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Comparative Study of the Impact of the Economy and Governments of Brazil and the United States on Deforestation

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Abstract

Artificial deforestation has been developing and growing for centuries, and in every country, agricultural economics feeds into it. The United States and Brazil are two different nations that indulge in tree clearing, and their states of development are crucial to the understanding of how their actions and policies affect their rates of deforestation. Archival data and the analysis allowed us to effectively compare how the economic and governmental policies implemented in each country affect deforestation.

Categories: United States, Brazil, Deforestation, Economy
Keywords: Agriculture, Market, Industry, Developed Country, Developing Country

Background Research

Deforestation has become a substantial issue, paralyzing biodiversity, green economies, and the environment within the global realm. With its early roots deriving from the early 1600s, this contentious undertaking has fostered copious negative implications from displacing indigenous communities to producing rapid desertification. Deforestation pertains to the act of tree-clearing. In this research paper, artificial deforestation, tree-clearing through human means, will be heavily emphasized upon. Whether it be natural or artificial, the detrimental impacts it brings cannot be changed. However, with artificial deforestation, by implementing adequate changes, it is still possible to reverse some of the damage humans have done. By exploring the disparities & similarities regarding economic and political approaches for tackling deforestation from two diverse countries, the United States (developed country) & Brazil (developing country), people can take the necessary steps to fully comprehend the overall scheme of artificial deforestation.

The United States economy represents that of a highly developed country, yet can still be considered mixed. For the most part, the United States has maintained a stable monetary policy and has only very rarely experienced hyperinflation, avoiding the chances of it becoming the norm. This helps to stabilize the economy and boosts growth prospects. Because of a stable democracy, capitalist economy, and high standard of living, the term first world is used to describe the country today. Between 1600 and 1900, the United States experienced extensive deforestation, but the size of its forest areas has remained relatively stable for the last century. Reforestation projects, such as planting projects after timber harvesting, natural regeneration, or planting projects on reclaimed farmland or urban sites, help to offset deforestation (Becker, n.d.).

Economic growth and overexploitation of natural resources, including forests, have been intuitively linked. This applies to almost all examples of artificial deforestation, establishing the driving factor as profit. Prior to European settlement, the United States was estimated to be 46 percent forested. Many of the available trees and much of the timber was quickly harvested by European settlers for homes, manufacturing, railroad construction, and to clear land for farming. By 1907, the United States' forest cover had decreased to 33% (Becker, n.d.). The United States is a major producer and consumer of beef, soybeans, and wood products, and these commodities are considered “forest-risk”. Because the US is one of the world's largest producers of most agricultural products, large-scale changes result in land being converted from forests to crops and pasture (Beckman et al., 2017).

In Brazil, the most prominent driving factor of deforestation is the soybean market. Since the 1990s, the expansion of world markets, new access to local credit, and government incentives (such as exemptions, funding of agricultural research, improved infrastructure, and improved marketing channels) have caused an increase in overall agricultural production. The high global demand for soybean oil and soybean meal (which are used for animal feed and refined cooking oil) has driven an increase in demand for Brazilian soybean, causing a significant increase in soybean cultivation in Brazil. The increase in agricultural cultivation impacts the rate of

deforestation because the forest land in the Amazon and other forests is being converted to cropland (Barona, et al. 2010). Another driving factor of deforestation in the Amazon is cattle ranching. Due to growth in investment in beef and dairy processing facilities located closer to production zones, improvement in cattle herds and management systems, fragmentation and concentration of landholdings, and widespread adoption of ranching by smallholders, cattle ranching in the Brazilian Amazon has increased in recent years. (Pacheco & Poccard-Chapuis 2012). It reached the point where from 1990 to 2005, cattle ranching was the cause for 80% of deforestation in Brazil (Steinweg et al., 2016). During those years, pasteurization caused the deforestation of 29,949,000 ha of land in Brazil (Sy et al., 2015). There are other factors driving deforestation in Brazil as well, including mining, hydroelectric dams, roads, and other infrastructure. The increase in agriculture and cattle ranching in the Amazon has driven the construction of more roads in the Amazon, causing more deforestation. Brazil has been pushing legislation to increase reliance on renewable energy, a goal they aim to meet by installing more hydroelectric dams. However, many of these dams are installed in the Brazilian Amazon. In 2012, Brazil had 138 hydro-plants installed in the Amazon, with 16 under construction and another 221 in the planning stages (Steinweg et al., 2016).

