What are the socioeconomic consequences of the presence of a military organization in the municipalities along the border band?

¿Cuáles son los reflejos socioeconómicos de la presencia de una organización militar en los municipios de la franja fronteriza?

Abstract: One of the characteristics of the Brazilian frontier, particularly in the Amazon region, is the low levels of social and economic development. The Brazilian Army, in addition to having a secular presence strategy in that region, welcomes and remunerates young people from the municipalities where its Military Organizations (MO) are installed. In view of this, research was conducted that seeks to explain the contributions of the of the MO in the generation of employment, income, and development in the municipalities of the border strip in Arco Norte. To answer the following question: how does the presence of an MO directly contribute to the generation of employment and income in a municipality in Arco Norte? The overall objective is to understand the impact of a State institution in a region far from the major economic centers and geographically isolated from the rest of the country and how state investment promotes a dialogue with the Human Development Index (HDI). The focus of the work was the 124 municipalities with territories in the Border Strip of the states of Acre, Amapá, Amazonas, Mato Grosso, Pará, Rondônia, and Roraima, and, within these states, those municipalities with the presence of MO. Primary economic indicators were collected from the Brazilian Institute of Geography and Statistics (IBGE) database, and governmental data referring to the pay of the military and numbers of the variable personnel of the analyzed MO. The method for data analysis was univariate inferential statistics, with the support of the SPSS software in carrying out the tests. The spatialization and clipping of the sample were carried out with the support of the QGis georeferencing software. The results were analyzed seeking to confirm the hypotheses raised from historical arguments of the strategy of presence.

Keywords: Brazilian Army; Amazon; Municipalities in the North Border Band; socioeconomic weight.

Resumen: Una de las características de la frontera brasileña, particularmente en la región amazónica, son los bajos índices de desarrollo social y económico. El Ejército Brasileño, además de tener una estrategia de presencia efectiva en esa región desde hace siglos, acoge en sus filas y remunera a jóvenes de los municipios en los que están instaladas sus Organizaciones Militares (OM). Ante ello, se realizó una investigación para explicar los aportes de la existencia de estas OM a la generación de empleo, ingresos y desarrollo en los municipios de la franja fronteriza en el Arco Norte. Para responder a la siguiente pregunta: ¿En qué manera contribuye directamente la presencia de una OM a la generación de empleo e ingresos en un municipio en el Arco Norte? El objetivo general es comprender el impacto de una institución

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del Estado en una región alejada de los grandes centros económicos y geográficamente aislada del resto del País y en qué medida la inversión estatal promueve el diálogo con el Índice de Desarrollo Humano (IDH). El trabajo se restringió a los 124 municipios con territorios en la franja fronteriza de los estados de Acre, Amapá, Amazonas, Mato Grosso, Pará, Rondônia y Roraima y, dentro de esos estados, aquellos municipios que cuentan con la presencia de OM. Se recopilaron indicadores económicos primarios en la base de datos del Instituto Brasileño de Geografía y Estadística (IBGE) y datos gubernamentales relativos al sueldo de los militares y números del efectivo variable de las OM analizadas. El método para el análisis de los datos fue la estadística inferencial univariada, con apoyo del *software* SPSS para la realización de las pruebas. La espacialización y el recorte de la muestra se realizaron con el apoyo del *software* de georreferenciación QGis. Los resultados se analizaron tratando de confirmar las hipótesis planteadas con base en argumentos históricos sobre la estrategia de presencia.

Palabras clave: Ejército Brasileño; Amazonia; Municipios de la Franja Fronteriza del Arco Norte; reflejo socioeconómico.

1 INTRODUCTION

The Amazon region, particularly its portion in Brazilian territory, is subject of valuable discussions about its development. This agenda goes beyond Brazilian and South American borders. Thus, it is no surprise that world and regional powers are paying attention to this area.

The region has reserves of mineral raw materials, biodiversity, water potential, and productive space for various activities ranging from sustainable natural resource management initiatives to large-scale agriculture and livestock farming. There has been and continues to be an international interest, stretching from the colonial period, when the Portuguese, Spanish, and travelers from other nationalities passed through the region, to the present day, with new formats that are beyond the control of the territory and sovereign decisions about its use.

Hence, the focus of this study is the Brazilian Legal Amazon region, which accounts for approximately 60% of the country's territory and requires Brazilian leaders to plan and conduct actions on development and defense issues that are important in the global context. More specifically, the area considered to be the Legal Amazon and the economic development of the municipalities in Brazil's Border Strip are defined geographically and politically-administratively. The Legal Amazon is understood as the region encompassed by all the relevant legislation (Law 1.806, of January 6, 1953 (Brazil, 1953); Law 5.173, of October 27, 1966 (Brazil, 1966); Federal Constitution of 1988 (Brasil, 1988). The focus on the municipalities of the Border Strip also respects the legislation that establishedd the Border Strip region itself.

As a result, the state seeks to implement strategies that identify with regional characteristics and are within the reach of its capacities. For the purposes of this study, the strategy of presence adopted by the Brazilian Army (EB) stands out.

