Curt Nimuendajú published in 2017. This is the map we georeference and use to construct the data on Indigenous historical locations.

Figure A.3: Nimuendajú map: detail of the middle Madeira valley



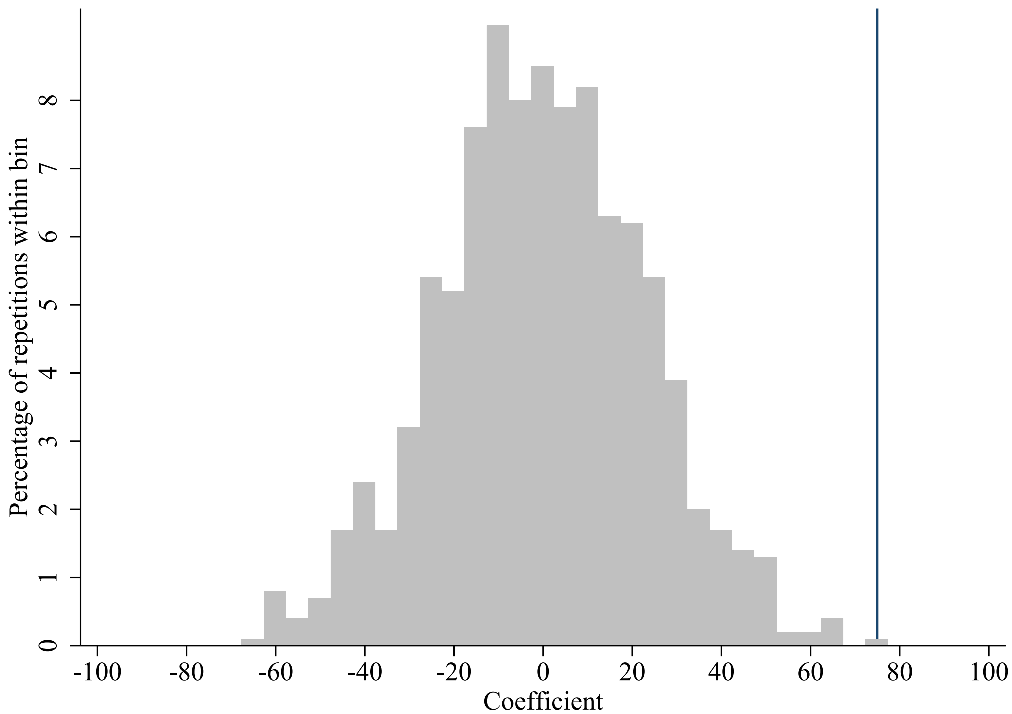
Note: The figure displays a subset of the Ethnohistoric Map of Curt Nimuendajú published in 2017. The figure focuses on the Madeira River valley near the city of Porto Velho. The colors indicate the known language groups. The dashed lines indicate groups of known-language that were marked as extinct by Nimuendajú. Entries without color indicate groups with uncertain or unknown languages. The fonts also indicate the extinction status of the group; a finer writing denotes extinctions. The dates indicate the years associated with the historical record of the group.

Figure A.4: Robustness to selection in omitted geographic fundamentals



Note: In the vertical axis, the graph displays the bias-adjusted coefficient proposed by Oster (2019) for the relationship between extinct groups and accumulated deforestation by 2010, in hectares, measured by PRODES. The horizontal axis displays different values for the coefficient of proportionality between selection in omitted variables and selection in included control variables; this parameter is denoted by δ in the framework of Oster (2019), and it enters as an assumption. Our analysis is conditional on $Groups_i$; in the definitions of Oster (2019), the estimates of our short regression are in column 1 of Table 3, while the estimates of the intermediate equation are displayed in column 3 of the same table. Each value δ in the horizontal axis thus indicates that the covariance between $ExtinctGroups_i$ and the omitted fundamentals (residualized from the observable fundamentals), conditional on the number of any groups within 20 km of the grid cell, is assumed to be δ times the (conditional) covariance between $ExtinctGroups_i$ and the included control variables (geographic coordinates and fundamentals). We assume that the inclusion of the omitted variables would fully explain the variation in deforestation across the sample; Oster (2019) uses the parameter $R^2_{max} = 1$ for this conservative assumption. The horizontal dashed gray line indicates our baseline coefficient after the inclusion of the control variables; this value holds under $\delta = 0$. For the bias-adjusted coefficient to be 0, then $\delta = -2.018$; this value is indicated on the horizontal axis and by the vertical dashed gray line.

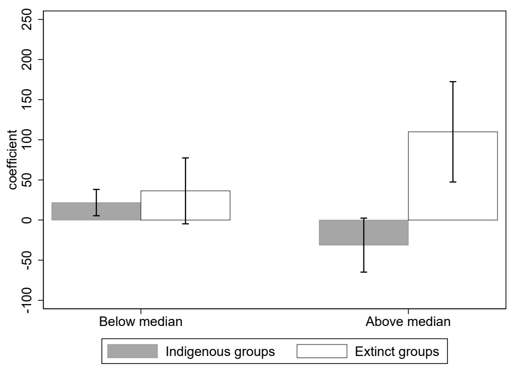
Figure A.5: Distribution of coefficients on “simulated extinctions”



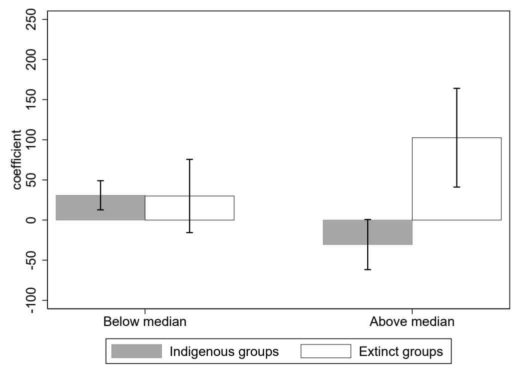
Note: The figure displays a histogram of estimates of coefficients in equation 1. The dependent variable is accumulated deforestation in 2010, in hectares, measured by PRODES, and the equation includes latitude, longitude, the geographic fundamentals used in column 3 of Table 3, the number of groups in the Nimuendajú map that are within 20 km of the grid cell, and the number of groups within 20 km of the grid cell for which we randomly assign a “simulated exticțion status”. We draw 1,000 simulations, randomly assigning “extinction status” with probability 0.217. The histogram in the figure indicates the distribution of the resulting coefficient on the number of “simulated extinct” groups within 20 km of the grid cell. The vertical blue line on the right indicates the coefficient on the number of actual extinct groups from column 3 of Table 3.

Figure A.6: Heterogeneity of the estimates by geographic characteristics

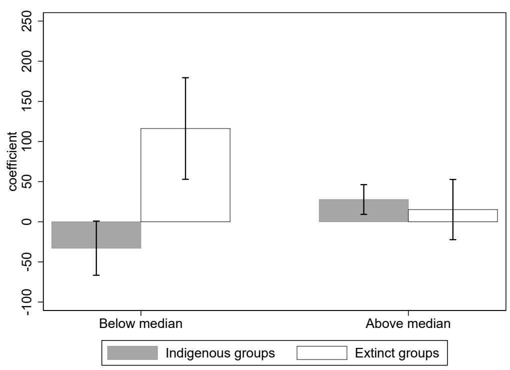
(a) Attainable yield: soybeans



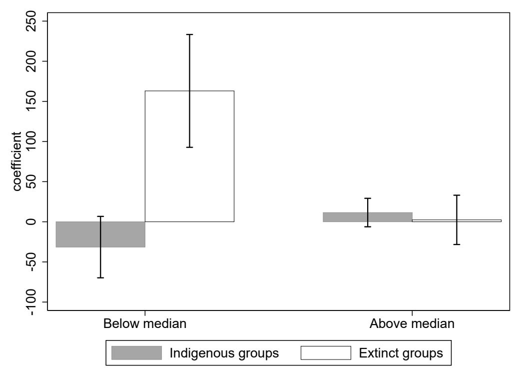
(b) Attainable yield: cassava



(c) Malaria suitability



(d) Distance to São Paulo



Note: Each graph displays the estimated coefficients on “Extinct groups” (transparent bar) and “Indigenous groups” (shaded gray bar) for different heterogeneity exercises. The dependent variable is accumulated deforestation by 2010, in hectares, measured by PRODES. The estimated equation includes latitude, longitude, and all geographic fundamentals from column 3 of Table 3. The variables “Extinct groups” and “Indigenous groups” are interacted with a dummy indicating if the value of the variable described on the top of each figure is above or below the sample median. Bars on the right (left) indicate the coefficients for the sub-sample which is above (below) the median. We also include the heterogeneity dummy as a control variable. See the text in Appendix A.2 for a description of each heterogeneity variable. The graphs also display the 90% confidence intervals as vertical lines, based on standard errors multi-way clustered according to four interlaced grids of $1° \times 1°$.

Table A.1: Summary statistics of Nimuendajú's map entries (full map)

	Obs.	Mean	Std. Dev.
Group entry in Brazilian Amazon	2124	0.39	0.49
Post-1800 group	2124	0.68	0.47
Latitude	2124	-8.23	10.23
Longitude	2124	-57.58	9.74
Group entry range (km)	2124	79.24	80.16
Number of sources	2124	8.93	10.98
Dated entry	2124	0.54	0.50
Oldest year of record of the entry	1148	1760.00	102.68
Known linguistic family	2124	0.68	0.47
Extinct	2124	0.45	0.50

Note: Each observation is a group entry in the Nimuendajú map. The table displays summary statistics for all groups in the map.

Table A.2: Summary statistics of sample grid - geographic fundamentals

	Mean	Std. Dev.
Latitude	-5.03	4.34
Longitude	-59.22	6.76
Altitude (m)	173.59	129.18
Terrain ruggedness index (m)	30.44	37.60
Water (ha)	38.24	172.34
Non-forest coverage (ha)	114.02	357.60
Malaria index	0.76	0.06
Average temperature (C)	26.12	0.70
Average monthly rainfall (mm)	189.24	29.42
Average relative humidity (%)	83.51	3.81
Close (up to 10 km) of a main river	0.16	0.37
Hevea br. range	0.57	0.50
Attainable yield: soybeans (kg DM)	1525.77	594.90
Attainable yield: cassava (kg DM)	904.66	533.22
Attainable yield: cacao (kg DM)	1172.53	375.27
Caloric suitability index (cals)	8412.21	1288.00
Distance to São Paulo (km)	2545.67	541.43
Observations	259,574	

Note: Each observation is a 4 km $\times$ 4 km grid cell within the Brazilian Amazon. The area of each grid cell is approximately 1,640 ha. There are 259,574 grid cells in the sample.

Table A.3: Balance of geographic fundamentals

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	Longitude	Latitude	Altitude	TRI	Water	Non-forest
Extinct groups	-0.509	0.595	-25.348**	2.051	1.995	-0.845
	(0.696)	(0.590)	(10.073)	(2.652)	(5.148)	(28.896)
Indigenous groups	-0.959**	-0.024	17.183***	1.108	-5.314	9.597
	(0.404)	(0.296)	(6.513)	(1.434)	(4.044)	(18.706)
Sample mean	-59.220	-5.033	173.589	30.435	38.242	114.016
Dependent variable:	Malaria index	Temperature	Rainfall	Humidity	River ($\leq$ 10 km)	Dist. to SP
Extinct groups	0.003	0.140**	0.992	0.376	0.020	69.505
	(0.007)	(0.062)	(3.981)	(0.406)	(0.023)	(70.876)
Indigenous groups	-0.005	-0.089**	1.742	-0.353	0.021**	66.941*
	(0.004)	(0.036)	(2.386)	(0.228)	(0.010)	(38.422)
Sample mean	0.756	26.119	189.237	83.506	0.162	2545.671
Dependent variable:	Soybeans pot. yield	Cassava pot. yield	Cacao pot. yield	Caloric suit.	*Hevea br.* range	
Extinct groups	-63.417	-57.610	-9.333	-118.166	-0.034	
	(58.391)	(50.952)	(34.225)	(147.963)	(0.054)	
Indigenous groups	35.074	47.954*	9.984	12.152	0.002	
	(31.574)	(26.531)	(19.471)	(85.820)	(0.027)	
Sample mean	1525.768	904.657	1172.526	8412.208	0.569	

Note: The table displays estimates of the coefficients in equation 1. The dependent variable is the geographic fundamental on the top of the column. The equation does not include any control variable. The sample size is 259,574. Standard errors in parentheses are multi-way clustered according to four interlaced grids of $1° \times 1°$. Statistical significance: * 10%, ** 5%, *** 1%.

Table A.4: Extinct Indigenous groups and land use in 2010

	Primary forest area (ha) (1)	Farming area (ha) (2)	Cropland area (ha) (3)	Pasture area (ha) (4)	Urban area (ha) (5)	Light intensity (6)
Extinct groups	-90.133***	84.478***	1.574	82.813***	0.997**	0.151***
	(27.096)	(24.234)	(2.699)	(24.097)	(0.407)	(0.052)
Indigenous groups	10.067	-9.189	-3.066	-5.776	-0.492**	-0.060**
	(13.769)	(13.122)	(2.142)	(12.531)	(0.244)	(0.025)
R-squared	0.452	0.431	0.135	0.405	0.007	0.020
Sample mean	1351.188	218.450	10.782	206.746	1.433	0.201
Observations	259574	259574	259574	259574	259574	259574

Note: The table displays estimates of the coefficients in equation 1. From columns 1 to 5, the dependent variable is the land use coverage indicated at the top, in hectares; these data are from MapBiomas. In column 6, the dependent variable is the average nightlightht intensity of the grid cell, from DMSP-OLS. The estimated equation includes latitude, longitude, and all geographic fundamentals from column 3 of Table 3. Standard errors in parentheses are multi-way clustered according to four interlaced grids of $1^\circ \times 1^\circ$. Statistical significance: * 10%, ** 5%, *** 1%.

Table A.5: Robustness to alternative proxies for proximity to map entries

	Dist. to midpoint	Dist. to approx. shape	Count of groups within:				Binary var.	Distance (km)
			5 km	10 km	30 km	40 km		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Extinct groups	82.702**	71.904***	94.713***	86.270***	64.095***	54.817***	81.619***	-0.733**
	(34.696)	(25.925)	(34.380)	(31.747)	(21.732)	(18.723)	(29.222)	(0.310)
Indigenous groups	-7.242	-5.316	-9.560	-6.946	-4.270	-2.684	-6.660	-0.371
	(17.896)	(13.580)	(16.563)	(15.901)	(11.454)	(9.904)	(18.090)	(0.397)
R-squared	0.434	0.436	0.434	0.435	0.437	0.438	0.435	0.450
Observations	259574	259574	259574	259574	259574	259574	259574	212404

Note: The table displays estimates of the coefficients in equation 1. The dependent variable is accumulated deforestation by 2010, in hectares, measured by PRODES. The estimated equation includes latitude, longitude, and all geographic fundamentals from column 3 of Table 3. The measures of proximity to Indigenous group entries in the Nimuendajú map vary by column. In column 1, we use the count of groups whose midpoints are within 20 km of the grid cell. In column 2, we use distances to the approximate of the entries. In columns 3 to 6, we count groups that are within different distance cutoffs, from 5 km to 40 km. In column 7, we use binary variables that indicate if any group or any extinct group is within 20 km of the grid cell. In column 8, we use the distances (in kilometers) to the nearest group and to the nearest extinct group. Standard errors in parentheses are multi-way clustered according to four interlaced grids of $1^\circ \times 1^\circ$. Statistical significance: * 10%, ** 5%, *** 1%.

Table A.6: Robustness to pre-Columbian sites

	Arch. site (1)	Earthwork (2)	Deforestation (3)
Extinct groups	-0.000	-0.020	79.359***
	(0.019)	(0.012)	(24.985)
Indigenous groups	-0.003	0.005	-7.135
	(0.007)	(0.007)	(12.753)
Proximity to pre-Columbian arch. site			186.125***
			(28.472)
Proximity to earthwork			215.719***
			(51.400)
R-squared	0.085	0.090	0.454
Dependent variable mean	0.088	0.030	260.722
Observations	259574	259574	259574

Note: The table displays estimates of the coefficients in equation 1. The dependent variable is: in column 1, a dummy indicating that a pre-colonial archaeological is within 20 km of the grid cell; in column 2, a dummy indicating that an earthwork (geoglyph or mound village) is within 20 km of the grid cell; in column 3, accumulated deforestation by 2010, in hectares, measured by PRODES. The estimated equation includes latitude, longitude, and all geographic fundamentals from column 3 of Table 3. Standard errors in parentheses are multi-way clustered according to four interlaced grids of $1° \times 1°$. Statistical significance: * 10%, ** 5%, *** 1%.

Table A.7: Robustness to colonial sites

	Aldeamento (1)	Arch. site (2)	Settlement (3)	Deforestation (4)
Extinct groups	-0.005	-0.009*	0.000	75.293***
	(0.004)	(0.005)	(0.008)	(26.128)
Indigenous groups	-0.003	-0.003	-0.001	-6.395
	(0.002)	(0.004)	(0.004)	(13.436)
Proximity to religious *aldeamentos*				-27.124
				(45.124)
Proximity to historic arch. site				56.257
				(51.334)
Proximity to pre-1800 settlements				126.619**
				(55.527)
R-squared	0.051	0.060	0.096	0.438
Dependent variable mean	0.017	0.019	0.026	260.722
Observations	259574	259574	259574	259574

Note: The table displays estimates of the coefficients in equation 1. The dependent variable is: in column 1, a dummy indicating if any of the religious *aldeamentos* circa 1730 from Bombardi (2014) is within 20 km of the grid cell; in column 2, a dummy indicating that a hsitoric archaeological is within 20 km of the grid cell; in column 3, a dummy indicating that a municipality seat of a municipality which was originally settled before 1800 is within 20 km of the grid cell; in column 4, accumulated deforestation by 2010, in hectares, measured by PRODES. The estimated equation includes latitude, longitude, and all geographic fundamentals from column 3 of Table 3. Standard errors in parentheses are multi-way clustered according to four interlaced grids of $1° \times 1°$. Statistical significance: * 10%, ** 5%, *** 1%.