Materials and Methods

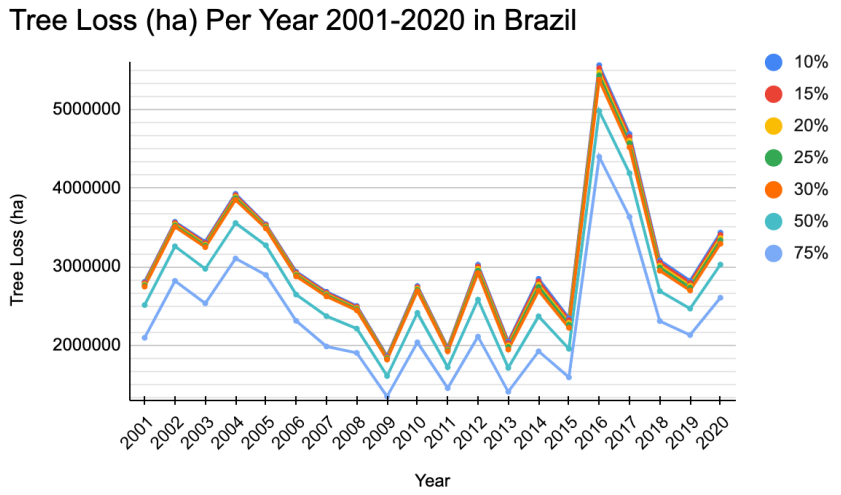
For this study, we focused on gathering archival data and studying the conclusions made by other researchers to perform a comparative study. We compared the relationships between the economies and government policies of the United States and Brazil with deforestation in that country. In the introduction, we described the different economic factors that contribute to deforestation. These economic factors have an impact on the policies the government chooses to implement. Therefore, we hypothesized that specific environmental policies linked to economic and industrial growth will contribute to the changes in the rate of deforestation.We will provide the changes in deforestation per year in each country and explain how specific policies have contributed to the changes in the rate of deforestation.

Data on deforestation from Global Forest Watch was used for analysis. Global Forest Watch is an organization that provides data on forests around the world with the mission of empowering people to protect them against deforestation. In addition to tree cover loss, they provide data on forest carbon fluxes, biomass loss, carbon dioxide emissions, and more. Global Forest Watch was founded by the World Resources Institute in 1997 as a part of the Forest Frontiers Initiative. Global Forest Watch offers a fully interactive map that shows intact forest ecosystems, tree cover loss, tree lost due to fires, and more. Countries can report their own deforestation to maximize the accuracy and up-to-dateness of the data, but many countries only update this data every 10-20 years. Because of this, most of the data from Global Forest Watch is collected by satellites and updated annually (Harris et al., 2016).

Our data is separated by country and by the threshold of canopy cover. The different data set represents the tree loss when different percent of canopy cover is used to define a forest. For example, the 10% data is the tree loss when a forest is measured as an area with trees in which the

area of canopy cover is at least 10% of the area of the land it is on. We used a t-test to look for differences in trends of deforestation.

Results and Data Analysis



threshold/year	10%	15%	20%	25%	30%	50%	75%
2001	2807365	2794202	2775178	2761618	2746362	2511772	2094865
2002	3571007	3557018	3538090	3524428	3507049	3259112	2819380
2003	3316999	3300984	3280973	3266999	3248527	2971953	2533330
2004	3926871	3908196	3886568	3871265	3848771	3554955	3103760
2005	3539438	3527422	3512463	3500862	3486563	3271827	2895021
2006	2934803	2921468	2904454	2891196	2876805	2644935	2310272
2007	2680946	2667225	2650383	2637283	2621820	2370608	1984615
2008	2500574	2487269	2471778	2459079	2444308	2211986	1902280
2009	1860174	1849988	1838505	1829956	1817901	1608447	1348291
2010	2753204	2738238	2720400	2705582	2688896	2411940	2036707
2011	1970080	1960178	1947607	1937608	1923364	1720221	1453888
2012	3023514	3002269	2973627	2949943	2918633	2579923	2109060
2013	2047521	2026977	1998270	1977761	1945506	1712477	1408858
2014	2845016	2813939	2771709	2740443	2693134	2368690	1922331
2015	2343959	2319838	2286109	2261282	2222772	1955191	1591479
2016	5564566	5526713	5474041	5435241	5378844	4980661	4397952
2017	4689315	4652375	4604466	4570645	4519833	4188994	3632931
2018	3080754	3053076	3014452	2988181	2948462	2688477	2308005
2019	2819902	2793972	2758982	2733931	2696749	2466243	2129550
2020	3433257	3404086	3363936	3334917	3291392	3026629	2604385