Thus, this paper aims to present the current positions of the EB in the Border Strip and the impacts generated on livelihoods, the economy and regional development. To do this, statistical comparisons, theoretical discussions, and a survey of socio-economic data were used, all of which is methodologically detailed in the next section. Both the current situational awareness, and existing threats are the reasons to answer whether the strategy of presence, particularly applied by the EB in the Legal Amazon Border Strip region contributes to overcome obstacles and currently favors the development of national defense.

Finally, the aim of the study is to identify the socio-economic impacts of the military presence in the municipalities of the Legal Amazon Border Strip, in terms of the economically

active population (formal jobs), the economy, and local development (contribution to constitute the municipal Gross Domestic Product ¬[GDP]), seeking to understand the degree to which vivification contributes to the local economy.

2 METHOD

This study took both qualitative and quantitative strategies as methodological approach making use of numerical data in certain parts. In others, the research was more conceptual, in order to enrich and substantiate the discussed topics, materializing positions and arguments that were found.

To achieve the research objective, the work aims to show the importance of the Brazilian Army for local development, and its impact on the population and the economy. The method took on a quantitative bias, with adherence tests being carried out to identify whether the data were parametric or not. Statistical tests were then carried out to compare samples and correlate variables within municipalities with the presence of Military Organizations (MO).

Non-parametric tests were used to assess whether two independent samples came from the same or identical populations. This test is used when the variables studied present a non-Gaussian curve (Siegel; Castellan, 2006). Such analysis is to confirm or refute the null hypotheses, which consider that the military presence is unrelated to the different aspects analyzed, or the alternative hypotheses, following the premise that the military presence has a significant impact on the municipalities.

The level of $\alpha = 0.05$ for the analysis of variance tests, which represents a 95% reliability of the results was adopted. To this end, tests were carried out using the SPSS program and can be found in the database.

For the purposes of correlation between the dependent and independent variables, the values in Table 1 were considered. The purpose was to demonstrate the influence of the independent variable on the dependent variable to be explained in each analysis.

Table 1 – Resultados das correlações a serem aplicadas nessa pesquisa

Very trong correlation	$r \leq 0,90$
Strong correlation	$0,6 \leq r \leq 0,9$
Moderate correlation	$0,3 \leq r \leq 0,6$
Weak correlation	$r \leq 0,3$

Source: Callegari-Jacques, 2009.

From a qualitative perspective, the concepts of presence strategy, border strip, demographic indices, Human Development Index (HDI), and gross domestic product (GDP) were used to analyze the impact of the military presence on the economy according to these variables in that geographical space, even though the region requires "redoubled efforts to overcome the lack of systematized and comparable statistical data" (Aragón, 2013, p. 57; our translation).

In order to integrate the data, the databases of the Brazilian Institute of Geography and Statistics (IBGE) were explored and analyzed with the support of georeferencing (QGis software) and statistical (SPSS) tools,

Thus, this work dealt with socio-economic data on the municipalities of the Legal Amazon Border Strip, such as GDP, HDI, population, etc. In addition, it analyzed data related to the location, ranks and salaries of the military personnel deployed in the MOs, which are within the spatial scope already specified. This information was retrieved from government websites. Table 2 consolidates their descriptions and sources.

Table 2 – Used indicators and data sources

Indicator	Description	Source
Population	Estimate of all inhabitants living in a given municipality. Using data from 2020.	IBGE, [20--]
Military personnel	Sum of all military personnel serving in MOs based in a given municipality. 2019	Anuário do (Yearbook of) EB 2020
GDP	Sum of all final goods and services produced by a country, state or city, usually in one year. 2018	IBGE, [20--]
Military pay	Specifically, only the salary (basic monthly portion of remuneration and allowances, inherent to the military rank or grade) and the special location bonus (portion due to the military, when serving in inhospitable regions). 2018	Provisional Presidencial Decree 2.215-10, from August 31, 2001. (Brasil, 2001)
Mean minimum wage	Average remuneration paid to all formal workers in a given municipality divided by the value of the minimum wage. The 2019 figures were used in this survey because they are the most recent available from the IBGE. 2018	IBGE, [20--]
Human Development Index (HDI)	Index that measures human development and progress in the quality of life of the population of a given municipality. It considers three components to base its calculation: Longevity, Education and Income.	IBGE, 2013

Source: prepared by the authors, 2021.

Using SPSS software, the following tests were carried out: (i) data normality test; (ii) Mann-Whitney u-test to identify differences in the GDP of border strip municipalities with and without the presence of MO; (iii) Spearman correlation test to check how the soldier pay variable relates to the GDP of the municipalities in the sample; and (iv) simple regression model to identify how much the Spearman correlation explains the correlation identified.