Table A.8: Robustness to measurement error in the Nimuendajú map

	Entries with more than 2 references	Weight cells by inverse distance to map markings
	(1)	(2)
Extinct groups	72.939**	65.999**
	(29.959)	(29.941)
Indigenous groups	-6.496	1.713
	(14.385)	(13.506)
R-squared	0.435	0.447
Observations	259574	259574

Note: The table displays estimates of the coefficients in equation 1. The dependent variable is accumulated deforestation by 2010, in hectares, measured by PRODES. The estimated equation includes latitude, longitude, and all geographic fundamentals from column 3 of Table 3. In column 1, the variables $ExtinctGroups_i$ and $Groups_i$ count only map entries of groups with 2 or more citations in the accompanying dictionary. In column 3, we weigh the observations according to the inverse of the distance to the $5° \times 5°$ map markings that we used to georeference Nimuendajú's map. Standard errors in parentheses are multi-way clustered according to four interlaced grids of $1° \times 1°$. Statistical significance: * 10%, ** 5%, *** 1%.

Table A.9: Robustness to proximity to non-Indigenous population in 1940

	Proximity to city	Log market potential	Deforestation, 2010
	(1)	(2)	(3)
Extinct groups	0.003	-0.009	77.967***
	(0.008)	(0.009)	(26.599)
Indigenous groups	-0.004	-0.005	-4.676
	(0.004)	(0.005)	(13.684)
Proximity to 1940 city			41.864
			(55.855)
Log market potential in 1940			333.324***
			(118.225)
R-squared	0.113	0.905	0.444
Observations	259574	259574	259574

Note: The table displays estimates of the coefficients in equation 1. In column 1, the dependent variable is a dummy indicating that the grid cell is within 20 km of a 1940 municipality seat. In column 2, the dependent variable is the logarithm of market potential in 1940. In column 3, the dependent variable is accumulated deforestation by 2010, in hectares, measured by PRODES. The estimated equation includes latitude, longitude, and all geographic fundamentals from column 3 of Table 3. Standard errors in parentheses are multi-way clustered according to four interlaced grids of $1° \times 1°$. Statistical significance: * 10%, ** 5%, *** 1%.

Table A.10: Robustness: consider whether the historical sources confirm the extinction

	(1)	(2)
Extinct groups (confirmed)	98.932**	103.077**
	(40.729)	(40.985)
Extinct groups (unconfirmed)		47.949*
		(26.373)
Indigenous groups	-0.528	-6.206
	(12.987)	(13.432)
R-squared	0.436	0.436
Observations	259574	259574

Note: The table displays estimates of the coefficients in equation 1. The dependent variable is accumulated deforestation by 2010, in hectares, measured by PRODES. The estimated equation includes latitude, longitude, and all geographic fundamentals from column 3 of Table 3. In column 1, the variable $ExtinctGroups_i$ consider only extinct groups for which our reading of the historical sources (see Appendix B.3) confirm the extinction of the group. In column 2, we include proximity to both extinct Indigenous group about which we confirm and about which we do not confirm the extinction in the sources. Standard errors in parentheses are multi-way clustered according to four interlaced grids of $1° \times 1°$. Statistical significance: * 10%, ** 5%, *** 1%.

Table A.11: Robustness to the use of other groups as a control

	Only extinct group entries (1)	Quadratic term (2)	Past (pre-1944) location entries (3)
Extinct groups	68.660***	74.688***	73.956**
	(24.625)	(26.195)	(30.638)
Indigenous groups		0.438	-5.233
		(18.912)	(18.388)
Indigenous groups (squared)		-2.736	
		(7.180)	
R-squared	0.436	0.436	0.436
Observations	259574	259574	259574

Note: The table displays estimates of the coefficients in equation 1. The dependent variable is accumulated deforestation by 2010, in hectares, measured by PRODES. The estimated equation includes latitude, longitude, and all geographic fundamentals from column 3 of Table 3. In column 1, we do not include the variable $Groups_i$, only the count of extinct Indigenous groups within 20 km of the grid cell. In column3, we include both the $Groups_i$ and $Groups_i^2$. In column 3, the variable $Groups_i$ counts only map entries that refer to past group locations, as opposed to Indigenous group locations that were contemporary to Nimuendajú when he prepared the map (circa 1944). Standard errors in parentheses are multi-way clustered according to four interlaced grids of $1° \times 1°$. Statistical significance: * 10%, ** 5%, *** 1%.

Table A.12: Robustness to alternative restrictions to map entries

	All entries (1)	Before 1800 (2)	Known ling. family (3))
Extinct groups	26.146	-22.279	70.248**
	(18.267)	(33.488)	(27.226)
Indigenous groups	-6.513	4.973	-6.468
	(12.967)	(32.767)	(13.139)
R-squared	0.434	0.433	0.435
Observations	259574	259574	259574

Note: The table displays estimates of the coefficients in equation 1. The dependent variable is accumulated deforestation by 2010, in hectares, measured by PRODES. The estimated equation includes latitude, longitude, and all geographic fundamentals from column 3 of Table 3. In column 1, the variables $ExtinctGroups_i$ and $Groups_i$ include, respectively, all extinct and all entries in the Nimuendajú map, regardless of whether they were recorded before or after 1800. In column 2, they include only entries dated before 1800. In column 3, they include entries with a known linguistic family, regardless of their date. Standard errors in parentheses are multi-way clustered according to four interlaced grids of $1° \times 1°$. Statistical significance: * 10%, ** 5%, *** 1%.

Table A.13: Robustness to alternative year cutoffs to map entries

	Entries dated after:						
	1600	1650	1700	1750	1800	1850	1900
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Extinct groups	28.201	31.493	42.562*	58.792**	74.959***	91.428***	90.392**
	(18.034)	(19.364)	(22.256)	(23.452)	(26.120)	(29.958)	(35.729)
Indigenous groups	-6.233	-5.629	-6.640	-5.970	-6.640	-12.013	-8.582
	(12.958)	(12.977)	(12.953)	(13.217)	(13.479)	(13.911)	(13.493)
R-squared	0.434	0.434	0.434	0.435	0.436	0.436	0.436
Observations	259574	259574	259574	259574	259574	259574	259574

Note: The table displays estimates of the coefficients in equation 1. The dependent variable is accumulated deforestation by 2010, in hectares, measured by PRODES. The estimated equation includes latitude, longitude, and all geographic fundamentals from column 3 of Table 3. The variables $ExtinctGroups_i$ and $Groups_i$ include, respectively, all extinct and all entries in the Nimuendajú map which were dated after the year shown on the top of the column. Standard errors in parentheses are multi-way clustered according to four interlaced grids of $1° \times 1°$. Statistical significance: * 10%, ** 5%, *** 1%.

Table A.14: Extensive and intensive margins

	Extensive margin	Intensive margin
	(1)	(2)
Extinct groups	0.054**	97.710***
	(0.022)	(27.430)
Indigenous groups	-0.007	-10.791
	(0.013)	(16.225)
R-squared	0.280	0.437
Dependent variable mean	0.416	627.141
Observations	259574	107913

Note: The table displays estimates of the coefficients in equation 1. In column 1, the dependent variable is whether the grid cell has strictly positive accumulated deforestation by 2010, as measured by PRODES, and the equation is estimated with the full sample. In columns 2, the dependent variable is accumulated deforestation by 2010, in hectares, measured by PRODES, and the sample consists only of grid cells that feature strictly positive deforestation. The estimated equation includes latitude, longitude, and all geographic fundamentals from column 3 of Table 3. Standard errors in parentheses are multi-way clustered according to four interlaced grids of $1° \times 1°$. Statistical significance: * 10%, ** 5%, *** 1%.

Table A.15: Alternative estimation

	Alternative inference		Tobit
	Conley (1999)	Cluster by mun.	model
	(1)	(2)	(3)
Extinct groups	74.959***	74.959***	150.062***
	(26.426)	(19.187)	(44.397)
Indigenous groups	-6.640	-6.640	-20.503
	(13.661)	(10.311)	(27.520)
Observations	259574	259574	259574

Note: The table displays estimates of the coefficients in equation 1. The dependent variable is accumulated deforestation by 2010, in hectares, measured by PRODES. The estimated equation includes latitude, longitude, and all geographic fundamentals from column 3 of Table 3. Columns 1 and 2 display ordinary least square estimates; column 3 displays estimates from a tobit model. In column 1, the standard errors in parentheses are robust to heteroskedasticity and spatial correlation as in Conley (1999), using an uniform kernel with distance cutoff of 100 km. In column 2, the standard errors in parentheses are robust to heteroskedasticity and cross-sectional correlation within clusters defined by municipality. In column 3, standard errors in parentheses are multi-way clustered according to four interlaced grids of $1° \times 1°$. Statistical significance: * 10%, ** 5%, *** 1%.

Table A.16: Group-level regression estimates

	(1)	(2)
Extinct	75.646***	62.078**
	(25.959)	(24.149)
Number of neighboring groups		-7.495
		(11.911)
Number of neighboring extinct groups		42.129
		(27.779)
R-squared	0.654	0.658
Observations	697	697

Note: The table displays estimates of the coefficients in equation A.1.The dependent variable is the average accumulated deforestation (by 2010) of grid cells that are within 20 km of the group. The estimated equation includes latitude, longitude, and the averages, across grid cells in the 20 km buffer around the group, of all geographic fundamentals from column 3 of Table 3. Standard errors in parentheses are multi-way clustered according to four interlaced grids of $1° \times 1°$. Statistical significance: * 10%, ** 5%, *** 1%.

Table A.17: Association with proximity to cities and settlements using alternative cutoffs

Cutoff (km):	5	10	15	25	30
	(1)	(2)	(3)	(4)	(5)
Panel A: proximity to cities					
Extinct groups	0.004***	0.014***	0.029**	0.056***	0.064***
	(0.001)	(0.005)	(0.011)	(0.020)	(0.023)
Indigenous groups	-0.001	-0.002	-0.003	-0.008	-0.009
	(0.001)	(0.003)	(0.006)	(0.010)	(0.012)
R-squared	0.021	0.071	0.126	0.199	0.218
Sample mean	0.009	0.034	0.070	0.155	0.198
Observations	259574	259574	259574	259574	259574
Panel B: proximity to settlements					
Extinct groups	0.008	0.029**	0.052***	0.080***	0.084***
	(0.005)	(0.011)	(0.019)	(0.027)	(0.029)
Indigenous groups	0.001	-0.000	-0.001	-0.003	-0.002
	(0.004)	(0.007)	(0.009)	(0.013)	(0.015)
R-squared	0.112	0.192	0.233	0.277	0.287
Sample mean	0.032	0.091	0.157	0.284	0.341
Observations	259574	259574	259574	259574	259574

Note: The table displays estimates of the coefficients in equation 1. The dependent variable are dummies indicating if the grid cell is within a cutoff distance of a city (Panel A) or settlement (Panel B). The cutoff, in kilometers, is shown on the top of each column. The estimated equation includes latitude, longitude, and all geographic fundamentals from column 3 of Table 3. Standard errors in parentheses are multi-way clustered according to four interlaced grids of $1^\circ \times 1^\circ$. Statistical significance: * 10%, ** 5%, *** 1%.

Table A.18: Association with road infrastructure

	Roads:	
	All roads	Main Roads
	(1)	(2)
Extinct groups	243.390***	94.916***
	(76.745)	(26.734)
Indigenous groups	-80.531*	-12.054
	(41.122)	(11.943)
R-squared	0.169	0.046
Sample mean	720.301	153.516
Observations	259574	259574

Note: The table displays estimates of the coefficients in equation 1. The dependent variable is the extension of roads inside the grid cell, in meters; column 6 considers all roads, while column 7 considers only state and federal roads. The road shapefiles are from IBGE's 2014 *Base Contínua ao Milionésimo*. The estimated equation includes latitude, longitude, and all geographic fundamentals from column 3 of Table 3. Standard errors in parentheses are multi-way clustered according to four interlaced grids of $1^\circ \times 1^\circ$. Statistical significance: * 10%, ** 5%, *** 1%.

Table A.19: Horse race with contemporaneous determinants of deforestation

	(1)	(2)	(3)	(4)	(5)
Extinct groups	44.359**	51.366**	55.685**	55.220**	17.461
	(19.121)	(21.911)	(24.779)	(22.697)	(15.845)
Indigenous groups	-5.192	0.464	7.193	4.896	11.093
	(10.354)	(11.204)	(12.423)	(10.652)	(7.914)
Proximity to settlement	318.101***				221.155***
	(25.705)				(19.690)
Proximity to city	200.378***				160.797***
	(27.531)				(23.605)
Road extension		0.083***			0.062***
		(0.005)			(0.004)
Main road extension		0.036***			0.023***
		(0.007)			(0.005)
Indigenous land dummy			-192.351***		-53.934***
			(30.086)		(15.880)
Proximity to indigenous village			47.323**		7.493
			(22.067)		(14.524)
Area of private farms				0.207***	0.129***
				(0.024)	(0.016)
Area of land projects				21.191***	13.511***
				(3.265)	(2.297)
Observations	259574	259574	259574	259574	259574
R-squared	0.537	0.544	0.459	0.495	0.633

Note: The table displays estimates of the coefficients in equation 1. The dependent variable is accumulated deforestation by 2010, in hectares, measured by PRODES. The estimated equation includes latitude, longitude, and all geographic fundamentals from column 3 of Table 3. Additional controls are distances to settlements and cities (column 1), road extension and main road extension (column 2), Indigenous reserves and distance to Indigenous villages (column 3), and the area within privately-owned farms (column 4); all these additional controls are jointly included in column 5. Standard errors in parentheses are multi-way clustered according to four interlaced grids of $1° \times 1°$. Statistical significance: * 10%, ** 5%, *** 1%.

Table A.20: Heterogeneity: extinct Indigenous groups and determinants of deforestation

	Proximity to settlement	Proximity to city	Road extension (m) all	Road extension (m) main	Indig. land	Proximity to ind. village	Private farms	Land projects
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Extinct groups	0.082***	0.027	260.202***	85.821***	-0.122***	-0.018	82.683**	0.301**
	(0.025)	(0.018)	(91.650)	(31.204)	(0.033)	(0.023)	(33.784)	(0.147)
Indigenous groups	-0.003	-0.005	-82.740**	-12.623	0.082***	0.038***	-27.956	-0.283***
	(0.012)	(0.009)	(41.080)	(11.687)	(0.017)	(0.009)	(20.105)	(0.078)
Extinct groups (assimilation)	-0.090**	-0.032	-262.111*	-109.446**	0.031	-0.050*	-75.468*	-0.669*
	(0.042)	(0.034)	(138.171)	(46.579)	(0.049)	(0.027)	(45.447)	(0.382)
Extinct groups (violence)	0.044	0.056	150.056	137.831**	-0.001	-0.020	31.715	0.531
	(0.045)	(0.037)	(155.901)	(54.088)	(0.046)	(0.026)	(51.335)	(0.447)
Extinct groups (disease)	0.082	0.160**	415.525**	148.234	0.028	0.035	-58.690	1.706**
	(0.091)	(0.072)	(191.208)	(92.434)	(0.060)	(0.045)	(68.192)	(0.852)
R-squared	0.261	0.173	0.169	0.047	0.169	0.071	0.280	0.058
Observations	259574	259574	259574	259574	259574	259574	259574	259574

Note: The table displays estimates of the coefficients in equation 1. In columns 1 and 2, the dependent variable is a dummy indicating if the grid cell is within 20 km of a settlement or city; the location of settlements and cities is from IBGE. In columns 3 and 4, the dependent variable is the extension of roads inside the grid cell, in meters; column 3 considers all roads, while column 4 considers only state and federal roads. The road shapefiles are from IBGE's 2014 *Base Contínua ao Milionésimo*. In column 5, the dependent variable is a dummy equal to one if the grid cell overlaps with a homologated Indigenous land in 2010; these shapefiles are from Funai and the homologation dates are from *Terras Indígenas no Brasil*. In column 6, the dependent variable is a dummy indicating if the grid cell is within 20 km of an Indigenous village; the location of Indigenous villages is from IBGE. In column 7, the dependent variable is the area of private farms in the grid cell, in hectares, obtained from the datasets SIGEF and CAR compiled by Imaflora. In column 8, the dependent variable is the area of government-sponsored land distribution projects in the grid cell, in hectares, obtained from INCRA. The estimated equation includes latitude, longitude, and all geographic fundamentals from column 3 of Table 3. Standard errors in parentheses are multi-way clustered according to four interlaced grids of $1° \times 1°$. Statistical significance: * 10%, ** 5%, *** 1%.

Table A.21: Association with modern ethnic composition and migration

Share of:	Indigenous (1)	Whites (2)	Brown (3)	Blacks (4)	Asians (5)	Migrants (6)
Extinct groups	-0.094***	0.040***	0.056**	-0.003	0.000	0.082***
	(0.029)	(0.012)	(0.022)	(0.005)	(0.001)	(0.028)
Indigenous groups	0.067***	-0.021**	-0.039***	-0.008**	0.000	-0.019
	(0.018)	(0.008)	(0.013)	(0.003)	(0.001)	(0.013)
R-squared	0.291	0.377	0.288	0.088	0.025	0.821
Sample mean	0.190	0.176	0.560	0.066	0.007	0.117
Observations	24790	24790	24790	24790	24790	501

Note: The table displays estimates of the coefficients in equation A.2 (columns 1 to 5) and equation A.3 (column 6). For columns 1 to 5, the dependent variable is the share of the population of the ethnic group on the top; observations are non-zero population census blocks from the 2010 census. In column 6, the dependent variable is the share of migrants from outside the Amazon in the total population; we define an individual as a migrant if this individual was not born in one of the Amazonian states. These latter estimates are obtained in regressions at the municipality level, using municipalities whose seats are within the Brazilian Amazon, and the data stems from the extended questionnaire which was applied to a representative sample of the 2010 census. The estimated equation includes latitude, longitude, and all geographic fundamentals from column 3 of Table 3. Observations (census blocks or municipalities) are weighted by area. The sample means reported at the bottom of the table are also weighted by area. Standard errors in parentheses are multi-way clustered according to four interlaced grids of $1° \times 1°$. Statistical significance: * 10%, ** 5%, *** 1%.