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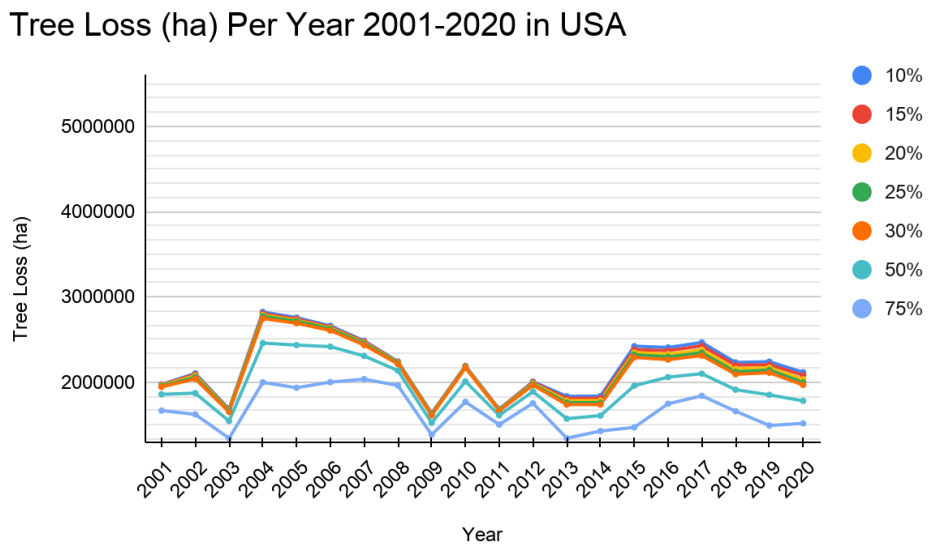

threshold/year	10%	15%	20%	25%	30%	50%	75%
2001	1973281	1968426	1961843	1953398	1943319	1856943	1666270
2002	2101489	2088411	2074939	2058419	2038436	1870736	1621690
2003	1684367	1676951	1669270	1662286	1649384	1544225	1341054
2004	2823291	2804373	2786687	2772940	2746257	2458621	1997023
2005	2756923	2741440	2726187	2715391	2691544	2434773	1934135
2006	2659958	2645761	2634271	2625362	2605856	2416774	2000229
2007	2484973	2474684	2463411	2453020	2435128	2307144	2034874
2008	2241632	2236386	2229774	2223762	2213724	2136147	1960757
2009	1634714	1630022	1623224	1618084	1608981	1521998	1382963
2010	2190012	2186011	2179681	2174744	2167662	2008152	1768439
2011	1683629	1679562	1674709	1669838	1663692	1611291	1501805
2012	2005823	1997288	1986126	1975419	1964094	1888194	1752074
2013	1833352	1808537	1783575	1759893	1736445	1571411	1341924
2014	1836704	1812519	1783557	1759672	1736527	1607381	1426387
2015	2421903	2381109	2346840	2322491	2289649	1957748	1468890
2016	2406715	2369629	2328083	2296655	2264067	2058805	1746267
2017	2465292	2425909	2379298	2344635	2311358	2099064	1839597
2018	2230649	2198871	2155186	2121499	2092359	1911150	1658875
2019	2240217	2204206	2170168	2142202	2109918	1850817	1490653
2020	2115380	2081436	2033115	1997367	1966716	1780477	1515913

Brazil

Tree loss in Brazil was generally increasing from 2001 to 2004 to reach a relative maximum of 3,926,871 ha in 2004. Then, the tree loss trended downward, decreasing until 2009 to reach a minimum of 1,860,174 ha in 2009. From 2009 to 2015, the tree loss fluctuates, increasing and decreasing every other year. During this period, the tree loss remains relatively low, remaining bounded between 1,860,174 ha and 3023514 ha. In 2016, there was a spike in tree loss, reaching a maximum for 2001-2020 at 5,564,566 ha. Tree loss then decreases from 2016 to 2019, until it begins to increase again in 2020.