3 THE STRATEGY OF PRESENCE IN THE AMAZON BORDER STRIP

According to the *White Paper on National Defense* (Brazil, 2020a), National Power should, roughly speaking, be aimed at meeting both development and defense needs, in view of the conjunctural and structural obstacles. Thus, the National Defense Policy (PND) is intended to implement defense plans based on three pillars: development, diplomacy and defense. These pillars "must be explored in greater or lesser depth depending on the specific case, in order to guarantee national security and defense" (Brasil, 2020b, p. 20; our translation).

In order to achieve its defense objectives, the National Defense Strategy (END) lists some Strategic Defense Actions (AED) aimed at the Amazon Border Strip, namely: "intensifying the presence of various government sectors in strategic areas of low demographic density" and "intensifying the contribution of various government sectors to the protection, development and greater integration of the Amazon region with other regions of the country" (Brasil, 2020b, p. 64). Thus, the application of actions capable of overcoming obstacles within the scope of a planning process aims to meet national objectives in a rational manner in all fields of national power (Brasil, 2020b).

Within the scope of this study, which focuses on economic and social expressions, economic growth makes no sense if it does not promote human development, i.e. if economic growth in a place does not result in an improvement in social indicators, then development can be questioned.

This becomes clear when we understand that the least developed regions have serious infrastructure deficiencies, which prevent them from having access to good health, education and decent housing in order to enjoy a long productive life.

The borders of the Legal Amazon are constantly a subject of reflection by the Brazilian geopolitical school. Travassos (1938), Backheuser (1952), and Mattos (2011b) emphasize the need to vivify these borders in order to strengthen Brazil's national objectives of local sovereignty and integration with other regions of the country.

Aragón (2013) considers that the Amazon conveys the idea of a region with a low demographic density, due to the fact that it has made little progress in overcoming certain delays in relation to other regions of Brazil. Even so, the author warns that the Amazon is not a vacuum, with the presence of federal and state entities linked to various sectors, such as education, security, defense, industries and others. The dichotomy exists because the region is the target of high global interests, but remains peripheral in its own country.

Becker (2009) and various authors highlight the importance of demography for understanding phenomena linked to the occupation of the territory. For decades, important thinkers in military geopolitics such as Golbery do Couto e Silva (1978) and Meira Mattos (2011b) have written works in which they believe that "Population is the way to solve the problem of both the 'demographic vacuum' and the lack of integration in the region" (Franchi, 2013, p. 265; our translation). For this reason, in-depth demographic studies on the evolution of Amazonian demography, such as those by Aragón (2013), are very useful. In a few years' time, new data from the next demographic census will make it possible to substantiate more relevant analyses for the country.

In addition to the population aspect, the Municipality Human Development Index (MHDI) also makes it possible to evaluate and compare the development of a given place. This index directly reflects the previous discussion on people moving away due to a lack of decent living conditions, encouraging the population in the interior to look for better quality in large urban centers.

In terms of economic expression, GDP helps to assess whether the economy is growing and, therefore, whether living standards are improving. In general, it refers to all the goods and services produced by the municipality over the course of a year.

It should also be noted that the municipalities that integrate the Legal Amazon extend beyond the Northern Arc to the Brazilian Central Arc. Hence it is possible to infer the complexity of working with this data, given the extent and diversity of the entire area.

4 THE BORDER STRIP IN BRAZIL AND THE PRESENCE OF THE BRAZILIAN ARMY

In the 19th century, the regions of the Brazilian land borders in the areas that today correspond to the Legal Amazon were far from the more developed urban centers and closer to the Brazilian coasts. Some of these borders were not even Brazilian, with the final delimitation of the territory only occurring in 1904 with the closure of the Pirara issue (Oliveira; Magalhães, 2012). The understanding of a Border Strip in Brazil goes back a long way. According to Mattos (2001),

> the first time Brazil recognized the legal status of the border strip was through Law 691 of November 18, 1850, by which Emperor Pedro II established a zone of ten leagues (66 kms) from the limits of the Empire with its neighbors where military colonies were created. [...] The Constitution of 1937 extended this strip to 150 kms, keeping the 66 kms previously established under federal jurisdiction. The Constitution of 1946 transferred the delimitation of the border strip to ordinary law, and Law 2,597 of September 12, 1955 consolidated the 150 km strip as essential to the country's defense (Mattos, 2011b, p. 81; our translation).

Under Brazilian law, the concept of the Border Strip is currently determined by:

> Law 6.634, of 05/02/1979, regulated by Decree 85,064, of August 26,1980, the content of which was ratified by the Federal Constitution of 1988, in the second Paragraph of Article 2 – Register of Brazilian Municipalities with an area totally or partially located in the Border Strip, which is the internal strip 150 km wide, parallel to the land dividing line of the national territory, aggregating existing information (geographic code and name of municipalities) with that produced in the identification and/or classification of municipalities within the strip, such as: border, partially or totally in the strip, references from the headquarters to the border line and to the limit of the internal strip (IBGE, 2022; our translation).

For security and defense studies, this concept gains importance. Complementary Law 97, of June 9, 1999 (Brasil, 1999), amended by Complementary Law 117, of September 2, 2004 (Brasil, 2004), gives the Armed Forces the power to conduct, in the Border Strip, actions inherent to the judicial police on a subsidiary basis, either on their own or in cooperation with other agencies.