Table A.22: Ethnic composition and accumulated deforestation in 2010

	(1)	(2)
Share - Indigenous	-0.141***	-0.079***
	(0.026)	(0.025)
Share - whites		0.303***
		(0.065)
Share - blacks		-0.115**
		(0.054)
Share - Asians		0.170
		(0.270)
R-squared	0.603	0.619
Sample mean	0.192	0.192
Observations	24790	24790

Note: The dependent variable is the share of the census block that has been deforested up to 2010, which we regress on the ethnic composition of the census block (and geographic controls). The sample consists of non-zero population census blocks from the 2010 census. In column 1, we include the Indigenous share. In column 2, we include also the share of whites, blacks, and Asians; browns (*pardos*) are the omitted ethnic group. The estimated equation includes latitude, longitude, and all geographic fundamentals from column 3 of Table 3. Census blocks are weighted by area. The sample means reported at the bottom of the table are also weighted by area. Standard errors in parentheses are multi-way clustered according to four interlaced grids of $1° \times 1°$. Statistical significance: * 10%, ** 5%, *** 1%.

B Data Appendix

B.1 Nimuendajú Map Data

Our work of converting the Nimuendajú map into useful spatial data is based on the high-resolution PDF file in the 2017 edition of the map. The map displays vertical and horizontal lines that comprise a $5° \times 5°$ grid. We use the intersection points of the lines to georeference the map. There are 67 such points. We georeference the map on QGIS Georeferencer Plugin, using a thin plate spline as the transformation type and a nearest-neighbor resampling. The resulting raster has the projection EPSG:4326 (WGS 84).

To identify the location of the map entries, we prepare a point shapefile on top of the Nimuendajú map raster. For each entry, we input two points, at each extreme point of the entry. If the entry is marked by a colorful line indicating the linguistic family of the group, we input the points roughly at the line. If there is no line (unknown language groups), we input the points at the extreme ends of the name.

We use a points shapefile instead of a line shapefile so the large information in the map could be imputed in a manageable way. We record the two extreme points to account for the range of the group and to facilitate reproducibility. Note this procedure entails some loss of information for the groups whose entries are a curved line, and could thus introduce some measurement error to our estimates. Most map entries are straight lines, so our procedure does not distorts the distances for these cases. However, the shape of other entries remind a semi-circle or a S. To address concerns of measurement error with respect to these entries, we also mannually added other points for these entries. For semi-circles, we added a third point along the curve, roughly equidistant from the extreme points. For S-shaped entries, we introduced two other points along the curves, roughly splitting the entry in three equal lenght parts. In Appendix A.2, we describe how we use these points in a robustness test.

On top of georeferencing and recording the map locations, our data set also includes the information that Nimuendajú recorded through text, color or font. For each map entry, we record the following information in the shapefile:

1. Group name, as written on the map.

2. All the dates which are written under the group name.

3. If a hollow group name font indicates the entry as a past location (as opposed to a location contempo-

rary to Nimuendajú, circa 1944).

4. The linguistic family, according to the color of the line and the legend at the left corner of the map.

5. A dummy variable indicating if the group is marked as extinct. This is done by examining whether the group name is written with a fine calligraphic font. In a few cases, the font in the 2017 map was confusing to understand, so in these cases we also examined a picture of the original 1944 map to ensure the correct assignment of this dummy. Moreover, for those entries which present a bar (i.e. feature a known linguistic family), the extinction information is also indicated by a dashed line pattern. To guarantee accuracy in the extinct information, we assign extinction status based on both the font and the line patterns; we then cross-checked the resulting information.

B.2 Other Data Sources

Besides the ethnohistoric data and PRODES deforestation rasters, we use the following data sources:

Land use. We use maps of land use from MapBiomas (collection 8), produced using Landsat imagery at 1-arcsec resolution. MapBiomas maps classify each pixel according to several potential categories. We use primary forest data from the Deforestation and Seconday Vegetation maps; we use the maps for the years 1986, 1990, 1995, 2000, 2005, 2010, 2015, and 2020. From the Land Cover and Land Use map for 2010, we use the following variables: cropland, pasture, farming (cropland plus pasture, including pixels with a mosaic of both), and urban land.

Nightlights. We use DMSP-OLS nighttime lights to measure the distribution of urban economic activity in 2010. We use the raster on average visible, stable lights, and cloud-free coverages for 2010, which we average within each grid cell.

Population centers. We use the location of population settlements from the list of localities cataloged by the *Instituto Brasileiro de Geografia e Estatística* (Brazilian Institute of Geography and Statistics, IBGE) for the 2010 census. We consider three categories of locations. The first category includes municipality seats (which we refer to as "cities"), which are the main urban center in the municipality areas. The second category includes any population center in the localities data that is not exclusively Indigenous, including municipality seats, municipal district seats (secondary urban centers), and rural villages; in the paper, we refer to these localities as settlements. The third category includes the Indigenous villages.

Road infrastructure. We use georeferenced data on Brazilian roads from version 4 of IBGE's *Base cartográfica contínua ao milionésimo*, a comprehensive dataset mapping Brazil. The road data is based on georeferenced information collected in 2007 and 2011. For each grid cell, we measure the length, in meters, of the roads crossing the cell. We consider both the total road extension and the extension of what we refer to as "main roads", which include only federal and state roads.

Indigenous lands. The location of protected Indigenous lands stems from shapefiles released by Funai, the federal institution responsible for Indigenous policy. By scrapping information on each Indigenous land from the website *Terras Indígenas no Brasil*, we obtain the dates of the decrees that created these reserves so we can restrict our analysis to the ones created up to 2010. More precisely, we use the decrees that "homologated" each land. Homologated lands are the ones receiving full legal protection from the Brazilian state. We then use this information to assign, to each grid cell, a dummy variable indicating whether it is intersected by some Indigenous land that was homologated up to 2010. For the estimates shown on Panel (b) of Figure 6, we use different cutoff years with respect to the homologation dates.

Private land ownership. To measure the location of private farms, we rely on the Agricultural Atlas, a consolidated map of land tenure prepared by the NGO Imaflora drawing from multiple official registries. This atlas refers to 2020; since the CAR is a recent registry, we cannot measure private farm locations in 2010, the year we use for most other variables. The location of private farms is based on an official public registry called *Sistema de Gestão Fundiária* (Land Tenure System, SIGEF), complemented by a recent self-declaratory dataset, the *Cadastro Ambiental Rural* (Rural Environmental Registry, CAR), managed by the Brazilian Ministry of the Environment. For detailed information on these data, see Freitas et al. (2018).

Land distribution projects. Shapefiles of land settlement projects are from the website *Acervo Fundiário* held by the *Instituto Nacional de Colonização e Reforma Agrária* (National Institute of Colonization and Land Reform, INCRA). We use the shapefile "Projetos de Assentamento Total". We use the creation dates available as an attribute of the shapefile to know whether each project existed by 2010. For the estimates shown on Panel (c) of Figure 6, we use different cutoff years with respect to the creation dates.

1940 Population Census. To obtain a measure of proximity to non-Indigenous population at the time of the Nimuendajú map, we use the shapefiles released by IBGE on the 1940 municipality seats; see IBGE (2011). We also digitize the column "População de Fato" from Table 48 of the 1940 Brazilian Census. We digitize these values for all municipalities that belong to the states that contain the Brazilian Amazon. For each grid cell, we compute: **(i)** the distance to the closest 1940 municipality seat, and **(ii)** a market potential variable, which sums the municipality populations divided by the distances to their municipality seats.

Municipality settlement dates. For each municipality in the Amazon region (as of 2010), we identify their settlement dates by scrapping the municipality histories available from the website *IBGE Cidades*. We then split the municipalities into two categories: first settled up to 1944 (the year of the Nimuendajú map), and first settled after 1944. For use as a control variable, we also consider municipalities settled before 1800.

Historical municipality seats. For the location of the municipality seats in the past, we use the shapefiles released by IBGE along with the study IBGE (2011). These shapefiles contain the location of the municipality seats in 1872, 1900, 1911, 1920, 1933, 1940, 1950, 1960, 1970, 1980, and 1991.

1920 Agricultural Census. To obtain information on the extent of farm area in 1920, we digitize Table I from the agricultural section of the 1920 Brazilian Census. This table contains both the farm area and the total municipality areas.

1940 Agricultural Census. To obtain information on the extent of farm area in 1940, we digitize Table 49 from the agricultural section of the 1940 Brazilian Census. We also digitize the municipality areas reported in the census.

Ethnic composition. To obtain information on the ethnic composition of the population across space, we use the results of the 2010 Demographic Census which were reported at the *setor censitário* (census block) level. We match these data with the shapefile of *setores censitários* from IBGE. The ethnic classification of the population is self-reported into five categories: white, black, brown, Asian, and Indigenous.

Migration. As information about the migration history of the population inhabiting the Brazilian Amazon, we use information on the place of birth. This information is available from the microdata of the 2010 Demographic Census. In each municipality, a representative sample of the municipal population answered an extended questionnaire which recorded the country and state of birth. We refer to an individual as a migrant from outside the Amazon if they were born outside one of the states which contain the Brazilian Amazon (Acre, Amapá, Amazonas, Maranhão, Mato Grosso, Pará, Rondônia, Roraima, Tocantins).

Relief. Elevation data is from the CGIAR-SRTM dataset at a 30-arcsec resolution. For each grid cell in our sample, we compute the average altitude and terrain ruggedness index (TRI) in meters.

Water coverage. We compute the water coverage of each grid cell, as measured by PRODES. As for deforestation, we measure water coverage in hectares.

Non-forest coverage. We compute the original non-forest formation coverage of each grid cell, as measured by PRODES. As for deforestation, we measure non-forest coverage in hectares.

Malaria suitability. We measure the climatic suitability of malaria with information from the Malaria Atlas, averaging the suitability indexes for *Plasmodium vivax* and *P. falciparum*; see Gething et al. (2011) for details on these indexes. We average the resulting index within each grid cell.

Climate variables. To measure climatic fundamentals, we use average temperatures, precipitation, and relative humidity from the ten-minute climatology dataset of the Climatic Research Unit (CRU); see New et al. (2002). We match each grid cell with the closest point in the CRU data.

Rivers. We identify the main rivers of the Amazon Basin based on shapefiles and maps from the *Agência Nacional de Águas* (National Water Agency, ANA); see ANA (2015). The main rivers in our sample are (in alphabetical order, as written in the shapefile) the: Abacaxi, Amazonas, Anamu, Araguaia, Arinos, Aripuanã, Branco, Canumã, Culuene, Cuniuá, Envira, Guaporé, Içá, Iriri, Iriri Novo, Jamanxim, Japurá, Jari, Jatapu, Javari, Juína, Juruá, Juruena, Jutaí, Madeira, Mamoré, Negro, Parima, Purus, Roosevelt, São Manuel, São Manoel, Solimões, Sucunduri, Tapajós, Tapauá, Tarauacá, Teles Pires, Tocantins, Trombetas, Uanamu, Uatumã, Uaupés, Uraricoera, and Xingu; these are the rivers highlighted in the map from ANA (2015). We use the river shapefile to assign each grid cell a dummy which indicates if it is within the 10 km buffer around these main rivers.

Rubber tree range. We use the range of *Hevea brasiliensis*, the most productive and economically relevant species of rubber trees, mapped by the *Plano Nacional da Borracha* (National Rubber Plan); see Comércio (1971). We georeference the map on the range of *H. brasiliensis* (Figure 3 of the document), create a polygon with the range, and assign a dummy equal to one if the grid cell intersects the species range.

Crop suitability. We use the rain-fed agro-ecological attainable yields of cassava and cacao under low-input use and of soybeans under high-input use from FAO's Global Agro-Ecological Zones project (FAO-GAEZ v.4). We average each of these attainable yields by each grid cell.

Distance to São Paulo. We use the distance between each grid cell and the city of São Paulo as a measure of remoteness and distance to the frontier. We calculate these distances using the Haversine formula, using the coordinates (23.5558 S, 46.6396 W) for São Paulo.

Caloric suitability. We use the caloric suitability index of Galor and Özak (2015), Galor and Özak (2016) and Galor, Özak, and Sarid (2016), which measures how many calories can be produced in a hectare. We average their index within each grid cell.

Archaeological sites. The location of archaeological sites is from the official list of Brazilian archaeological sites (*Cadastro Nacional de Sítios Arqueológicos*, CNSA) held by the *Instituto do Patrimônio Histórico e Artístico Nacional* (IPHAN) and publicly available as a points shapefile. We consider any site recorded as ”Pré colonial” or ”Pré contato” in this database as pre-colonial. We consider any site recorded as ”Histórico” or ”Pós contato” in this database as historic (that is, after the European arrival).

Pre-Columbian earthworks. The precise georeferenced location of 1269 geoglyphs and mound villages is from a publicly available compilation made by Jacobs (2023). These locations are based on many references in the literature and most were checked on satellite imagery by Walker et al. (2023).

Historical aldeamentos. The list of 66 religious *aldeamentos* circa 1730 in the Portuguese Amazon is from Bombardi (2014). We obtain their location by georeferencing Map 6 in page 40 of her thesis.

B.3 Classification of Extinct Groups

The following is a dictionary of the group names that appear as extinct in our data. We include groups whose midpoints are within the Brazilian Amazon or that, under visual inspection, are in the neighborhood of it. There are no other restriction to the groups; the dictionary below includes groups that were recorded before 1800, and which are thus not used in our baseline results. We first list and discuss extinct groups with a recorded linguistic family (i.e. which feature a colored dashed line under the group name), and then we list and discuss extinct groups without a recorded linguistic family. Both lists are alphabetical. The numbers in italics after the group name refer to the numbering of the sources in the Bibliographic Index in page 81 of Nimuendajú (2017). For brevity, we use the source numbers instead of writing the full references. We complement the sources listed by Nimuendajú with two more comprehensive sources on Indigenous groups, which we consult for all the Indigenous groups below. The first is the *Handbook of South American Indians* (Steward 1946), which we refer below as HoSAI. The HoSAI was a large, 7-volume enterprise of anthropologists providing a comprehensive reference on South American Indigenous peoples. Nimuendajú contributed many chapters to it, and the first version of his map was used as an input for its writing. The second is the *Dicionário Etno-Histórico da Amazônia Colonial* (Porro 2007). The first part of this historical dictionary lists and provides information on the history of many Indigenous groups in the context of colonial Brazilian Amazon. The dummies **A**, **V** and **D** indicate, respectively, any evidence of **assimilation**, **violence** or **disease** in the sources we consult. We consider the extinction likely related to assimilation if the sources mention *aldeamentos*, missionary attempts, non-religious assimilation efforts, or individuals inhabiting non-Indigenous towns. We consider the extinction likely related to violence if the sources mention conflict with non-Indigenous groups, conflict with other Indigenous groups, forced capture (enslavement, slave raids), violent displacement, or massacres. We consider the extinction likely related to disease if the sources mention epidemics or individuals dying from illnesses; the exact disease does not need to be well-identified, and mentions of diseases or "fevers" are enough for our classification. These categories are not mutually exclusive, so a group can be categorized in more than one. Moreover, a value of zero should be understood as absence of evidence for these causes, but not necessarily the absence of their occurrence. In each entry below, we provide a brief explanation of what we find on the sources about the probable extinction causes. Finally, we record in the dictionary below if the sources we consult contain the information that the group is extinct; whenever this is the case, we add a note in italics at the end of the entry.