United States

Tree loss in the United States (in ha) was almost always lower than tree loss in Brazil. It reached a relative minimum in 2003 at 1,684,367 after increasing slightly from 2001 to 2002. In 2004, it reached a maximum of 2,823,291 ha, and from there it decreased until 2009, when it had a relative minimum of 1,634,714 ha. From 2009 to 2014, the tree loss fluctuated slightly but remained relatively low, always below 2,120,012 ha. Tree loss increased from 2014 to 2017, and then began slowly decreasing from 2017 to 2020.

A T-test was used to compare the significance of the difference between these two data sets, however, it would not make sense to directly compare the tree loss in each country since each is a different size. So, we found the percentage of the tree loss area out of the country it is in and compared these values for the 10% threshold data sets. This yielded a $p<0.05$, confirming our hypothesis, that the data sets show a significant difference. We will now explore the reasons for this difference.

Discussion

Hypocrisy has arisen within the developed nation's scope of understanding. Latin American countries led by Brazil have struggled to avoid deforestation or restrict agribusiness appetite for decades. The rest of the world has allowed them to grow productivist agriculture and livestock, as well as dig for minerals to meet our consumer needs. Leaders in other nations continue to ignore the situation in Brazil as it takes a turn for human rights and the environment. Pre-development, nations had no issue in striving for radical change in reducing the detrimental effects of deforestation. The nations' economy would then skyrocket and stabilize, resulting in an abrupt change in attitude on this environmental hazard (Dorcadie, 2019). Because they lack the resources to exploit the environment, very poor countries have low rates of deforestation. Deforestation rates may initially rise as incomes rise, as forest exploitation aids economic development. As income rises and more environmental amenities are demanded, a point is reached where sustained increases in income lead to decreased rates of deforestation, or even increased rates of reforestation to repair earlier damage to forest cover.

Balancing economic development demands and regional environmental concerns in the face of deforestation has been an issue for Brazil. The restriction of deforestation has been proven to be technically difficult, costly, and politically controversial at local, national, and international levels (Wood, 1990). For the past few decades, global leaders have been aiming to assess the current ecological framework and determine what is best for the environment. However, due to extenuating factors that impede on certain aspects of the climate, the deforestation policies that have been implemented harm the constituents of the land; specifically, those who subsist in and around tropical forests. According to the data, the tree loss (ha) in Brazil had steadily declined

from 2001-2009, largely due to the reinforcement of public policies. There is an increase in volatility from 2009-2015, which results in a sharp increase during 2015 and 2016. This is due to the search for food supplies, such as beef, soy, palm oil in margarine, and other everyday foods. Hunting for such resources has long been known for the rapid acceleration of deforestation in Brazil and Indonesia (Niranjan, 2019).

There has been much statistical research done to hypothesize whether environmental enforcement efforts/policies have had any lasting impact on deforestation rates in the Brazilian Amazon. The primary policy that has been proven globally, and especially in developing nations like Brazil, is reducing carbon emissions and forest degradation. Government working groups have collaborated in order to find solutions to reduce deforestation. There have been a total of 14 ministries, including the 'Gabinete Civil', Environment, Agriculture, Science and Technology, Defense, Agrarian Development, Industry, and Foreign Trade, National Integration, Justice, Energy and Mining, and Transports, (Abranches). The groups conducted a plan to understand the causes of deforestation and date back to how it began.

In Brazil, there are many significant challenges that remain in reducing the detrimental effects of artificial deforestation. Economic changes and policies are a major factor, where Brazil's continued success in economic relations have taken a toll on the environmental aspect of the developing nation. For instance, Brazil has been undertaking massive investments in hydropower generation, infrastructure works, and soybean production. The fourteen ministries have been able to acknowledge the contradictions and inconsistencies among federal policies. By neglecting the environmental concerns, federal programs have been given the right to build roads and pursue research in energy production. This not only impedes on the current ecosystem but also overuses natural resources and land. With no prior thinking or planning in order to mitigate environmental damage, federal programs have not been able to provide sustainable results for the Brazilian Amazon. Because of the slow yet steady progress from the past few years, federal programs and governmental leaders have taken advantage of this improvement and used it to wield better economic results for the country. In doing so, this counteracts the improvements made.

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