The concept of police power is set out in Art. 78 of Law 5,172 of October 25, 1966 (Brasil, 1966), which provides for the National Tax System (STN) and establishes general tax law rules applicable to the Union, states and municipalities.

> Art. 78: Police power is considered to be an activity of the public administration which, by limiting or disciplining rights, interests or freedoms, regulates the practice of an act or abstention from a fact, due to public interest concerning safety, hygiene, order, customs, the discipline of production and the market, the exercise of economic activities dependent on concession or authorization from the Public Power, public tranquility or respect for property and individual or collective rights (Brazil, 1966; our translation).

By respecting the distance of 150 kilometers (km), the border strip can divide municipalities, making it possible to cover only part of their territories within the strip and, in some cases, to exclude the municipality's administrative headquarters. Map 2 shows how difficult it is for the Armed Forces to apply their police powers, as identifying the location is complex, especially in municipalities whose headquarters are outside the strip, in which it is understood that there would be a population center and greater possibility of action against cross-border and environmental crimes.

Map 1 – Location of municipal administrative headquarters in the Legal Amazon with territory in the border strip
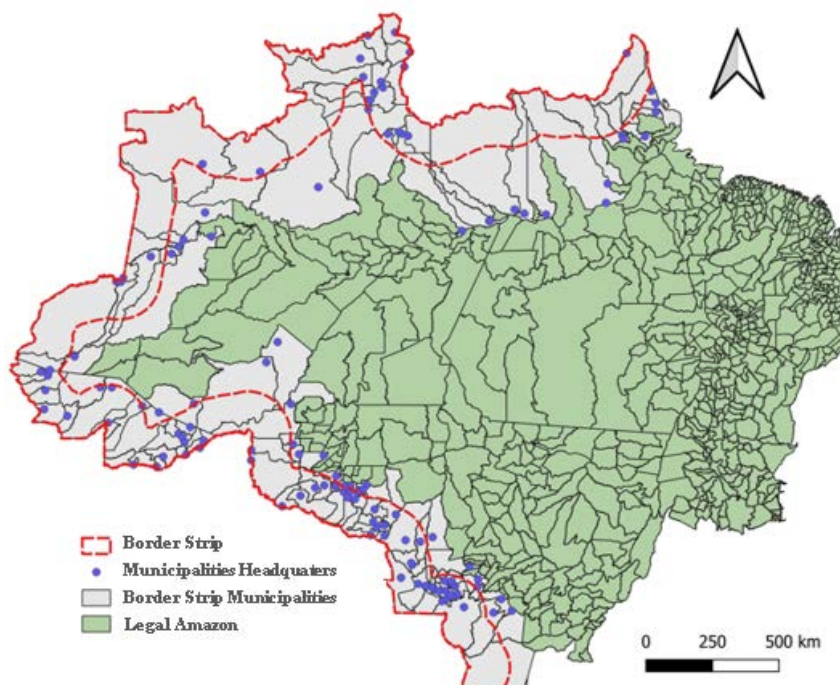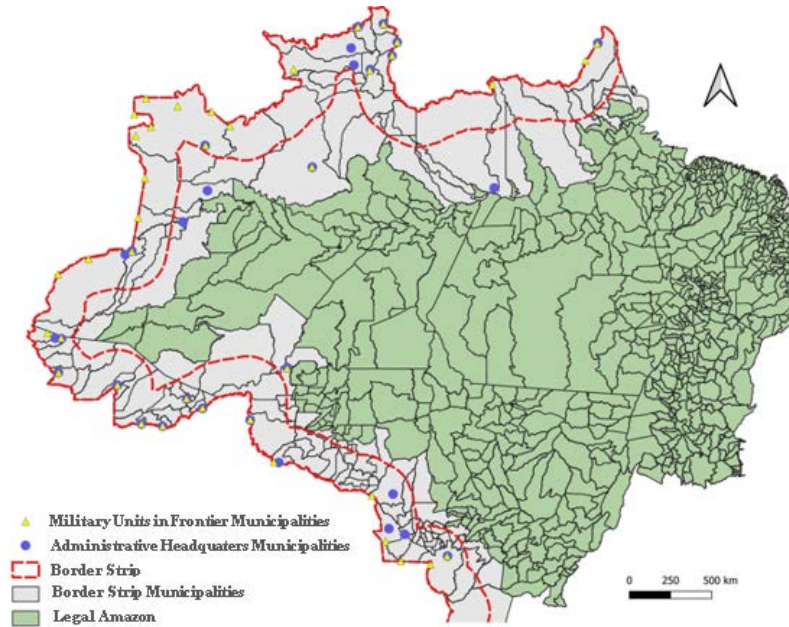

Source: Prepared by the authors, 2021.

It is not always that the administrative headquarters are the location of the MOs on the border. Indeed, there are military units outside the border strip, although part or the municipalities' territory where they are located lies inside it.