Groups with a known linguistic family in the Nimuendajú map

Acioné. *19.* Although Nimuendajú cites 19 as a source, the Acioné are not in the index of p. 781. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Amaribá. *19. 454.* 19 (p. 636) mentions the Amaribá as an extinct group that had previously contacted and traded with the Atorais. 454 (v. 2, p. 388) mentions their population was small by the time of contact with a 1812 British expedition sent by the governor of Georgetown. The group is recorded in the HoSAI, which merely refers to their location, extinct status, and small population. They are recorded in Porro (2007), which mentions them as inhabiting aldeamentos between 1775 and 1787. **A=1, V=0, D=0.** *Extinction confirmed in our reading of the sources.*

Anambé. *191. 267. 550. 554. 558.* 267 (p. 163) mentions that the Anambé were almost wiped out by an epidemic of smallpox in the 1870s, but makes no reference for assimilation or violence. The HoSAI mentions this smallpox epidemics. The group is not in Porro (2007). **A=0, V=0, D=1.** *Extinction confirmed in our reading of the sources.*

Apotó. *19. 247. 271.* The sources, such as 247 and 271, mention the Apotó only briefly. 19 (p. 708) mentions the Apotó among many other nations inhabiting the region around lake Saracá, and mentions that "there is no group, even if very remote, that has not been touched by ['civilized'] influence". The HoSAI mentions there is little information on the Apotó other than their location and the fact that one of their groups spoke "the Língua Geral". The group is not in Porro (2007). **A=1, V=0, D=0.**

Aracajú. *19. 30. 217. 221. 528.* 19 (p. 708) records the group as Uaraguaçu or Araquaju, only mentioning their location. 528 (book VI, ch. VI) describes the Jesuit missionary activity towards the group. The HoSAI references 528 and other sources as evidence of assimilation of the Aracajú of religious and non-religious nature, including their presence inhabiting the town of Almeirim. The HoSAI also refers to frequent war against the Wayapís from the Jary and Iratapuru Rivers and against the Cossari of the Araguaya River. The group is not in Porro (2007). **A=1, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Arára *10. 23. 25. 191. 251. 267. 420. 555. 559. 632. 753. 761. 914.* 10 (p. 54) mentions that the region the Arára inhabited in the Xingu was settled by non-Indigenous during the rubber boom, that they were nomadic, and that they disappeared by merging with other groups. 23 (p. 6) references a 1859 Jesuit mission that gathered several Indigenous groups, including the Arára. 23 (p. 264) also witnessed an Arára slave among the Juruna, and mentioned that they had several enemies. 632 (p. 398) declares them extinct by

1921. In 753 (p. 547), Nimuendajú himself gives a detailed account of their extinction, refering to violent episodes with rubber tappers. Besides the conflict with rubber tappers, the HoSAI also mentions conflict with the Asurini and Shipaya. The group is not in Porro (2007). **A=1, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Ararawa *187. 638.* 638 does not mention the Ararawa but refers to the Arara, which Nimuendajú clearly identified with the Ararawa because of the location. 638 (p. 211) refers to terrible violence episodes committed by rubber tappers from Brazil and Peru against Indigenous peoples, including children, but he makes no specific reference to the Araras. He later refers to violent events against the Arara, writing that they were "tamed" and became almost extinct. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Aráua. *4. 45. 193.* 193 (p. 299) writes that he found a single village of the Aráua on the igarapé Chiué, and though they were hostile, they looked assimilated, since all "were regularly clothed, like ordinary Amazon folk." The HoSAI mentions that the Aráua became extinct after an epidemic of measles in 1877. Porro (2007) records the group as the Arauari, indicating their location according to a source from 1768. **A=1, V=0, D=1.** *Extinction confirmed in our reading of the sources.*

Aravirá. *19.* Also known as Bororo do Cabaçal or Bororo da Campanha. 19 (pp. 209-210) gives precise geographical indications that coincide with their location on Nimuendajú's maps. They were considered a hostile group, but in the late 18 century some were brought to aldeamentos in the villages of Rio de Pedras, S. Anna, Lanhoso and Pizarrão. Still according to 19 (p. 211), the Aravirá became extinct because of hunger and disease in the village where they were brought to. The group appears in the HoSAI as Bororo do Cabaçal, but without details on their likely extinction causes. The group is not in Porro (2007). **A=1, V=0, D=1.** *Extinction confirmed in our reading of the sources.*

Arihini Baré. *19. 341. 489.* 19 (p. 562) writes that the Arihini were brought to an aldeamento in N. S. de Curiana and in S. José de Marabitanas. They were clearly not yet extinct at the time of Von Martius' book. The group is not recorded in the HoSAI. Porro (2007) records that the group (as Ayrini or Ariiní) inhabited aldeamentos. **A=1, V=0, D=1.**

Arikém. *240. 322. 510. 563. 569. 751. 918.* 240 (p. 239) and 322 (p. 25) only mention the presence of the Arikém between the rivers Preto and Branco. 510 (pp. 186-189) presents in detail the story of the extinction of the Arikemes, mentioning brutal attacks by rubber tappers and a disorganization of the

Arikeme society by assimilation with Brazilians. 510 (p. 189) records that several individuals died of a flu-like disease. The group is recorded in the HoSAI, which does not contain any information on their likely extinction causes, despite describing many aspects of their culture and economy. The group is in Porro (2007) as Ariquena, recording that many Ariquém individuals inhabited colonial towns in the 18th century. **A=1, V=1, D=1.** *Extinction confirmed in our reading of the sources.*

Arinagoto. *19. 441. 454. 491.* 19 (p. 750) only mentions the group, with the names Arinacoto and Arigua. The other sources do not mention these names. The group is in the HoSAI, which merely records their location. The group is not in Porro (2007). **A=0, V=0, D=0.**

Arupay. *555. 738.* In 738 (p. 398), Nimuendajú writes that the Juruna attacked and killed the Arupay, enslaving them. The group is in the HoSAI as Arupaí, which indicates that they were extinct in conflict with other Indigenous groups before any contact with Europeans. The group is not in Porro (2007). **A=0, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Bahuana *194. 761. 899.* Scarce references: 194 is a map, and we could not access 761 and 899. The Bahuána are not in the HoSAI. The group is in Porro (2007), who records that the Bahuana were part of the population of the town of Silves by 1775. **A=1, V=0, D=0.**

Biriuoné. *19.* Another name for the Aravirá. **A=1, V=0, D=1.** *Extinction confirmed in our reading of the sources.*

Boanari. *19. 285. 939.* 19 (p. 601) mentions the existence of the Boanarí and spots them close to the Rio Negro. 285 (p. 77) mentions that they became extinct due to diseases after an aldeamento attempt by a priest. The group is in the HoSAI as Bonari; the reference merely records their location. The group is in Porro (2007), who cites a 1775 source that saw them close to the river Uaupés. **A=1, V=0, D=1.** *Extinction confirmed in our reading of the sources.*

Bororo do Cabaçal. Another name for the Aravirá. **A=1, V=0, D=1.** *Extinction confirmed in our reading of the sources.*

Carahiahy. *19. 30. 150. 194. 327. 936.* 19 (p. 563) cites the Carahiahy as inhabiting the proximity of the Rio Negro in the early 19th century. 30 (p. 307) presents a glossary of words of their Arawak language. 150 (p. 65) records their presence in the town of Moura. The group is in the HoSAI as Cariaya, merely recording their location. The group is in Porro (2007), who identifies the Carahiahy as part of the population of Moreira in 1787, having been previously displaced by other Indigenous groups from the rivers Jaú and

Anani and suffering from a dwindled population by the 18 century. **A=1, V=0, D=0.** *Extinction confirmed in our reading of the sources.*

Eliang. Nimuendajú lists no historical source for this group. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Gamellas. *19. 233. 270. 364. 365. 369. 370. 374. 403. 759. 849. 906.* 369 (pp. 297-300) mentions several violent conflicts between the Gamella and European settlers in the late 18 century in Maranhão, involving both the Gamella of Codó and the Gamella of Vianna. 369 (p. 193) mentions that the Gamella of Vianna were subject to an aldeamento but rebelled and waged war against the colonizers. 370 (p. 40) similarly reports the constant hostility between the Gamella of Codó and nearby settlers. 374 (p. 33) mentions conflicts with three "domesticated" villages of the Gamella (p. 33), in which settlers viewed the Indigenous as lazy and accused them of robbery. 403 (p. 132) writes that the town of Monção was composed of Gamella. In 849 (p. 65), Nimuendajú describes the extermination of the Gamella of Codó in 1856 during the administration of the governor Antonio Cruz Machado, who hired Indigenous and white troops to displace the Gamella and build a road. The event led to deaths, displacement, and likely enslavement of the group. The group is in the HoSAI, although it contains little information on their extinction. The group is not in Porro (2007). **A=1, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Guahuara. *528.* 528 (book VII, ch. XV) reports that the Guahuara (he uses the spelling Guauaras) were contacted by Jesuit missionaries and taken to aldeamentos. The Guahuara are recorded in the HoSAI as a historic group that inhabited 22 villages circa 1688, and that were assimilated within the Nheengatu-speaking caboclo population. The group is not in Porro (2007). **A=1, V=0, D=0.** *Extinction confirmed in our reading of the sources.*

Ihini Baré. *489.* We could not access a copy of the only reference provided by Nimuendajú. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Ipotwát. *168. 916.* Little information in the sources; e.g., 916 is a sketch map of the location of some groups, including the Pauatê. The group is recorded in the HoSAI as Ipotewát. Based on information from 1938, the HoSAI mentions that they were extinct but it provides no information on possible extinction causes. The group is not in Porro (2007). **A=0, V=0, D=0.** *Extinction confirmed in our reading of the sources.*

Ira Amraire. *846.* The only reference is an unpublished manuscript by Nimuendajú. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Iten. *19. 52. 269.* 52 (p. 287) describes the Iten (he uses the spelling Itene). He refers to the group as violent, providing some accounts of conflicts with the Brazilian military and with Bolivian populations. He clearly points out that the group has not assimilated into the non-Indigenous society. The group is recorded in the HoSAI as a group that was also referred to as Moré; some members of the group inhabited Spanish missions that were destroyed in the 18th century. The group is not in Porro (2007). **A=1, V=1, D=0.**

Jacariá. *19. 45.* The Jacariá are mentioned in 19 (pp. 251, 385, 416), without any clear reference to their possible extinction causes. The group is recorded in the HoSAI as a sub-group of the Caripuná, without any mention of their possible extinction causes. The HoSAI suggests that the Caripuná, including the Jacariá, were extinct at the beginning of the 20 century, when only few individuals remained alive. The group is not in Porro (2007). **A=0, V=0, D=0.** *Extinction confirmed in our reading of the sources.*

Jaru. *164. 228. 510. 742. 917.* In 724 (p.139), Nimuendajú describes the Jarú as an extinct group which was considered hostile by local inhabitants. They had contact with rubber tapers, but Nimuendajú records no episodes of violence. The HoSAI records there is little information on the Jarú, which it indicates as extinct. The group is not in Porro (2007). **A=0, V=0, D=0.** *Extinction confirmed in our reading of the sources.*

Kanakateyé. *19. 369. 370. 390. 759.* 370 (p. 319) describes the violent episodes that resulted in the extinction of the Kanakateyé, which he refers to as Timbirá Cannaquetgê. The only village inhabited by the group was raided in 1814 by a joint force which consisted of Portuguese soldiers and warriors from some other Indigenous group. Many individuals of the group were captured and sent to Pará to be sold in slavery. The group is recorded in the HoSAI as Kéncateye, with little information about their history. The group is not in Porro (2007). **A=0, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Karimé. *700. 953.* 700 (p. 297) reports the Karimé as a group that inhabited the Parima mountains in modern-day Roraima. The group was decimated in conflict with the neighboring Paraitirys. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Karipúna. *19. 30. 45. 341. 352. 353. 563. 972.* 19 (p. 251) describes the Karipúna as a warlike people. 972 (ch. VI) refers to common violent conflict between the Karipúna (he uses the spelling Caripuna) and the local Euroamerican population in the late 19 century. The account of the encounter of 972 with the group clearly indicates no assimilation. The group is in the HoSAI as Caripuná, which suggests their extinction at the early 20 century but without mentioning the probable extinction causes. The group is in Porro (2007) in more than one entry; Porro (2007) notes that the name was common to different groups. The Karipúna groups in the Nimuendajú map appear in Porro (2007) as the Caripuna of the Rio Madeira; the entry does not mention assimilation or violence. **A=0, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Kepkiriwát. *510. 563. 916. 937.* The group was contacted by Rondon in 1913. Although 916 lists some words in their language and 563 (p. 203) describes many of their customs, the references listed by Nimuendajú do not confirm their extinction nor provide any information about their likely extinction causes. The group is in the HoSAI as Kepikiriwat, without any clear evidence on their probable extinction causes. The group is not in Porro (2007). **A=0, V=0, D=0.**

Koeruna. *19. 30.* 19 (p.111,116) only mentions some customs of the Koerúna. The group is recorded as Coeruna in the HoSAI, which refers to the Koerúna as a Witotoan subgroup. The HoSAI points out that these groups experienced an exploitative and ruthless contact with rubber tappers. The group appears in Porro (2007) as Coeruna; the entry indicates that they inhabited the cities of Tefé, Manaus, and Moura in the late 18 and early 19 centuries. **A=1, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Kulino. *19. 30. 47. 150. 194. 247.* The sources listed by Nimuendajú merely records their location; for instance, 47 (p. 337) records their location in the Igarapé Comatia at the time of his 1846-47 travels to the Amazon. The Kulino of the Solimões are referred to as Curina in the HoSAI, which lists them as one of the Panoan groups, without providing details on their extinction status or probable extinction circumstances. The group appears as Culino in Porro (2007), which merely records their presence near the Solimões river from 1639 to 1775. **A=0, V=0, D=0.**

Kuniba. *44. 185. 193. 740.* 193 (p. 304) records that the Kuniba (he uses the spelling Conibo) had occupied a site on the banks of the Purus river near the mouth of the Tacacá river, but abandoned it after frequent attacks from the Nauas. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=1, D=0.**

Kuruminaka. *137. 886.* 886 (p. 115) refers to the Kuruminakata as one of the "Chiquito" Indigenous groups that joined Jesuit missions in Bolivia. The group is not in the HoSAI. The group is not in Porro (2007). **A=1, V=0, D=0.**

Manao. *19. 30. 150. 194. 221. 284. 314. 383. 906.* 19 (p. 623) records that the Manao were moved to religious missions, often through violent capture. The HoSAI records that the Manao acted as slavers for the Portuguese and for the Dutch during the 18th century, that they rebelled against the Portuguese in 1757, and that they were converted to Christianity by the Carmelites. The group is in Porro (2207), who records some assimilation by indicating that the Manao inhabited many colonial cities in the 18 century. **A=1, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Mariaté. *19.* The only reference is 19, who merely points their location (p. 473). The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Mure. *537. 539. 540.* 537 (pp. 121,122) lists the Mure as a group which inhabited the missions of San Simon, San Judas, and San Miguel, although some individuals also had a nomadic lifestyle outside the missions. The group is not in the HoSAI. The group is not in Porro (2007). **A=1, V=0, D=0.**

Nyurukwayé. *19. 272. 365. 366. 369. 370. 377. 390. 759.* 370 (p. 450) writes that the Nyurukwayé (he uses the spelling Norocoagê) had a violent fate similar to the Cannaquetgê (Kanakateyé), although he does not describe their extinction in detail as he does for the latter. The group is recorded as Nyurukwayé in the HoSAI, as a Timbira subgroup. The group is not in Porro (2007). **A=0, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Pacajá. The group appears in the Nimuendajú dictionary as Pakajá, although in the map with both spellings . See entry for Pakajá. **A=1, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Paikoneka. *269. 886.* 886 (p. 134) mentions the Paikoneka as an Arawak group that was contacted by Jesuits in 1707 and later lived in Jesuit missions. It seems some of them later moved away from the missions and took refuge in the forest. No mention of violent conflict or diseases. The group is referred to as Paiconeca in the HoSAI, which does not provide any specific details on its extinction. The group is not in Porro (2007). **A=1, V=0, D=0.**

Pakajá. *19. 191. 194. 221. 223. 233. 247. 267. 282. 284. 292. 528. 906. 915.* Described as brave by 247 (p. 41). 292 (p. 228) writes that the Indigenous groups near the Pakajá river had rebelled but were then sent to aldeamentos by captain Pedro da Costa Favella. 528 (book III, ch. IV) mentions war against the Portuguese, and then successful Jesuit missions toward the Pakajá, despite some violent contact with the missionaires. The group is in the HoSAI as Pacajá; the information on their history mentions the use of Nheengatuu (which suggests some assimilation), conflicts with the Portuguese and with the Tupinambá, and the contact with Jesuit missions. Porro (2007) mentions that many Pacajá inhabited in the town of Portel by 1763, indicating assimilation. **A=1, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Palmellas. *452. 655.* 452 (p. 18) mentions the Palmella as a "semi-savage" group inhabiting aldeamentos. 655 (p. 66) hypothesizes that the group moved to its location in Brazil in post-Columbian times to flee whites or diseases in the Guyanas. As these possible violent episodes did not occur in the group location on the Nimuendajú map and do not seem the cause of the group extinction, we do not assign violence as a likely extinction cause. The Palmella are mentioned in the HoSAI as the southernmost Carib group in Brazil. The group is not in Porro (2007). **A=1, V=0, D=0.**

Parauiana. *19. 30. 101. 241. 440. 454. 806. 955.* 19 (p. 624) refers to the Parauiana as a group captured in a war between the Portuguese and the Arecuna, also indicating the capture of some of them as slaves. 101 (p. 151) mentions the Parauiana (he uses the names Parawyang and Paravilhana) as a historically powerful group which, at the time of his travels by 1911, were already extinct. 454 (paragraph 733) mentions the Parauiana (he uses the name Paravilhana) as an once powerful but greatly reduced people. The group is in the HoSAI as Paraviyana; although there is no reference for their likely extinction causes, the HoSAI suggests they had been mostly absorbed by the Wapishana. Porro (2007) indicates that the group inhabited colonial settlements by 1775, being the largest population in the town of Carvoeiro. **A=1, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Parawá. *203. 573. 832.* 203 (p. 133) refers to the Parawá (he uses the spelling Parauá) as a peaceful group that inhabited deforested lands which belonged to some powerful landowner. 203 also mentions that the Parawá suffered violent assaults from an enemy Indigenous group, the Catuquinas. According to 573 (p. 423), the Parawá lost a war to the Kurina, who forced them to relocate. The group is not in the HoSAI. Porro (2007) refers to the Parawá (the entry name is Parauaana) as inhabitants of Carvoeiro by 1768. **A=1, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Parirí. *735. 751. 759.* All the references are from Nimuendajú himself, who met a Pararirí speaker in Belém, and focus on the Parirí language. The extinction of the group is described in the HoSAI as the result of attacks from the neighboring Parakanã, that took place between 1910 and 1932. By 1932, there were only two surviving children, both with advanced tuberculosis. The group is not in Porro (2007). **A=0, V=1, D=1.** *Extinction confirmed in our reading of the sources.*

Pausiána. *19. 101. 440. 488. 490. 899. 953.* 19 (p. 635) refers to the Pauisiána as a people inhabiting a region close to the Paravilhanas. 101 (p. 14) met the Pausiána (he uses the spelling Pauschiana) and writes about them as a group almost extinct. The HoSAI refers to the group as Pauishana, merely recording their location. Porro (2007) identifies the Pausiána (the entry name is Paxiana) as a group inhabiting aldeamentos in the Rio Branco region by 1775. **A=1, V=0, D=0.** *Extinction confirmed in our reading of the sources.*

Pauxí. *528.* 528 (ch. XII) mentions the efforts of a Jesuit priest, Fr. Salvador do Vale, in converting the Pauxí. The group is not in the HoSAI (the only references are for the Karib-speaking Pauxí, which are not extinct on the map, and not for the Tupi-speaking Pauxí near the Xingu river). Although they are in Porro (2007), there is little information about them in it. **A=1, V=0, D=0.**

Pobzé. *365. 441.* 441 (p. 142) refers to the Pobzé as a group that had moved to the Colonia Leopoldina, an aldeamento, since roughly 1850. 441 also mentions the occurrence of diseases and decampment in the Colonia Leopoldina, which reduced the population in the aldeamento from 500 to 100 inhabitants. The group is not in the HoSAI. The group is not in Porro (2007). **A=1, V=0, D=1.** *Extinction confirmed in our reading of the sources.*

Põrekamekra. *19. 337. 359. 369. 370. 390. 759.* 19 (p. 289) states that the Põrekamekra (he uses the spelling Pure-came-crans) were subject to missionary attempts and lived in a "semi-civilized" state. 369 (p. 316) refers to the Põrekamekra (he uses the spelling Purecamekrans) as a peaceful group that seemed more "compatible" with assimilation, that settled in lands of a local landowner, that experienced episodes of famine and extreme poverty, and that were dispersed among other groups. The group is in the HoSAI as Porecamecra; the HoSAI only describes some cultural attributes of the group. The group is not in Porro (2007). **A=1, V=0, D=0.** *Extinction confirmed in our reading of the sources.*

Purukaród. *11.* 11 (pp. 205,206) merely reports on the Purukaród, which he spells as Purucarus, without providing specific information. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Purukoto. *10. 101. 285. 286. 440. 441. 454. 488. 808. 953.* 101 (p. 153) met the Purukotó, noting that their population was small at the time of his visit (1911-13). Although 286 (pp. 139-145) has a long description of Purukotó culture and society, it does not mention conflict, diseases and assimilation attempts. The HoSAI refers to the group as Purucoto, noting they were extinct, but without providing any information about probable extinction causes. The group is not in Porro (2007). **A=0, V=0, D=0.** *Extinction confirmed in our reading of the sources.*

Rama-Rama. *164. 452. 917.* 164 (p. 124) reports on the Rama-Rama as a group consisting of very few individuals and, at the time of the Rondon Commission circa 1916, already near extinction. 164 also reports that the group experienced violent separation and labor exploitation by rubber barons. The HoSAI simply states their location, Tupi language, and their ”almost extinct” status. The group is not in Porro (2007). **A=0, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Rokorona. *537. 539. 540. 541. 886.* 537 (p. 122) mentions there is little information about the Rokorona, but it seems that some of them inhabited religious missions in Alto Peru. 886 (p. 85) mentions the Rokorona as historically inhabiting the Mission of Santa Rosa, in modern Bolivia. The HoSAI lists the Rocorona among the Chapacuran tribes, without providing much information. The group is not in Porro (2007). **A=1, V=0, D=0.**

Sapará. *19. 101. 440. 454. 455. 488. 953.* 19 (p. 635) merely cites the Sapará as related to the Pauxiana. 101 (p. 149) reports there were very few Sapará left at the time of his visit (1911-13), although he does not mention the reason for their declining population. The HoSAI simply records the locations of the Sapará. Porro (2007) indicates that the Sapará inhabited aldeamentos by 1775. **A=1, V=0, D=0.** *Extinction confirmed in our reading of the sources.*

Sapupé. *19. 194. 221. 317.* The sources listed by Nimuendajú provide little information; e.g., 194 is a map, and 317 (p. 27) merely records the presence of the group near the river Maué. The group is not in the HoSAI. The group appears in Porro (2007), which records their presence in a Jesuit mission in 1714. **A=1, V=0, D=0.**

Sinabu. *14.* The only reference is 14, which simply mentions the Sinabu as a sub-tribe of the Shipibo, a small group in Peru (p. 84). The group is not in the HoSAI (there is only an Ecuadorian group of the same name). The group is not in Porro (2007). **A=0, V=0, D=0.**

Sirianá. *101. 286. 311. 440. 454. 455. 760. 881. 899. 943.* 101 (p. 190) records the Sirianá (he uses the spelling Schirianá) as a warrior group, noting a war between the Siriana and a neighboring group (the Marakaná) that almost led to the extinction of the latter. The HoSAI refers to the Shirianá as a ”very warlike people who succeeded in dominating several weaker tribes”. The group is not in Porro (2007). **A=0, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Takonyapé. Nimuendajú lists no source for this group. The HoSAI indicates that the Tacunyapé experienced a series of missionary attempts by Jesuits, and that their populational decline followed a series of epidemics in the late 19th century. Porro (2007) records that, by the 19 century, the Takonyapé inhabited cities, which suggests assimilation. **A=1, V=0, D=1.** *Extinction confirmed in our reading of the sources.*

Takwatip. *168. 741. 916.* In 741 (p. 205), Nimuendajú refers to the Takwatip as one of the Tupi groups belonging to the same tribe as the Kawahiba; they were not extinct at the time of Nimuendajú's contact with them in 1921-22. In p. 208, 741 also records that these groups have been almost extinct in conflict with the Mundurukú. The HoSAI notes that the Takwatip were brought by Rondon to the Rio do Machado region, and that by 1925 the last six remaining individuals of the group moved to the proximity of a telegraphic post. The group is not listed in Porro (2007). **A=0, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Tapajó. *27. 194. 233. 247. 281. 284. 287. 292. 320. 321. 432. 528. 758. 863. 864. 875. 906.* 758 is a detailed description of the Tapajó by Nimuendajú himself. This originally large and powerful group was decimated by conflict with the Portuguese in the 17th century. They were also the target of missionary attempts, and eventually the remaining Tapajó were assimilated into aldeamentos. The HoSAI mentions the Tapajó only when discussing other groups, often with comparative purposes. The group is listed in Porro (2007), who refers to their large cities and armies and attributes their extinction to violent contact with Europeans. **A=1, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Tobajara. *1. 2. 12. 19. 68. 255. 265. 279. 280. 284. 287. 290. 291. 381. 383. 412. 767. 830. 906.* Early colonial contact, referenced by a large number of sources. 19 (p. 193) refers to the Tobajára as a Tupi group from Maranhão. 19 points out that, by the early 19 century, the descendants of the Tobajára had been assimilated and inhabited the cities of Paço do Lumiar and Vinhais. 383 (p. 29) describes both violent attacks against the Tobajára, including slave raids, as well as missionary attempts. The HoSAI refers to the Tobajara as Tobayara, a Tupi people that lived inland from the Tupinambá; the HoSAI does not mention probable extinction causes. The group is not listed in Porro (2007). **A=1, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Tukumafét. *168.* Nimuendajú records a single source, which is uninformative about likely extinction causes. In the HoSAI, the Tucumanfét are listed among the Tupi-Cawahib, but the HoSAI provides little information about the group. The group is recorded in Porro (2007), but it only indicates their presence near the Madeira river by 1768. **A=0, V=0, D=0.**

Tupinamba. *2. 12. 19. 64. 68. 218. 230. 255. 258. 259. 265. 275. 280. 282. 284. 287. 290. 291. 292. 293. 323. 365. 369. 377. 383. 515. 528. 755.* 383 (p. 444) details religious aldeamentos inhabited by the Tupinambá, and also indicates the enslavement of many of the individuals from this group to work in sugarcane plantations. The history of the Tupinambá is described in detail in the HoSAI, indicating conflict with the Portuguese and with other Indigenous groups. The group is recorded by Porro (2007) as inhabiting regions in the lower Amazon river, near the Tupinambarana island. They are recorded as a warrior group, often in conflict with other Indigenous groups. By 1650, there was a single remaining village, and many Tupinambá had been baptized by Portuguese missionaries. **A=1, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Tupinambarana. *19. 150. 194. 233. 247. 263. 287. 320. 875. 906.* Porro (2007) identifies the Tupinambarana and the Tupinambá as part of the same group; see the entry for the Tupinambá. **A=1, V=1., D=0** *Extinction confirmed in our reading of the sources.*

Uainamari. *58.* 58 (p. 100) records the presence of the Uainamari near the banks of the Purús river, but mentions that he observed very few traces of them. 58 also states there was an encounter with a previous expedition, and after some shots were fired the Uainamari individuals fled into the jungle. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Uiriná. *19. 30. 489.* The sources provide little information about the group. 19 (pp. 601, 627) only mentions the Uiriná due to their geographical or linguistic proximity to other groups. The group is not in the HoSAI. The group is not indexed in Porro (2007). **A=0, V=0, D=0.**

Upuruí. *260. 324. 440. 495. 554. 578. 802. 887.* The references are not informative; for instance, 554 (p. 18) simply lists the Upuruí (he uses the spelling Upuruhy) as a small and peaceful group inhabiting the banks of the Parú river. The HoSAI mentions their location and indicates they have mixed with the Oyana and no longer existed as an autonomous group. The group is not in Porro (2007). **A=0, V=0, D=0.** *Extinction confirmed in our reading of the sources.*

Urupá. *150. 233. 236. 240. 322. 510. 740. 742. 760. 917.* In 742 (p.139), Nimuendajú provides a detailed description of the Urupá group which inhabited the Madeira river valley. Nimuendajú mentions that part of the group moved to religious missions, while the population of the remaining group declined due to smallpox and influenza outbreaks in the aftermath of the contact with rubber tappers in 1900. By 1925, the last surviving individuals were under the protection of the SPI. The HoSAI merely records their location and their social proximity with the Oyana. The group is in Porro (2007) as Orupá, with references to their location and the aspect of their tattoos. **A=1, V=0, D=1.** *Extinction confirmed in our reading of the sources.*

Waraiku. *19. 30. 45. 47. 194. 247. 320.* The references are usually from travel records and are not informative about their likely extinction circumstances. For instance, 47 (p. 337) merely records their location by the mid 19 century, while 194 is a map. Their mention in 19 (p. 426, as Uaraicu) is brief, also merely recording their location. The group is recorded in the HoSAI as Guareicu; the text merely records their historical presence in the lower Jutahy river region. The group is in Porro (2007) as Guaraicu, but it only records their locations according to different sources, with no mention of assimilation, violence, or diseases. **A=0, V=0, D=0.**

Wayumará. *19. 101. 440. 455. 953.* The sources from Nimuendajú provide little information. For instance, 19 (p. 635) merely records their tattoo patterns, which were similar to the Pauxiana's. 101 (p. 153) records that there were only two surviving Wayumará men at the time of his expedition (1911-13), without mentioning a reason for their dwindled population. The HoSAI merely describe their location. Porro (2007) records the Wayumará (as Uaiumará) as a group that, by 1775, were inhabiting aldeamentos. **A=1, V=0, D=0.** *Extinction confirmed in our reading of the sources.*

Wirafét. *168. 741. 742. 760.* Nimuendajú briefly cites the Wirafét (as Wiraféd) in 741 (p.275) and 742 (p.144), merely recording their location and small population. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Yabaána. *19. 489. 491.* Very scarce and limited references. The Yabaána are in the HoSAI as Hobacana, and it simply reports their location on the Marauia river. The group is in Porro (2007), who also merely records their location. **A=0, V=0, D=0.**

Yabotifét. *168.* We could not identify any group with a similar name being cited in 168. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Yahahí. *523. 741.* The map identifies the Yahahí as a Mura-language group inhabiting the Madeira river valley near the Kawahiwa, but we found no information about them in the sources listed by Nimuendajú. Yet, in reference 742 (p. 142), Nimuendajú lists the Yahahí as a sub-group of the Murá-Pihahá that inhabited the Branco river area and that was absorbed into other Murá-Pihahá groups. Nimuendajú mentions neither violence nor assimilation. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.** *Extinction confirmed in our reading of the sources.*

Yauaperí. *285. 286. 305. 308. 309. 310. 347. 351. 353. 354. 355. 356. 357. 468. 761.* 286 (pp. 9,10) contains a detailed description of the extinction of the Yauaperí (he uses the spelling Jauapery, following the river near where the group inhabited) in 1885. The group was targeted by a local landowner who planned on enslaving them, and the conflict resulted in the massacre of a substantial share of the group (although some were able to flee). The HoSAI merely records their location. The group is not in Porro (2007). **A=0, V=1,**

D=0. *Extinction confirmed in our reading of the sources.*

Yumána. *19. 30. 446. 456. 501.* 19 (p. 474) records the Yumána (he uses the spelling Jumana) as a group that, in the early 19 century, probably consisted of a small community and possibly even few families. The sources are not informative of the reasons for their extinction; for instance, 446 (p. 355) merely records that the Yumána (he uses the spelling Ximána) practiced infanticide. The HoSAI indicates that the Yumána (the HoSAI uses the spelling Jumana) were likely absorbed by the Mura, but the text contains no hint that such absorption was violent. The group is not in Porro (2007). **A=0, V=0, D=0.** *Extinction confirmed in our reading of the sources.*

Yurimagua. *19. 38. 150. 194. 203. 247. 287. 314. 320. 345. 383. 513. 875.* 150 (LVII, CXVII) reports that the Yurimagua (he uses the spelling Jurímáua) were a warrior people whose villages were raided by the Spanish in the early 19 century. On the other hand, 875 (paragraph 7) reports that the Jurimagua settlement, which was connected to Spanish Jesuit missionaries, was attacked by the Portuguese. The HoSAI details the group conversion to Christianity by the Jesuits, previous slave raiding attacks from the Portuguese, and a severe smallpox epidemics in 1760. The group is in Porro (2007) as the Jurimagua, who reports on their assimilation: in the 18 century, they inhabited the cities of Coari and Tefé. **A=1, V=1, D=1.** *Extinction confirmed in our reading of the sources.*

Zurumata. *454. 671. 802.* The sources contain little information on the Zurumata. For instance, 454 (p. 474) merely writes that he met with a family of Zurumata, without providing further details. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Groups without a known linguistic family in the Nimuendajú map

Aboba. *19. 45. 46.* 19 (p. 208) writes that the Ababas stem from the Chiriguanos, a West-Tupi group. The Ababas were among the Central-Tupis and already in the early 19th century they were living in "weak groups" between the rivers Corumbiara and Ji-Paraná (which is where Nimuendajú locates them on the map). 19 (p. 214) suggests that the word ababa simply means "people" for the Chiriguanos. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Aiçuare. *194. 320. 875.* 875 (p. 20) mentions assimilation efforts toward the Aysuares. The HoSAI mentions that they were placed under Jesuit protection in the late 17th century at the Mission of Yurimaguas. Porro (2007) refers to them as Aisuari (Achouari, Axuari, Carapuna), writing that they inhabited aldeamentos by 1720 and the town of Tefé by 1768. **A=1, V=0, D=0.** *Extinction confirmed in our reading of the sources.*

Akokwa. *440. 578. 799. 800.* 440 (p. 264) simply refers to the Acoqua as one of the groups inhabiting the interior of the French Guiana. 578 (p. 122) records the location of the Akokwa as well as the history of their contact with the Europeans, which seemed to have been infrequent and brief. The group is in the HoSAI as Acokwa, which records their location and suggests a Cariban language. The group is not in Porro (2007). **A=0, V=0, D=0.**

Akroá–Gamellas. *906.* We did not find the reference for the group in 906. Although the HoSAI contains references for both the Acroá and the Gamella, there is no reference for a group known as Akroá-Gamellas in the region recorded by Nimuendajú. The group is not in Porro (2007). **A=0, V=0, D=0.**

Alaruá. The group is not in the HoSAI. Porro (2007) places them in the town of Alvarães in the late 18 century, suggesting assimilation. **A=1, V=0, D=0.**

Amanajú. *221.* The group is not in the HoSAI, which mentions the Amanajó and identifies them with the Amanayé, which are possibly related but a different group. Porro (2007) only mentions that they lived on the left bank of the Tapajós river in the 18 century. **A=0, V=0, D=0.**

Amikwan. *19. 440. 578. 800. 951.* 19 (p. 709) lists the Amicuanos among likely Tupi groups. 578 (p. 123) mentions that missionaries never attempted to catechize this group, and it probably did not became extinct. 951 (p. 119) names them Namicouanne. HoSAI simply repeats the information in the same sources, listing them among the Cariban Family with vague documentation from the 18 and 19 centuries. The group is not in Porro (2007). **A=0, V=0, D=0.**

Anajá. *19. 284. 330. 336. 528.* 528 (p. 107) mentions contacts between the Anajás and religious orders, and 330 (p. 589) lists them as ”reduced” groups, a term that suggests assimilation by religious orders. The group is not in the HoSAI. Porro (2007) records their resettlement towards aldeamentos in the 17 and 18 centuries. **A=1, V=0, D=0.** *Extinction confirmed in our reading of the sources.*

Andirá. *19. 194. 383. 906.* 19 (p. 415) mentions them as related to the Caripunas but hostile to them. 383 (p. 517) mentions missionary villages inhabited by the Andirazes. The HoSAI mentions them as a subdivision of the Maués, which were likely assimilated and dispersed in a ”just war”. The local river still bears their name. Porro (2007) records their presence in religious missions, and identifies them with the Maué. **A=1, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Anhangatininga. *906.* The group is not listed in the index of 906. The group is not in the HoSAI. Porro

(2007) records their location in the 18th century, but contains no additional information on the group. **A=0, V=0, D=0.**

Anibá. *19.292.* 19 (p. 708) links them to the Tupis, but provides little information. The HoSAI lists them as a group of unidentified indigenous language. Porro (2007) records that they were part of the population of Silves in 1789. **A=1, V=0, D=0.**

Apehou. *797.* The only reference is a map. The HoSAI records that the group inhabited the Xingu river region, where Jesuit missions were established, but it is unclear whether the group inhabited these missions. The group is not in Porro (2007). **A=1, V=0, D=0.**