However, Map 2 shows that in only two cases there are military units located in municipalities on the border, but their municipal headquarters are outside the Border Strip. Both cases have peculiarities that justify this more inland location, accompanying the population core.

Map 2 – EB Military Organizations in municipalities of the Legal Amazon Border Strip

Source: prepared by the authors, 2021.

The first case is the *Comando da 17ª Brigada de Infantaria de Selva* (Command of the 17th Forest Infantry Brigade), located in Porto Velho, in the state of Rondônia (RO), a unit whose mission is to coordinate and control the battalions closest to the border (Cruzeiro do Sul, state of Acre (AC), Rio Branco (AC), and Guajará Mirim, state of Rondônia (RO). The other case is the *3º Batalhão de Infantaria de Selva* (3rd Forest Infantry Battalion) in Barcelos, state of Amazonas (AM), by one of the main river access routes to Brazil—the *Rio Negro*—which is also the entry route to Colombia and Venezuela.

To make it easier to understand these locations, the MO can be divided into those present in the Border Strip and those in the bordering municipalities [1] and neighboring countries, understanding that they are all important and each requires a detailed look.

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1   The municipalities of the border strip include those within 150 km of the border line. Borderline municipalities are those that are in contact with neighboring countries

According to Table 3, of the 124 municipalities in the Border Strip, 30 have an EB Military Organization, which corresponds to 24.2% of this strip. On the other hand, of the 52 municipalities located on the border, 24 have this characteristic, amounting to approximately 46.2% of this sample.

Table 3 – Municipalities on the Borde Line and Border Strip within the Legal Amazon (by state)

State	Municipalities			Presence of MO	
	Legal Amazon	Border strip	Border line	Border strip	Border line**
Acre	22	22	17	8	5
Amapá	16	08	02	1	1
Amazonas	62	19	08	6	5
Mato Grosso	141	27	04	4	4
Pará	144	05	03	1	1
Rondônia	52	28	09	3	2
Roraima	15	15	09	7	6
Tocantins	139	0	0	0	0
Maranhão	181*	0	0	0	0
TOTAL	772	124	52	30	24

*Maranhão has 79.3% of its territory (or 261,350.785 Km²) within the scope of the Legal Amazon. Of the 181 municipalities, 21 have only part of their territory included in the Amazon area.

**OM that are close to the border (20-30 Km)

Source: IBGE, 2020.

5 THE EFFECTS OF THE PRESENCE OF MILITARY ORGANIZATIONS ON THE POPULATION OF THE LEGAL AMAZON BORDER STRIP

First of all, it is worth pointing out that the strategy of presence is part of a strategic culture of employment of the Armed Forces, more precisely of the Brazilian Army, particularly in the Amazon region (Moraes, 2021). Until the present day, the military presence in the Amazon has pursued objectives for each period of historiography, such as territorial expansion, consolidation of borders, maintainance of integrity, in order to avoid separatism, contributing to regional development and combating cross-border crime. For this study, these objectives are of little importance, but rather the consequences of such military presence on the Amazonian border strip.

A first way of analyzing the population living in this territorial area is to quantitatively compare it with other areas. Although it is constituted of seven states (AC, AP, AM, PA, RR, RO, MT), the Legal Amazon Border Strip has 3,264,348 individuals. And the Border Strip located outside the Legal Amazon registers 7,359,964 residents, distributed in four states (RS, SC, PR, MS). The area

encompassed by the Border Strip of the Legal Amazon covers 1,787,247 km2 and that outside 438,064.1 km2. According to Graph 1, a comparison between the two areas reveals that approximately one third of individuals occupy an area approximately four times larger (IBGE, [20--]).

Graph 1 - Comparison of population and geographical area between the Legal Amazon Border Strip and the Border Strip outside the Legal Amazon

Source: Prepared by the authors, 2021.

This result is to be expected given the historical processes of occupation of the region and the physiographic and national integration difficulties that the states of the North region of Brazil went through in the 20th century (Hemming, 2009; Gadelha, 2002). Even so, when compared to the Legal Amazon, the border region is home to only 11% of the 29,313,409 individuals who live in the Legal Amazon (IBGE, [20--]). In view of the delimitation of the work, the analysis was deepened by comparing the 30 municipalities with military presence and the 94 without it in the Border Strip of the Legal Amazon, totaling 124 analyzed municipalities, according to the data in Table 4.

Table 4 – Statistical data on the population in the 124 municipalities of the Legal Amazon Border Strip (in 2021)

	All	With OM	Without OM
Number of municipalities	124	30	94
Mean	32.926,256	73.592	20.094
Median	17.078	20.508	14.099
Standard Deviation	72.072,356	134.890,039	18728,267
Minimum value (smallest population)	1.755	1.755	2.127
Maximum value (largest population)	548.952	548.952	107.631

Source: IBGE, [s. d.]. Table prepared by the authors, 2021

To do this, an adherence test was carried out, containing the total populations of all municipalities in the Legal Amazon Border Strip, to identify whether the selected data was parametric, i.e. whether it was close to the Gauss curve. The results (p < 0.001) indicated that non-parametric tests were indicated for the selected sample, so that the Mann-Whitney u-test was used.

The results of this test (U = 919, p = 0.03) showed there is a statistically significant difference among the populations of municipalities in the Border Strip with and without the presence of MO. This reinforces the alternative hypothesis that military presence has influenced the settlement.

Based on this finding and an analyzing the median, the set of municipalities in the Border Strip with presence of MO has a population median of 20,508 people. And the municipalities in the Border Strip without the presence of MO have a population median of 14,099 people. Therefore, considering the population median of the municipalities with the presence of MO, Porto Velho (RO), Boa Vista (RR) and Rio Branco (AC) have the largest populations.

Specifically, in the municipalities with MOs, the association between military personnel and population size was investigated. Spearman's non-parametric correlation test indicated that there are positive and strong associations between the number of military personnel and the population of the municipalities (rho = 0.784, p < 0.001). In addition, a simple regression model with bootstrapping (to compensate for the non-normality of the data distribution) showed that military personnel explained around 61% of the variation in the number of people in the municipalities analyzed, F (29.1) = 9.65, p = 0.004.

The arguments of geopoliticians such as Meira Mattos (2011b) and Silva (1978) confirmed that the absence of population is a risk to the maintenance of portions of the national territory and this showed that it was necessary to populate them with those who arrived. Currently, the need to populate the border is no longer so emphasized. However, it must be understood that a small population concentration imposes limitations on municipal development due to various factors: reduced supply of labor and consumer markets; lack of access to federal resources in various areas intended for larger cities; retention of the economically active population; limited capacity to attract private investment, i.e. variables directly linked to the number of people.

Another aspect to be considered in the population picture is its impact on national political life. It should be recognized that small populations indicate a reduced number of voters and, therefore, a loss of capacity to have their agendas addressed. The debate on the Legal Amazon in Congress and the Senate in Brasilia is mainly focused on the environmental issue and the political situation, with little attention paid to agendas focused on the real needs of the most remote municipalities in the Amazon Border Strip (Casanova et al., 2017).

According to the Superior Electoral Court (TSE), in 2020, the total number of voters eligible to vote in the Legal Amazon was 14,908,298, which corresponds to 9.61% of the 147,918,483 Brazilian voters (BRASIL, 2020c). Undoubtedly, little relevance in the electoral race results in diminished power of voice and consideration of public policies. This corroborates the view of Aragón (2013), who stated that the Amazon remains, in many respects, invisible to national eyes, reflecting the little attention given to the implementation of development policies.

6 THE IMPACT OF THE LEGAL AMAZON BORDER STRIP ON THE ECONOMY

Ratzel's (2011) approach shows how vital spaces progress if the state stimulates the extension of life over the surface of the earth. In this context, population settlement in a given region would depend on its productive capacity. Indeed, the possibility of economic growth is an attraction for people to settle. However, to increase the number of individuals without providing them with work and income would be to offer labor to illegal activities.

One tool for measuring the local economy is to analyze its GDP, a variable related to the economic expression of municipalities' main sectors, be they agricultural, industrial and/or services, as well as the tax collection related to them. Roughly speaking, this data can show the economic situation of a given location. However, as Drummond points out, if income generation is centralized in a few large extractive enterprises, high GDP may not be transformed into real quality of life for the population (Diniz, 2007; Drummond, 2002).

Following the same method used to analyze the population, the GDP statistics for the 124 municipalities were collected, as shown in Table 5.

Table 5 – GDP statistics for the 124 municipalities in the Legal Amazon Border Strip (in 2018)

	Todos	With OM	Without OM
Number of municipalities	124	30	94
Mean	R$ 688.250,18	R$1.616.406,29	R$ 395.148,25
Median	R$ 251.368,34	R$ 280.727,40	R$ 236.379,39
Standard deviation	R$ 1.913.878,86	R$ 3.616.034,41	R$ 542.187,71
Lowest GDP in the sample	R$ 38.330,56	R$ 71.467,47	R$ 38.330,56
Highest GDP in the sample	R$16.647.157,60	R$ 16.647.157,60	R$ 3.238.473,09

Source: IBGE, [20--]. Table prepared by the authors, 2021.

As Table 5 shows, the municipalities in the Border Strip with presence of MO have a median GDP of R$280,727.40, while the municipalities in the Border Strip without the presence of MO have a median of R$236,379.39. The higher median for the first group of municipalities shows once again that these figures are boosted by the municipalities of Porto Velho (RO), Boa Vista (RR) and Rio Branco (AC).

Even if we exclude the three capitals present in this study, the GDP median of the other 27 municipalities is R$252,906.44, i.e. the sample of municipalities with a military presence has a higher median than the others. These data point to the use of non-parametric tests (p < 0.001) in the normality test. This time, the Mann-Whitney u-test (U = 1079, p = 0.045) identified statistically significant differences in GDP between border municipalities with and without a military presence. In other words, just like population, there is some other variable capable of differentiating these two samples in terms of GDP.