Apotianga. *287. 383. 906.* 287 (p. 21) mentions the group in the village of Corupi. 383 (p. 194) writes that they were part of a religious missionary village. The group is not in the HoSAI. The group is not in Porro (2007). **A=1, V=0, D=0.**

Aracajú. There is no item in the dictionary by Nimuendajú that refer to this group; the only item refers to the known-language group with the same name. Hence, we assign no possible extinct causes to these entries. **A=0, V=0, D=0.**

Arae. *19. 253. 373. 375. 397.* 19 (p. 362) simply locates the Aráes in the upper Xingu region. 253 (p. 41) refers to the Araes as both a creek and an abandoned gold mining village, without any mention to an Indigenous group with the same name. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Aramayu. *578.* 578 (p. 139) contains only a brief reference to the group. The group is in the HoSAI, which simply records their location. The group is not in Porro (2007). **A=0, V=0, D=0.**

Arapiyu. *194. 221. 233. 283. 906.* The HoSAI describes the Arapium as probably extinct after the 18 century, but does not provide indications as to how. Porro (2007) records that the group inhabited 18 century aldeamentos. **A=1, V=0, D=0.** *Extinction confirmed in our reading of the sources.*

Arára (Lower Madeira). *4. 19. 194. 228. 270. 271. 272. 282. 305. 341. 342. 528. 906. 923. 972.* We could not find detailed references to this group. 19 (p. 385) simply records their location to the south of the Mundurkus. 272 (vol. I, p. 75) contains an entry about the Ararás, which are described as a powerful Indigenous group living between the Madeira and Tapajós rivers, to the south of the Mundurukú. 972 (p. 139) writes about the Aráras as a powerful group that inhabited the Madeira river valley and that had once been feared by non-Indigenous settlers, although their numbers and power seemed to have declined. Porro

(2007) records the resettlement of the Arára who lived on the Madeira river by religious friars. **A=1, V=0, D=0.**

Arára (Machado). *45. 228. 309. 311. 761. 906. 962.* Most references were not available to us. The HoSAI refers to an Arára group that lived near the confluence of the Machado and Madeira rivers and that, along with the Torá, were put into a religious mission. The group is not in Porro (2007). Note: it is unclear the extent to which the Araras of he Lower madeira and of the Machado river are the same, just observed in different periods. **A=1, V=0, D=0.**

Arára (Maranhão). There is no entry in the dictionary by Nimuendajú that refer to the Arára group in Maranhão; the Arára entries refer to groups in very far locations. Hence, we assign no possible extinct causes to these entries. **A=0, V=0, D=0.**

Arára (Oyapock). *508.* The only reference is a map. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Aratu. *194. 284. 287.* 284 (p. 1199) cites the group as a warrior nation that fought alongside the Portuguese in a war. 287 (p. 40) writes that they were subjected to the Tapinambaranas. The group is not in the HoSAI. Porro (2007) records that they lived together with the Tupinambaranas in the 18 century. **A=0, V=0, D=0.**

Arauaki. *19. 150. 194. 284. 287. 292. 341. 428. 513. 522. 523. 528. 906. 936.* 19 (p. 687) writes that the Aroaquis were numerous but already partly assimilated to ”civilization” in the early 19 century. 150 (p. 30) mentions them as inhabiting an area autonomously despite the area having been worked by missionaries. 287 (p. 77) mentions them as group in the 17th century. The HoSAI writes that they were scattered along the Guiana Coast and that they called themselves by Locono. Porro (2007) lists them as a very numerous group, and although many were assimilated, they were still living autonomously in the 18 century. **A=1, V=0, D=0.**

Arequena. *27.* 27 is a historical dictionary which contains an entry for the group (v. 2, p. 223); it simply records some of the customs of the group according to a report from 1875. The HoSAI records that, in the 19 century, the Arequena were taken by religious missionaries from their traditional lands to the town of Barcellos. Porro (2007) records that the Uariquena inhabited the towns of Barcelos and Santa Isabel by the 18 century and that they had ”Hebrew” names, suggesting some degree of religious assimilation. **A=1, V=0, D=0.**

Ariane. *440. 811.* Scarce documentation. We could not find references to the group in 440, while 811 is a map. The HoSAI records the group as having attacked the Maprouan, probably in the 17 century. The group is not in Porro (2007). **A=0, V=0, D=0.**

Aricari. *274. 334. 440. 528. 578.* 578 (p. 138) writes that the French violently exterminated this group. The HoSAI refers to 578 to record that they became extinct after contact with Europeans in the 18 century. The group is not in Porro (2007). **A=0, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Arino. *19. 221.* 19 declares the group as extinct (p. 384) without providing an explanation for why or an account of their extinction. The HoSAI records that the Arinos stopped being mentioned by historical sources in the 18 century, and that their location was then occupied by Tapanuyna. The group is not in Porro (2007). **A=0, V=0, D=0.**

Aripuaná. *194. 528. 906.* 528 (p. 524) writes about successful Jesuit missionary efforts towards the group. The group is not in the HoSAI. Porro (2007) simply records their location in the 18th century **A=1, V=0, D=0.**

Armagotu. *528. 808.* We could not find a referece to this group in 528, while 808 is a map. The HoSAI indicates the location of the Aramagatos and mentions that they mixed with the Aramisho in the 18 century after being attacked and dispersed by slave raids. The group is not in Porro (2007). **A=0, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Arouargue. *440.* We could not find a reference to a group named Arouargue in 440. The group is not in the HoSAI, although the index suggests that the word Arouage might have been used to refer more broadly to the Arawak. The group is not in Porro (2007). **A=0, V=0, D=0.**

Assauinaui. Nimuendajú lists no reference about this group. The group is not in the HoSAI. The group is in Porro (2007), which only records their location. **A=0, V=0, D=0.**

Auacachí. *194. 317. 906.* 317 (p. 29) mentions the Auacachís as the first inhabitants of the town of Serpa. The group is not in the HoSAI. The group is in Porro (2007) as Abacaxi, with mentions about religious conversion and their presence in 18 century colonial towns. **A=1, V=0, D=0.**

Aucuruy. *47.* 47 (p. 347) writes that they were dispossessed by other indigenous groups and became extinct. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Avantiu. *194. 195.* The two references are maps. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Baepuat. *937.* The only cited source is a map. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Bahuána. There is no item in the dictionary by Nimuendajú that refers to this group; the only item refers to the known-language group with the same name. Hence, we assign no possible extinct causes to these entries. **A=0, V=0, D=0.**

Barauana. *440. 489.* Very scarce documentation. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Barbados. *290. 292. 325. 380. 383. 386. 436. 759. 906.* 386 (p. 91) records that, in 1722, the Portuguese authorities declared war against many non-Tupi Indigenous groups in Maranhão, including the Barbados. 386 (p. 95) also records that a peace agreement between the Portuguese and the Barbados was reached in 1727. The HoSAI contains a brief mention to the Barbados as a Bororo subgroup; due to the geographical position, this reference does not correspond to the Barbados recorded in the Nimuendajú map. The group is not in Porro (2007). **A=0, V=1, D=0.**

Bicitiacap. *937.* The only source listed by Nimuendajú is a map. The group is not in the HoSAI. The group is not in Porro (2007) **A=0, V=0, D=0.**

Buritiguara. *253.* There is no entry for the Buritiguara in the dictionary 253. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Burué. *45. 47.* 47 (p. 435) lists the group on the right bank of the Jutahy river. The group is only mentioned in the HoSAI as inhabiting the right bank of the Jutaí River. The group is not in Porro (2007). **A=0, V=0, D=0.**

Caapina. *194. 217. 221.* Scarce references: 194 is a map, we could not access 217, and we could not find an exact reference to the group in 221. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Caboquena. *19. 284. 292.* 19 (p. 281) refers to a raid by Pedro da Costa Favella in 1665, which resulted in the killing and enslavement of many Indigenous groups, including the Caboquena. 284 (p. 1097) also refers to this slave raid, indicating that their defeat led to massive losses among the Caboquenas. The group is not in the HoSAI. Porro (2007) suggest an Aruak language and indicates the group location. **A=0, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Caburicena. *19. 150.* 19 (p. 563) suggests that the Caburicena were a subgroup of the Manaós that moved toward aldeamentos and eventually inhabited colonial towns. 150 (paragraph CCCXLI) simply records the location of the group on the Cauauari river. The group is not in the HoSAI. The group is in Porro (2007) as Cauauri; Porro (2007) records some of their trade relationship with other Indigenous peoples and the Europeans, their disappearance and dispersion by 1768, and the presence of some Cauari individuals in Manaus. **A=1, V=0, D=0.** *Extinction confirmed in our reading of the sources.*

Cacygara. *816.* The only reference is a map. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Cafuana. *194.* The only reference is a map. The group is in the HoSAI as Cafuane, which conjectures that this group may be related with the Witotoan peoples. The group is not in Porro (2007). **A=0, V=0, D=0.**

Cahicahy. *19. 260. 279. 292. 325. 365. 528. 906.* 528 (book VIII, ch. XI) describes in the detail the Jesuit missions towards the Cahicahys (he uses the spelling Caicaízes) and a violent war of the Portuguese colonial authorities against the group. 528 (book VIII, ch. XIV) also describes a disease (likely smallpox) that resulted in the death of many Cahicays, and possibly the majority of the group. The group is not in the HoSAI. The group is not listed in Porro (2007). **A=1, V=1, D=1.** *Extinction confirmed in our reading of the sources.*

Caiarioni. *194.* The only reference is a map. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Camarapin. *12.* 12 records that the French declared a war against the group in 1613 (p. 27) and that the war resulted in the disappearance of the group (p. 400, 401). The group is in the HoSAI, which briefly points to a French military campaign against the group in 1613. The group is not in Porro (2007). **A=0, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Camboca. *19. 194. 284. 287. 292. 314. 528. 906.* 19 (p. 198) writes about the Cambocas as inhabiting aldeamentos near Melgaço, Oeiras and Portel. 528 (book III, ch. XV) contains a brief mention to succesful missionary attempts by the Jesuits towards the group. The group is not in the HoSAI. The group is in Porro (2007) as Comboca, which refers to them as the oldest inhabitants of the colonial town of Oreiras. **A=1, V=0, D=0.**

Capaná. *906.* The group is not listed in the index of 906. The group is not in the HoSAI. Porro (2007) simply indicates their location along the Negro river. **A=0, V=0, D=0.**

Capuena. *19.* 19 only writes about some eating habits (p. 601) and the language (p. 627) of the

Capuena. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Caraguana. *816.* The only reference is a map. The group is not in the HoSAI. Porro (2007) simply indicates their location in 1639. **A=0, V=0, D=0.**

Carambú. *555.* We could not access the only reference to the group. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Carapeuara. *223. 528.* We could not find references to a group of that exact name in the references provided by Nimuendajú. The group is not in the HoSAI. The group is in Porro (2007), which lists them as inhabitants of the colonial town of Almeirim in 1789. **A=1, V=0, D=0.**

Cararueni. *194.* The only reference is a map. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Cariana. *489.* 489 met a young Kaliána man (p. 171) and recorded some words of their language (p. 176). The group is in the HoSAI as Calianá, as an isolated language group on the upper Paragua river. The group is not in Porro (2007). **A=0, V=0, D=0.**

Carinuaca. *808.* The only reference is a map. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Caripuna. *19. 911.* 19 (p. 251) writes that the Caripunas were a numerous group who practiced agriculture and were not considered hostile towards the Brazilian Euroamericans. There are no indication in 19 that they were extinct nor references to possible extinction causes. The group is in Porro (2007) as the Caripuna of the Branco river; the entry describes their trade connection with the Europeans and other Indigenous groups, and points to their location along the Jatapú river in 1787. Although Porro (2007) writes that they were considered extinct by 1738, later reports suggest this was not the case. **A=0, V=0, D=0.**

Catoayari. *194.* The only reference is a map. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Cauacaua. *194.* The only reference is a map. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Caüaná. *915.* We could not access the reference listed by Nimuendajú. The group is not in the HoSAI; the Caüaná entry in the handbook refers to an Indigenous group in the Andes. The group is in Porro (2007), which indicates their location by 1768. **A=0, V=0, D=0.**

Cauauri. *194.* The only reference is a map. The group is not in the HoSAI. The group is in Porro

(2007), which writes that they are the same group as the Caburicena, so we assign the same variables as for the latter; see the entry for the Caburicena above. **A=1, V=0, D=0.** *Extinction confirmed in our reading of the sources.*

Cauni. *194.* The only reference is a map. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Caupuna. *241.* We could not find a reference to a group with this name in 241. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Cautario. *19. 45. 46.* The sources provide little information. 19 (p. 251) refers to the Cautarios as a populous and peaceful group. 45 and 46 are cartographic references. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Chiricum. *440.* We could not find references to the group in 440. The group is in the HoSAI as Chiricoume, which points to their location but mentions that they were not found by an expedition led by Coudreau. The group is not in Porro (2007). **A=0, V=0, D=0.**

Cipó. *45. 58. 345.* Uninformative references: e.g. 58 (p. 94) contains second-hand information about the existence of the group on the Tapauá river, mentioning that they were a small and friendly group. The group is in the HoSAI as Sipó, merely recording their location. The group is not in Porro (2007). **A=0, V=0, D=0.**

Coani. *528. 906.* 528 (book VI, ch. X) describes the succesful missionary efforts of the Jesuits towards the Coanizes. The group is in the HoSAI, which lists them as one of the populations of the lower Xingu which disappeared and about which there is little information of ethnographic value. Porro (2007) writes that the group lived in the vicinity of a Jesuit mission. **A=1, V=0, D=0.** *Extinction confirmed in our reading of the sources.*

Comaní. *19. 241. 317.* 19 (p. 708) refers to the group as still existing by the time of his travels and as of likely Tupi origin. 241 (paragraph VII) lists the Comaní as one of the Indigenous groups inhabiting the town of Silves. The HoSAI simply indicates their location according to 19. Porro (2007) writes that the Comanís inhabited a Jesuit mission, converted to Christianity, and eventually were part of the population of Silves. **A=1, V=0, D=0.**

Condurí. *19. 194. 221. 247. 287. 320. 528. 875. 921.* The references are usually old and contain little information. 528 (book III, ch. X) writes some failed missionary attempts by the Jesuits towards the group in the 17 century. 875 (ch. II) lists the Condurí as one of the groups inhabiting a region along the north banks of the Amazon river. The HoSAI simply indicates their location on the banks of the Amazon. 19 (p. 729) includes the Condurís as one of the group which appear in some colonial references as living on the northern banks of the Amazon and that are often related to the myth of the Amazons. Porro (2007) writes about their 17 century location, describes some of their trade relations and material culture, and records their presence in 18 century Franciscan missions. **A=1, V=0, D=0.**

Corote. *454.* We did not find a reference to the Corotes in 454. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Crutriá. *45. 46.* The references are cartographic. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Cuchiuara. *19. 194. 247. 875.* 875 (ch. II) details his contact with the Cuchivara, whom he visited a few times, mentions their defeat in conflict against another Inidgenous group, and mentions the baptism of many Cuchivara individuals. The group is not in the HoSAI. The group is in Porro (2007) as Cuchiguara; the entry records their location, their migration following violent attacks from another Indigenous group, and their presence in colonial towns. **A=1, V=1, D=0.**

Cumayari. *247.* We could not find a reference to this exact group name in 247. The group is not in the HoSAI. Porro (2007) simply records their location on the Purus river circa 1639. **A=0, V=0, D=0.**

Curacirari. *241. 247. 320.* The sources are old and record little more than the location of the group; e.g. 241 (paragraph CXVI) mentions a village of the group, which he refers to as Curusicariz. The group is in the HoSAI as Curuzirari; the HoSAI mentions their location on the banks of the Solimões and describes the density of their settlements. The group is in Porro (2007) as Curuzirari, containing references to their location in the 17 century. **A=0, V=0, D=0.**

Curanaue. *19. 194. 936.* There is little information about the group; e.g. 19 (p. 425) simply indicates the location of the Curunao and 194 is a map that records the group location. The group is not in the HoSAI. The group is recorded in Porro (2007) as enemies of the Manaós and already extinct by 1768. **A=0, V=0, D=0.** *Extinction confirmed in our reading of the sources.*

Curi. *816.* The only reference is a map. The group is not in the HoSAI. The group is in Porro (2007), which simply records their historical location. **A=0, V=0, D=0.**

Curiató. *194. 287. 528. 906.* 287 (p. 38) records the group location on the Trombetas river. 528 (book

I, ch. XII) writes about the religious conversion of the Curiatós by Jesuit missionaries. The group is not in the HoSAI. The group is in Porro (2007), which records their presence in Jesuit and Franciscan missions. **A=1, V=0, D=0.**

Curivaurana. *498.* The only reference is a lexicon which we could not access. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Curupity. *555.* We could not access the only reference listed by Nimuendajú. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Cururi. *260. 287.* 287 (p. 14) simply records their location along the Itapecorú river. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Cussani. *340. 800.* We could not access 340, and 800 is a map. The group is in the HoSAI as Cusari, a group of the Guianas that, during the 18 century, migrated away from the coast. The group is not in Porro (2007). **A=0, V=0, D=0.**

Davinavi. *441.* We could not find a reference for a group with this exact name in 441. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Demacuri. *936.* We could not find any reference to a group with that exact name in 936. The group is not in the HoSAI. Porro (2007) simply records their location. **A=0, V=0, D=0.**

Guacara. *19. 247.* The Guacaras are listed in 19 (p. 708) as Guacari, simply recording the group location. The HoSAI merely records the group location according to 19. Porro (2007) refers to the Guacará as a group that likely inhabited the upper Nhamundá river, suggesting a less reliable reference due to an alleged connection with the mythical Amazons. **A=0, V=0, D=0.**

Guajará. *326.* We could not find an explict reference to the Guajarás in 326, a brief documenting listing the comarcas of the Province of Pará. The group is in the HoSAI as Uaiara, mentioning that they eventually appeared on the upper Gurupí river. The group is in Porro (2007), which writes that, by 1768, they inhabited aldeamentos. **A=1, V=0, D=0.**

Guajejú. *45. 46.* The only references are cartographic. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Guaná. *528. 759.* 528 (book VIII, ch. X) describes missionary and colonial attempts in resettling the Guanás (he uses the spelling Guanazes). Besides suffering forced assimilation, the group suffered from a massacre committed by a Portuguese colonizer, were violently targeted by the Caicaízes, and suffered from diseases after their resettlement. The HoSAI contains no information about the group; the entry for Guaná refers to the Indigenous people inhabiting the Chaco region, not the group in Maranhão. **A=1, V=1, D=1.** *Extinction confirmed in our reading of the sources.*

Guanaré. *325. 364. 380. 386. 906.* In his yearly chronology of Piauí, 386 records war declarations by the colonial authorities in 1722 and 1731 against the Guanarés, with the goal of capturing their entire population.The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Guanarú. *194.* The only reference is a map. The group is in the HoSAI, which refers to it as one of the groups listed by an early Spanish source (Acunã). The group is listed in Porro (2007), which also only records their location according to Acuña. **A=0, V=0, D=0.**

Guanavena. *19. 284. 292.* 19 (p. 281) refers to a raid by Pedro da Costa Favella in 1665, which resulted in the killing and enslavement of many Indigenous groups, including the Guanevenas. The group is not in the HoSAI. The group is in Porro (2007), which simply refers to the Guanavena as an Aruak group of the lower Jutaí river. **A=0, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Guarayú. *194. 284. 292. 528. 655. 658. 906.* There is also a non-extinct Tupi-language group in the map with the same name, in the Mojos region; the extinct unknown-language entry is in the lower Tocantins river, and the references to it seem scarce. 528 (book V, ch. XII) has a brief reference to the Guarajuz of the Tocantins river, who in 1671 complained to the colonial governor of suffering from a rebellion of another Indigenous group that they had enslaved. The Guarayú listed in the HoSAI refers to the Tupi group of same name but in the Mojos. The group is not in Porro (2007); although there is an entry for the Guarajú, Porro (2007) places this group by the Madeira river, not the Tocantins river. **A=0, V=1, D=0.**

Guaxiná. *292. 528.* 528 (book VIII, ch. XI) writes about a violent attack by the Portuguese on the Guaxinás and other Indigenous groups, which led the Guaxinás to flee to the forest. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=1, D=0.**

Guayoana. *194.* The only reference is a map. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Guayrabe. *816.* The only reference is a map. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Harritiahan. *797.* The only reference is a map. The group is not in the HoSAI. The group is not in

Porro (2007). **A=0, V=0, D=0.**

Ibanoma. *194. 875.* 194 is a map, but 875 is a diary that contains many references to a group known as Ybanoma. 875 (ch. II) describes his contacts with the group, which seemed to be suffering with conflict, recording a burnt village. 875 writes that the Yabanomas were friendly to the Jesuits and receptive to their missionary efforts. 875 also records a complaint by the group chief that they were being violently attacked by the Portuguese (ch. IV), as well as a slave raid on the group (ch. V). The group is in the HoSAI, which records the Ibanoma as an extinct little-known group of the Amazon river and mentions trade relations with other groups in the Guianas. The group is in Porro (2007), which records their location and mentions that they resisted the first assimilation and resettlement attempts. **A=1, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Igapuitariyara. *194.* The only reference is a map. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Igaruana. *906.* There is no reference to this group in the index of 906. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Índios. Some entries in the Nimuendajú map are referred to only by the generic term "Índios". Some of these entries appear as extinct, while others as non-extinct. Given the difficulty in identifying the precise group Nimuendajú refers to (na identification that Nimuendajú himself could not do), we also assign no possible extinct causes to these entries. **A=0, V=0, D=0.**

Ingahiba. *19. 194. 217. 218. 233. 270. 282. 284. 287. 292. 294. 314. 330. 336. 339. 383. 528. 906.* 19 (p. 173) suggests that the Ingahiba (which he refers to as Nhengayba) were a small group and that their name was a derogatory term used by other Indigenous groups. 528 records the religious conversion of the Ingaíbas (book VI, ch. IX) and the occurrence of a smallpox-like disease among them (book VI, ch. XV). The group is in the HoSAI as Nheengayba, which records an attack of the group, jointly with the Aruã, against the city of Belém in 1654. The group is in Porro (2007) as Nheengaiba. Porro (2007) records their resettlement in the 18 century, their use of the língua geral, and their presence in colonial towns. **A=1, V=1, D=1.**

Iruri. *194. 249. 317. 383. 528. 906.* 528 records many of their customs (book VII, ch. XXIV) and refers to the existence of were Jesuit missions towards the Iruris (book VII, ch. XXV) . The HoSAI records that, by the late 18 century, many Iruri individuals were incorporated within Mura communities.

Porro (2007) refers to the Iruris as a non-Tupi group who inhabited the Madeira river valley and who later were part of the colonial towns of Itacoatiara and Monte Alegre. **A=1, V=0, D=0.**

Itipuna. *194. 816.* The two references are maps. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Itutan. *340. 440. 508. 578. 743. 800.* 578 (p. 141) refers to the Itutan (he uses the spelling Ituan) as a group which lived deep into the forest, probably as a consequence of suffering violent attacks. In 743, Nimuendajú writes that the Itutanes (he uses the spelling Itoutanes) were the traditional inhabitants of the Uaçá river region before the arrival of other groups like the Aruã or the Palikur (p. 113), that some French priests contacted them with religious purposes (p. 13), and that some Itutanes lived among the Palikur by the mid 19 century. The HoSAI records that some Itutan individuals, along with the Aruã and the Galibi, settled near the Uaça river and became under French cultural influence. The group is not in Porro (2007). **A=1, V=1, D=0.**

Jacarégoá. *906.* There is no group with this name in the index of 906. The group is not in the HoSAI. The group is in Porro (2007) as Jacareguá, but the dictionary only indicates their location in 1714. **A=0, V=0, D=0.**

Jacundá. *8. 19. 45. 191. 222. 267. 348. 365. 370. 877. 889.* The references are usually biref. 19 (p. 196) indicates the group location on the opposite margin of the Tocantins than the Jundiahy, refering to hostilities between the two groups and with non-Indigenous groups. 370 (p. 37) lists them as one of the groups inhabiting the lower Tocantins circa 1814.The Jacundás are in the HoSAI, which records their location and some of the group's brief contacts with the Euroamerican society. The last contact with the group was recorded in 1849. The HoSAI conjectures they were extinct due to the long time since their last contact, but is not sure about it. The group is not in Porro (2007). **A=0, V=1, D=0.**

Jamundá. *194. 221. 528.* The group name used by the sources and in the map seems to come from the river where they were found. 528 (book I, ch. XII) records a Jesuit mission towards the Jacundazes. The group is not in the HoSAI. Porro (2007) only mentions their location by the Nhamundá river. **A=1, V=0, D=0.**

Jauari. *335. 366. 906.* We could not find references to an Indigenous group of this name in the sources listed by Nimuendajú. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Jeruvichahena. *441. 455. 491.* We could not find a reference to a group of this name within the sources listed by Nimuendajú. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Joane. *282. 287. 326. 330. 528. 913.* The most detailed reference is 528, which also uses the name Sacacá to refer to the group; see the entry for Sacacá below. The group is not in the HoSAI. The group is in Porro (2007), which records that the Joanes were also known as Sacará and that they inhabited a colonial town by 1798. **A=1, V=0, D=0.**

Jundiahy. *45. 222.* 45 is a map, and we could not access 222. The group is in the HoSAI, which suggests that they are the same as the Kupe-Rob, a group which appears as non-extinct in the Nimuendajú map. The HoSAI indicates frequent conflict with the Jacundás, with the Apinayé, and with Euroamericans. The group is not in Porro (2007). **A=0, V=1, D=0.**

Kaha-Dyapá. *573.* 573 (p. 424) refers to the Kaha-dyapá (he uses the spelling Caha-dyapá) as a peaceful Katukina subgroup. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Kaikusiána. *324. 440. 578. 800.* 324 (p. 523) mentions a small village with some last surviving individuals of the group, which he indicates was headed towards extinction, although he does not discuss possible extinction causes. 578 (ch. V) records the group location and their proximity to the "Armagaoutos, Coussanis and Acoquas". The group is in the HoSAI as Caicouchiane; the HoSAI simply indicates the group location. The group is not in Porro (2007). **A=0, V=0, D=0.** *Extinction confirmed in our reading of the sources.*

Karanariu. *340. 440. 508. 578. 800.* 578 (p. 140) refers to the Karanariu as a group that inhabited the same regions as the Palicur in the past, were very poor, and whose memory was fading among the Palicur. The group is recorded in the HoSAI as Caranariau, an extinct group that had been enslaved by the Palicur. The group is not in Porro (2007). **A=0, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Karane. *240. 578. 742.* 578 (ch. VI) describes the historical contact between Europeans and the Karanes (he uses the spelling Karannes), mentioning that their extinction followed their move towards a religious mission. The group is in the HoSAI as Caran, which mentions their presence in a mission by 1738. The group is not in Porro (2007). **A=1, V=0, D=0.** *Extinction confirmed in our reading of the sources.*

Karitiana. *240. 510.* 510 (Lecture 3, ch. II) refers to the Karitianas (he uses the spelling Caritiana) as a group inhabiting the Jacy-Paraná river and that, at the time of his expedition in 1909, were frequent targets of violent attacks by rubber tappers that occupied the region. The Karitiana attacked Rondon's expedition after confusing one of its members with a rubber tapper. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=1, D=0.**

Katawisi. *19. 45. 58. 192. 198.* Same name as a known-language non-extinct group in the map. The group is located within the Mucuim and Ituxi rivers. 58 (p. 95) refers to the Catauixis as a group living near the Mucuim river, refers to some of their material culture, and mentions the outbreak of a disease that resulted in many deaths. 192 (p. 501) lists many Indigenous groups inhabiting the region along the Ituxi river, including a group by name of Catauixi. The group is not listed in the index of 198. The group is in the HoSAI as Catawishi, in the same entry as the other Katawisi entries in the Nimuendajú map; the HoSAI refers to the Mucuim river group as no longer existing. The group is not in Porro (2007). **A=0, V=0, D=1.** *Extinction confirmed in our reading of the sources.*

Katukina. *45.* Same name as a known-language non-extinct group in the map. The group is located on the Mucuium river. The only reference is a map. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Katukinarú. *208. 209.* 208 (p. 63–66) contacted the group in his travels from 1896-7, staying for 5 nights among the group. In his short report, he refers to them as Catuquinarú. 208 recorded some words of their language, counted 196 individuals, and detailed their construction and housing habits. The group is in the HoSAI as one of the Catukinan peoples; the HoSAI has a paragraph on their material culture, following 208. The group is not in Porro (2007). **A=0, V=0, D=0.**

Kirikirisgoto. *441. 808. 812.* 441 (ch. 1.9) records the location and some aspects of the language of the Krikirisgoto; the other references are maps. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Koto. *185. 693.* We did not find references to the group in 185, and we could not access 693. Same name as a known-language non-extinct group in the map. The group is located near the Embira river, in Acre. The HoSAI contains references to the Cotos, but the entry seems to refer only to the non-extinct group farther north. The group is not in Porro (2007). **A=0, V=0, D=0.**

Kurukuan. *568.* We could not access the only source listed by Nimuendajú. The group is in the HoSAI as Curcucuan, which only records their location. The group is not in Porro (2007). **A=0, V=0, D=0.**

Kussari. *440. 578. 800. 811.* 578 (ch. VII) describes the history of the Kusari, mentions their conversion to Christianity and presence in a religious mission by 1732, and warns about the loss of their culture. The group is recorded in the HoSAI as Cusari. According to the HoSAI, the Kussari began a migration in 1720, eventually reaching a religious mission and assimilating within Tupi populations. The group is not in Porro (2007). **A=1, V=0, D=0.** *Extinction confirmed in our reading of the sources.*

Lambi. *19. 45. 46.* 19 simply records the location of the Lambys (p. 251). 45 and 46 are cartographic references. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Maba. *45. 46.* The only references are maps. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Maçarari. *185.* 185 (ch. III) simply lists the Maçarari as one of the groups inhabiting the region near the mouth of the Jutaí river. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Maiapena. *194. 906. 936.* 194 is a map, and we could not find references to a group with this name in 906 or 936. The group is not in the HoSAI. Porro (2007) records the Maiapena as a people who had resisted the Portuguese up until 1730, and that in 1768 inhabited the region along the Curicuari river. **A=0, V=0, D=0.**

Mainatari. Nimuendajú lists no reference to this group. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Majubim. *916.* 916 contains a vocabulary of the Parnauate (of which the Majubim were a sub-group, but that appear as a non-extinct Tupi group in Nimuendajú's map) and a map, both from 1926. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Makapa. *440. 508. 578. 811.* 578 (ch. VIII) mentions brief contact episodes between Europeans and the Makapa during the 17 and 18 centuries. All the references to Macapá in 440 are about the homonymous city. 508 and 811 are maps. The HoSAI only records the location of the group. The group is not in Porro (2007). **A=0, V=0, D=0.**

Mamayana. *19. 194. 221. 233. 284. 287. 330. 528.* 19 (ch. 197) simply lists the Mamayana as one of the Indigenous groups in the Marajó island. 528 refers to the Mamaianazes as a group inhabiting the island of Marajó (ch. II) and who converted to Christianity after Jesuit contact (ch. XV). The group is not in the HoSAI. The group is in Porro (2007), which suggests their assimilation by referring to aldeamentos and their presence in colonial towns. **A=1, V=0, D=0.**

Maniquera. *906.* The group name is not listed in the index of 906. The group is not in the HoSAI. The group is in Porro (2007), which only records their location in 1714. **A=0, V=0, D=0.**

Manitivitana. *441.* 441 (ch. 2.22) refers to the Manitivitana as an extinct group of the upper Negro river valley which was in conflict with the Spanish. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Mapruan. *440. 578. 811.* 578 (p. 139) records that the group was violently chased by the Arians. The group is in the HoSAI as Maprouan, which mentions that there were few surviving individuals by 1673 and that a rival Indigenous group, the Arians, had attacked them. The group is not in Porro (2007). **A=0, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Mapuá. *282. 284. 287. 330. 528.* 287 (ch. 24) writes about the Mapuazes as a war-like people that was in frequent conflict with the Portuguese. 528 (book 3, ch. II) records the Mapuases as one of the groups of the Marajó island, and as targets of proselytism by Jesuit missionaries (ch. VI). The HoSAI does not contain references to the group (although it refers to the river of the same name). The group is in Porro (2007), which records that the group inhabited religious aldeamentos. **A=1, V=1, D=0.**

Marabitana. *19. 441. 491. 808.* We did not find references to this group within the textual sources provided by Nimuendajú. The group is not in the HoSAI. Porro (2007) writes that the Marabitana inhabited many colonial towns and that, by 1787, they no longer had a tribal structure. **A=1, V=0, D=0.** *Extinction confirmed in our reading of the sources.*

Maracanã. *937.* The only reference is a map, uninformative about extinction causes. The group is in the HoSAI, which merely records their location. The group is not in Porro (2007). **A=0, V=0, D=0.**

Maraguá. *194. 247. 528. 906.* 528 (book VIII, ch. VII) refers to Maraguases inhabiting Jesuit-led aldeamentos. 528 (book VIII, ch. LXV) also mentions many deaths due to an unspecified epdiemic. The group is not in the HoSAI. Porro (2007) mentions that they inhabited the town of Monte Alegre. **A=1, V=0, D=1.**

Maraón. *274. 335. 340. 440. 508. 578. 743. 811.* 743 (p.10) mentions episodes of conflict with the French and with the Galibi and of diseases in the 17 century. The HoSAI refers to the Maraón as inhabiting religious aldeamentos in the 18 century, and as extinct. The group is not in Porro (2007). **A=1, V=1, D=1.** *Extinction confirmed in our reading of the sources.*

Marauaná. *287. 326.* They are likely the same as the Maraón, but the sources are not confident about it. 287 (p. 30) merely records their presence in the Amazon river. 326 (p. 280) records that a colonial village was built on the same location of a Marauá village. The group is in the HoSAI as likely the same as the Maraón or Marawan, although the HoSAI is not sure about this. Porro (2007) merely records their location. **A=0, V=0, D=0.**

Marauni. *528.* 528 records that the Maraunizes suffered a violent attack from the Oivanecas (book VII, ch. XVIII) and were the subject of Jesuit missionaries (book VII, ch. XVI). The group is not in the HoSAI. The group is not in Porro (2007). **A=1, V=1, D=0.**

Maripisana. *19. 441. 491. 808.* Also known as Marabitana or Maribitana. Neither name is in the index of 19. 491 refers to Marabitana as a locality, not an Indigenous group. The group is not in the HoSAI. Porro (2007) mentions that the Marabitana inhabited many colonial towns. **A=1, V=0, D=0.**

Maruquevene. *194.* The only reference is a map. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Mauitsi. *441. 454.* We did not find references to the Mautsi in neither source listed by Nimuendajú. The group is recorded in the HoSAI as Maitsi, a group recorded by Schomburgk in a map but about which Koch-Grunberg could not find traces of their existence. The group is not in Porro (2007). **A=0, V=0, D=0.** *Extinction confirmed in our reading of the sources.*

Mayé. *340. 440. 508. 578. 742. 799. 800.* The sources cited by Nimuendajú are not much specific about the Mayé; many are maps. The HoSAI refers to the Mayé as an extinct group that was enslaved by the Palikur. The group is not in Porro (2007). **A=0, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Menejou. *811.* The only source is a map. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Mepuri. *19. 150.* 19 (p. 581) merely lists the Mepuri as one of many groups inhabiting a region. The group is not in the HoSAI. Porro (2007) mentions that the Mepuri inhabited the towns of São Gabriel da Cachoeira and Nossa Senhora de Caldas by 1800. **A=1, V=0, D=0.**