On the other hand, when Spearman's correlation test was carried out on the variable military pay received by soldiers serving in those municipalities with municipal GDP, positive and moderate associations were identified (rho = 0.562; p = 0.001). In addition, the military pay variable explains approximately 0.52% of municipal GDP, according to the simple regression model.

This leads to the inference that the null hypothesis is refuted. **Statistically, the group of municipalities with military presence has variables that significantly distinguish them from the observations of the group of municipalities without military presence.** In addition, Spearman's correlation pointed to a moderate correlation between municipal GDP values and the gross pay paid to military personnel serving in that municipality.

The moderate correlation between military pay and municipal GDP can be seen as boosting economic indices when comparing the mean minimum wage paid to formal workers in a given municipality and the mean minimum wage paid to military personnel.

Table 6 – Results of the comparison between means in minimum wages paid to formal workers and military personnel in the municipalities (in 2019)

Municipality	Mean minimum wage	Mean salary of all military personnel	% higher earnings of all military personnel compared to the average salary in the municipality	Mean salary of only Cp/Sd	% higher earnings of Cp/Sd compared to the average salary in the municipality
Porto Velho	3,4	3,67	7,94%	1,97	**-42,06%**
Boa Vista	3,5	2,15	**-38,57%**	2,15	**-38,57**
Cáceres	3,3	3,05	**-7,58%**	2,08	**-36,97**
Rio Branco	3,2	3,01	**-5,94%**	2,02	**-36,87**
Guajara-Mirim	2	3,08	54,00%	1,87	**-6,50**
São Gabriel da Cachoeira	1,9	2,63	38,42%	1,99	4,74
Oriximina	3,1	3,27	5,48%	3,27	5,48%
Assis Brasil	2,3	3,27	42,17%	2,44	6,09%
Comodoro	2,3	3,27	42,17%	2,44	6,09%
Vila Bela da Santissima Trindade	2,3	3,27	42,17%	2,44	6,09%
Tabatinga	1,9	3,54	86,32%	2,08	9,47%
Santa Rosa do Purus	2,2	3,27	48,64%	2,44	10,91%
Pontes e Lacerda	2,1	3,27	55,71%	2,44	16,91%

Table 6 – Continuation

Municipality	Mean minimum wage	Mean salary of all military personnel	% higher earnings of all military personnel compared to the average salary in the municipality	Mean salary of only Cp/Sd	% higher earnings of Cp/Sd compared to the average salary in the municipality
Cruzeiro do Sul	1,7	3,29	93,53%	2,06	21,18%
Barcelos	1,6	3,16	97,50%	2,07	29,38%
Oiapoque	2	2,64	32,00%	2,64	**32,00%**
Marechal Thaumaturgo	1,8	3,27	81,67%	2,44	**35,56%**
Costa Marques	1,8	3,27	81,67%	2,44	**35,56%**
Bonfim	1,7	3,27	92,35%	2,44	**43,53%**
Epitaciolandia	1,6	3,27	**104,38%**	2,44	**52,50%**
Placido de Castro	1,6	3,27	**104,38%**	2,44	**52,50%**
Atalaia do Norte	1,6	3,27	**104,38%**	2,44	**52,50%**
Alto Alegre	1,6	3,27	**104,38%**	2,44	**52,50%**
Pacaraima	1,6	3,27	**104,38%**	2,44	**52,50%**
Uiramuta	1,6	3,27	**104,38%**	2,44	**52,50%**
Mancio Lima	1,5	3,27	**118,00%**	2,44	**62,67%**
Japura	1,5	3,27	**118,00%**	2,44	**62,67%**
Amajari	1,5	3,27	**118,00%**	2,44	**62,67%**
Normandia	1,5	3,27	**118,00%**	2,44	**62,67%**
Santo Antonio do Içá	1,4	3,27	**133,57%**	2,44	**74,29%**

Source: IBGE, [20--]; Brasil, 2019b. Table prepared by the authors, 2021.

Table 6 shows that: (i) in 50% of the municipalities (15) the mean salary of Corporals (Cp) and Soldiers (Sd) (population of local origin) is at least 30% higher than the local mean salary. Among these 15 municipalities, in 11 the mean military pay is more than double the mean minimum wage (+100%) (Epitaciolândia, Mâncio Lima, and Plácido de Castro, in Acre; Atalaia do Norte, Japurá and Santo Antônio do Içá, in Amazonas; Alto Alegre, Amajari, Normandia, Pacaraima and Uiramutã, in Roraima). (ii) it should also be noted that there are six municipalities where the average salary of the Cb/Sd was between 9.47% and 4.74% higher than the average local salary, which may indicate a negligible difference. On the other hand, in 25 of the 30 municipalities the salary paid to corporals and soldiers is in line with or higher than the local salary averages. (iii)

However, Table 8 also shows that five municipalities had an average salary higher than the average salary paid to military personnel. These municipalities are the three capitals on the border strip: Rio Branco (AC), Boa Vista (RR) and the municipalities of Cáceres, Mato Grosso (MT), Guajará-Mirim (RO).