Moquem. *19. 45. 46.* Very scarce references. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Moru. *340. 440. 578.* 578 (p. 140) uses the name Moroux to refer to the group, about which he only records the location. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Morua. *194.* The only reference is a map. The group is in the HoSAI, which only mentions their location along the Jutahy river. Porro (2007) merely indicates the historical location of the group. **A=0, V=0, D=0.**

Muriva. *221.* We could not access the only source listed by Nimuendajú. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Nauna. *194.* The only source is a map. The group HoSAI merely records their location. Porro (2007) simply records their location in 1639. **A=0, V=0, D=0.**

Nhandiriwat. *937.* The only reference is a map. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Nhauanhen. *251.* 251 (p. 98) contains only second-hand information about this group from the contact with Mundurukus, but simply recording their location. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Norak. *274. 440. 578. 798. 799. 801.* Many references are maps. 578 (p. 131) describes the history of contact and location of the Norak in the 17 and 18 centuries, without any mention to possible extinction causes. The group is recorded in the HoSAI as Norague, but it only mentions their customs regarding the execution of prisoners. The group is not in Porro (2007). **A=0, V=0, D=0.**

Noyenne. *800.* The only reference is a map. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Oivaneca. *528.* 528 (book VII, ch. XVIII) mentions the Oivanecas as hostile against Jesuit missionaries, but records no violent extermination, diseasers, nor succesful missionary activity towards the group. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Onicoré. *19. 528. 906.* The Onicoré are not listed in the index of 19. 528 (book VII, ch. XXV) merely lists the Onicorés as one of the five non-Tupi groups inhabiting the Madeira river region. The group is not in the HoSAI. Porro (2007) records that the Onicoré inhabited the town of Itacoatiara by 1775. **A=1, V=0, D=0.**

Ouranajou. *800.* The only reference is a map. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Oyanpique. *799.* This might be an alternative name for the Wayãpi, which are not extinct, but Nimuendajú was not sure about it. The only reference is a map. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Palenten. *19. 45. 46.* Very scarce references, one of which (46) is a map. The group is not listed in the index of 19. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Pama. *19. 45. 270. 312. 315. 353. 906. 962.* 19 (p. 414) mentions that the Pamas were expelled from the region of the Madeira river by the Caripunas, but without any explicit reference to conflict. 315 (p. 42) writes about a Franciscan mission with over 200 Pama individuals. 315 also tells that the Pama spent only some months of the year in the mission. The HoSAI records the Pama as a subgroup of the Caripunas and points to their location. Porro (2007) only records their location. **A=1, V=0, D=0.**

Pamana. *19. 58. 200. 350.* The group is not listed in the index of 19. 200 (p. 127) contains a second-hand reference to a brief encounter between the Pammanás and the expedition of Manoel Urbano to the Mucuim river. The HoSAI lists the Pamaná as a subgroup of the Caripunas and points to their location. The group is not in Porro (2007). **A=0, V=0, D=0.**

Papateruana. *194.* The only reference is a map. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Parabayana. *812.* The only reference is a map. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Paracoto. *5. 801. 811.* All references are maps. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Paraparixana. *528.* 528 (book VII, ch. XXV) describes Jesuit missions towards the Paraparixana. The group is not in the HoSAI. Porro (2007) merely records their location. **A=1, V=0, D=0.**

Pariana. *39. 194. 241. 247. 345. 816.* The references are usually briefly and provide little detail; e.g. 194 and 816 are maps, and 241 (ch. IX) simply mentions the existence of a people named Pauriana. 345 (p. 37) mentions the existence of an aldeamento inhabited by the Pariana. The HoSAI merely records their location and linguistic similarity with the Cayvicena. Porro (2007) records that the Pariana were forcefully moved by colonial autorities and settled in a village at the mouth of the Içá river. **A=1, V=0, D=0.**

Parintintin. *19. 29. 37. 45. 251. 761. 765.* Parintintin is a name historically used (by the Munduruku and the Portuguese) to refer to some of the Kawahiwa, a non-extinct Tupí group which is also recorded in the Nimuenadajú map. It is unclear why Nimuendajú included some unknown language and extinct entries under the name of Parintitim, possibly reflecting uncertainty about the precise identity and extinction status of some of the groups historically recorded as Parintintin. The HoSAI contains a detailed description of the

Parintintins by Nimuendajú, which clearly refers to the Kawahiwa. There is no entry for Parintitin in Porro (2007). **A=0, V=0, D=0.**

Pariquy. *19. 241. 294. 341. 428. 513. 522.* 241 (paragraph IX) refers to the forceful resettlement of the Paraquis to the region of the town of Serpa. 341 (Documento C) contains a budget item for the religious education and settlement of the Paraquis. The group is in the HoSAI as Pariqui, but the HoSAI simply records their location. The group is listed in Porro (2007) as Pariqui, mentioning that they were resettled by the Portuguese and inhabited the town of Itacoatiara. **A=1, V=0, D=0.**

Patiti. *45. 46.* The only references are maps. The group is not listed in the HoSAI. The group is not listed in Porro (2007). **A=0, V=0, D=0.**

Pauana. *194. 284.* 194 is a map and we could not find the reference to the Pauana in 284. The group is not listed in the HoSAI. The group is not listed in Porro (2007). **A=0, V=0, D=0.**

Piapay. *283. 555. 738.* In 578 (p. 404), Nimuendajú suggests that the Piapay were extinct and describes a war of the Sipaya against them. The HoSAI lists the Piapay as enemies of the Curuaya. The group is not in Porro (2007). **A=0, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Pino. *440. 578.* 578 (p. 129) only indicates the location where the Pino lived. The HoSAI simply records their location to the west of another group. The group is not in Porro (2007). **A=0, V=0, D=0.**

Piriu. *440. 578. 800.* 578 (c. XII) details the contact of the Piriu with the Europeans, mentioning many missionary attempts toward the group. The group is in the HoSAI as Apurui. The HoSAI mentions their location, their presence in a religious mission, and their survival to at least 1830. **A=1, V=0, D=0.**

Puxaca. *19. 45. 46.* Very scarce references. 45 and 46 are maps, and the group name is not listed in the index of 19. The group is not recorded in the HoSAI. The group is not listed in Porro (2007). **A=0, V=0, D=0.**

Quirioripa. *441. 808.* We did not find a group with this name in 441. 808 is a map. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Sacaca. *325. 326. 383. 528. 906. 913.* 528 (book I, ch. VIII) writes that there was a Jesuit mission in the village of the Sacacas. The group is not recorded in the HoSAI. Porro (2007) records the Sacaca as original inhabitants of the island of Marajó, eventually inhabiting the colonial town of Monforte. **A=1, V=0, D=0.**

Sewaku. *45. 47.* The sources listed by Nimuendajú are maps. The group is recorded in the HoSAI as

Sewacu, but the HoSAI only includes their location. The group is not listed in Porro (2007). **A=0, V=0, D=0.**

Tacayuna. *906.* Scarce references. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Tagari. Nimuendajú lists no sources for this group. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Tamararé. *45.* The only source is cartographic. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Tapakurá. *19. 221. 738.* In 738, Nimuendajú writes that there is very little information about this group (p. 405), and that the evidence for their existence is "semi-mythical" (p. 398). The group is not listed in the HoSAI. The group is not listed in Porro (2007). **A=0, V=0, D=0.**

Tapira. *454.* 454 (p. 479) refers to the Tapirindianer as a feared Indigenous group in the region he visited, without providing further details. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Tapiraua. *191. 267.* Scarce and uninformative references. The HoSI records that the Tapiraua and the Kupe-Rob were the same group. The HoSAI writes that the Tapirauas were not numerous and seemed to be on the brink of extinction. The group is not listed in Porro (2007). **A=0, V=0, D=0.** *Extinction confirmed in our reading of the sources.*

Tapuiussú. *221. 282.* We could not find references to the Tapuiussu in the sources. The group is not in the HoSAI. The group is not listed in Porro (2007). **A=0, V=0, D=0.**

Taricoupi. *440. 578. 800.* No group with this exact name is described by 440 or 578; 800 is a map. Based on the 1741 date and location, the Taricoupi plausibly refers to the Taripi discussed in 578 (ch. XIII). 578 briefly mentions conflicts between the Taricoupi and Indigenous groups allied with the Portuguese. The group was contacted by Jesuit missionaries, but it is not clear that the contact led to an effective assimilation effort or the establishment of a mission. The group is not in the HoSAI. The group is not listed in Porro (2007). **A=0, V=1, D=0.**

Tawari. *201. 573.* 573 (p. 423) records their location to the west of a rubber producing regionThe HoSAI records their location and cultural characteristics, without suggesting they were extinct. The group is not in Porro (2007). **A=0, V=0, D=0.**

Tobachana. *194.* The only reference is a map. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Tobajára. There is no entry in the dictionary by Nimuendajú fir this group; the only entry refers to the known-language group with the same name. Hence, we assign no likely extinct causes to this group. **A=0, V=0, D=0.**

Tocantim. *19. 221. 287. 383.* 19 (p. 256) suggests that the Tocantins were extinct, without mentioning possible extinction causes. Writing in 1662, 287 (p. 26) only points to the group location. 383 (p. 452) mentions a religiousmission toward the Tocantins. The group is not recorded in the HoSAI. Porro (2007) only records their location along the river of same name. **A=1, V=0, D=0.** *Extinction confirmed in our reading of the sources.*

Tocoyenne. *340. 440. 578. 799. 800.* 578 (ch. XIV) records episodes of contact between Jesuits priests and the Tocoyenne. There is no mention of assimilation or missionary enterprises. The group is the HoSAI as Tocoyen, which records their location circa 1730. **A=0, V=0, D=0.**

Tomokom. *324.* 324 (p. 569) met with the last Tomokom (he uses the word Tamocome) woman, without explaining why the group was going extinct. The group is not in the HoSAI. The group is not listed in Porro (2007). **A=0, V=0, D=0.**

Torori. *19. 241. 528. 906.* 528 (book VII, ch. XXV) briefly mentions missionary efforts towards the Tororis. Porro (2007) metions that the Torori integrated the population of the town of Itacoatiara. **A=1, V=0, D=0.**

Tuchinawa. *45. 187.* 45 is a map, and we could not access 187. The group is not in the HoSAI. The group is not listed in Porro (2007). **A=0, V=0, D=0.**

Tucujé. *19. 94. 217. 221. 223. 284. 287. 292. 528. 906.* Many references are brief and provide little information; e.g. 19 (p. 709) relates their name to a river dolphin and indicates the location of the Tucujús. 528 records a Jesuit mission towards the Tucujús (book IX, ch. XV), their resettlement by the missionaries (book IX, ch. XII), and the frequent occurrence of "fevers" among that people (book IX, ch. XI). The HoSAI simply records their location. The group is listed in Porro (2007), which indicates that the Tucujú inhabited the town of Portel. **A=1, V=0, D=1.**

Uaboy. *957.* 957 (p. 71) refers to the Uaboys as Aboyos, recording the group as extinct. 957 also mentions they inhabited a religious mission, eventually rebelling against the missionaries. The group is not in the HoSAI. The group is not listed in Porro (2007). **A=1, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Uanapú. *19. 223. 282. 287. 292. 915.* 223 (paragraph 476) writes that the Uanapús (he uses the spelling Guanapus) were violently targeted by a Portuguese expedition, suggesting the full destruction of the group villages. The group is not recorded in the HoSAI. Porro (2007) records that most Uanapaus were resettled in the town of Portel. **A=1, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Uaranacoacena. *19. 150.* 19 (p. 627) only contains a linguistic reference. 150 (paragraph CCLXXXXIX) states that the Uaranácuacénas were resettled in an aldeamento, and that the group was one of the first in the region to assimilate. The group is not in the HoSAI. Porro (2007) suggests an advanced assimilation of the group by the end of the colonial period; they inhabited Carvoeiro and Airão, and had disappeared from their original area. **A=1, V=0, D=0.** *Extinction confirmed in our reading of the sources.*

Uariua. *19. 241. 899.* We could not find references to the Uariua within the sources listed by Nimuendajú. The HoSAI contains the location of a group of the same name, but the location (in the Guianas) does not match the one in Nimuendajú's map (near the Rio Negro). Porro (2007) records the group location and suggests that, by 1787, their population was scattered. **A=0, V=0, D=0.** *Extinction confirmed in our reading of the sources.*

Uassahy. *356. 428. 522.* 428 (p. 86) indicates the location of the Uassahys and details some of their culture; the group was not extinct at the time of his report (1875). The HoSAI only contains their location. The group is not listed in Porro (2007). **A=0, V=0, D=0.**

Uauarate. *194.* The only reference is a map. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Uaya. *194.* The only reference is a map. The group is in the HoSAI, as a "wild" population that was frequently targeted and killed by other Indigenous groups in the region. Porro (2007) only contains their location. **A=0, V=1, D=0.**

Uruati. *287. 383. 528. 906.* 528 writes extensively about failed Jesuit missionary efforts towards the Uruatis: he mentions a brief conflict which resulted in the death of four Jesuits (book I, ch. VI), a wider conflict against the Portuguese (book V, ch. XII) and their extermination after conflict with other Indigenous groups (book V, ch. XIII). The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=1, D=0.** *Extinction confirmed in our reading of the sources.*

Urucuai. *19. 45. 46.* The group is not listed in the index of 19, while 45 and 46 are cartographic references. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Urumanaue. *194.* The only reference is a map. The group is not in the HoSAI. Porro (2007) only records their location. **A=0, V=0, D=0.**

Urumí. *510. 563. 917. 937.* The group seemed to be contacted by Rondon. However, the references are not informative about possible extinction causes; e.g. 917 is a vocabulary collected by Rondon in 1913 and 937 is a map. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Urupá. *19. 45. 221. 233. 236. 243. 317.* The references are usually brief and not much informative. 19 (p. 206) refers to the Urupá (he uses the spellings Uyapés and Oropiás) as a small group inhabiting a region dominated by the Apiacás; it is not clear they suffered violence from the latter. 317 (p. 22) lists the group among the Indigenous groups on the Tapajós river. The group is not in the HoSAI; the entry for the Urupás refers to the group on the Madeira river, not to the group on the Tapajós. The group is not in Porro (2007). **A=0, V=0, D=0.**

Ururu–Dyapá. *573.* 573 (p. 423) contains a brief, uninformative reference to the Ururu-dyapa. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Ururucú. *284. 287. 528.* 528 (book IV, ch. III) refers to the Ururucú (he uses the spelling Urucucú) as a group with which the Jesuits were conducting missionary activities. The group is not in the HoSAI. Porro (2007) refers to religious missionary activity towards the Ururucús. **A=1, V=0, D=0.**

Uyapé. *19. 45.* The group is not listed in the index of 19, while 45 is a cartographic reference. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Wai. *440. 578. 799. 800.* 578 (ch. XV) provides a detailed account on the Wai. They inhabited religious missions established circa 1730, and by 1743 some of them were recorded as speakers of French, which suggests ongoing assimilation. The HoSAI only records the location of the Wai. The group is not in Porro (2007). **A=1, V=0, D=0.**

Xacuruina. *19. 45.* 19 (p. 252) simply describes the group location. 45 is a cartoraphic refrence. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Yaguanai. *194. 320. 816.* 194 and 816 are maps. We did not find references for a group with this name in 320. The group is not in the HoSAI. The group is in Porro (2007), which contains a detailed account of their historical locations and large number of villages, but no evidence about their extinction. **A=0, V=0,**

D=0.

Yao. *17. 19. 333. 335.* Scarce references: e.g. 19 (p. 734) has an uninformative reference, and 333 (Appendix II) simply lists the location of their villages.The group is in the HoSAI, which suggests a Carib language and mentions conflict with Spanish colonizers and neighboring Arawak groups. This conflict led the Yao to relocate away from their location near the Moruca river. The group is not in Porro (2007). **A=0, V=1, D=0.**

Yapocoye. *324.* 324 (p. 86) records their location, indicates they inhabited many villages in the interior of French Guiana, and details some of the customs of the Yapocoyes. The group is in the HoSAI, which records their location and notes cultural and linguistic similarities with the Oyana. The group is not in Porro (2007). **A=0, V=0, D=0.**

Yauei. *194.* The only reference is a map. The group is not in the HoSAI. Porro (2007) conjectures that this group is the same as the Jaquei, about which it simply contains the location. **A=0, V=0, D=0.**

Yoemamay. *194.* The only reference is a map. The group is not in the HoSAI. The group is not in Porro (2007). **A=0, V=0, D=0.**

Yufiua. *194.* The only reference is a map. The group is not in the HoSAI. Porro (2007) records that the group inhabited the towns of Tefé and Manaus. **A=1, V=0, D=0.**

Yúma. *936.* We could not find a reference to the Yuma in 936. The Yuma briefly referenced by the HoSAI does not match the location in the Nimuendajú map. Porro (2007) refers to the resettlement of the Yuma to an aldeamento in 1774. **A=1, V=0, D=0.**

Zapucaya. *247.* Uninformative references. The group is not in the HoSAI. Porro (2007) lists their location in 1639 and highlights their woodworking skills. **A=0, V=0, D=0.**

Zuana. *816.* The only reference is a map. The group is not in the HoSAI. Porro (2007) describes the Zuana as a populous group inhabiting the area between the Japurá and Negro rivers. **A=0, V=0, D=0.**

Zurina. *19. 247.* 19 (p. 415) simply records their location according to Alcuña. The HoSAI only mentions their location and their proximity to the Caripuná. Porro (2007) records the location of the Zurina and indicates that the group engaged in trade with other Indigenous groups by supplying wood objects. **A=0, V=0, D=0.**