The results show that, in at least 50% of the municipalities, military pay can be an attraction for young male citizens at compulsory military service age (corporals and soldiers), offering a formal job with a higher mean salary than that found in the city. There is also free access to medical and dental services and the possibility of becoming a soldier for a period of up to eight years (Brazil, 1966), which shows the positive impact of the presence of MO and their contribution to the area.

Finally, although it cannot be said that gross military pay is a variable that distinguishes one group of municipalities from another, it is possible to associate the influence of this military presence with the value of municipal GDP, according to the results presented above.

7 IMPACT ON THE DEVELOPMENT OF THE LEGAL AMAZON BORDER STRIP

In order to measure human development and the progress made in the quality of life of the population of a given municipality, the Municipal Human Development Index (MHDI) was created. This index ranges from 0 to 1, being the closer to 1 the greater the human development, and is calculated using the geometric mean of three fundamental components: longevity, education, and income.

It should be emphasized that the MHDI values are well out of date, with the most recent publication having been made using data from 2010 (IBGE, 2013). Thus, the statistical analysis, as conducted on population and economic impact, is hampered in terms of contemporaneity. Even so, it was decided to maintain and analyse the HDI correlations in order to test the method and have organized data from a T-0, which could be updated in the future. Thus, the method of analysis in the field of development will take into account the evolution of these data in the three results available from the IBGE.

Table 9 – Mean of the MHDI of the surveyed universe

	1991	2000	2010
MEAN FU C/ Lg Amz Bd Stp	0,433	0,552	0,688
MEAN Mun Lg Amz Bd Stp with MO	0,341	0,464	0,607
MEAN Mun Lg Amz Bd Stp without MO	0,309	0,487	0,643

Source: IBGE, 2013. Elaborada pelos autores.

The data in Table 9 shows how similarly the MHDI has evolved in the surveyed region, regardless of the presence of MO. This tends to logically lead to the conclusion that growth in the selected municipalities has already occurred naturally, without the influence of the MO instalation. Graph 2 helps to understand this similarity.

Graph 2 – Evolution of the MHDI of the universe surveyed
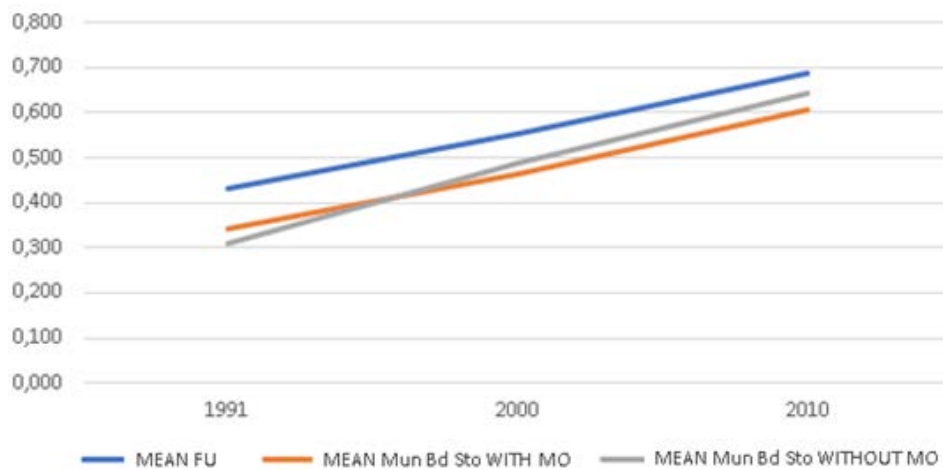
Legend: MEAN FU = Mean of the federative unit; MEAN Mun Bd Stp with MO = Mean of municipalities in the border strip with military organizations; MEAN Mun Bd Stp without MO = Mean of Municipalities in the Border Strip without Military Organizations;
Source: prepared by the authors, 2021.

It is possible to judge whether the municipalities of the Legal Amazon Border Strip have kept pace with the growth of their Federative Unit (FU). As Graph 2 shows, there is a slight overtaking of municipalities that have MO by municipalities that do not.

Another relevant aspect, also mentioned above, is the diversity of the Legal Amazon. For example, its two highest MHDIs since 2000 are precisely the states of Rondônia and Mato Grosso, which belong to the central border arc, as shown in Table 10, and are therefore very much affected by local agribusiness.

This allows to infer that the installation of MO has no or little impact, on the MHDI of the Legal Amazon Border Strip. There is no differentiated movement between the two groups of municipalities and no contemporary data to refute the hypothesis of differentiating the groups. Therefore, the military presence has little or no influence on the MHDI. It should be emphasized once again that the HDI data present is out of date and as soon as a new Demographic Census is conducted by the IBGE, these analyses should be redone in order to generate a more effective comparison. In addition, more detailed studies should be conducted to take a closer look at municipalities, such as the study by Arantes de Moraes et al. (2021), which details the impacts of installing an infantry battalion in the municipality of Barcelos (AM), located on the border strip.

From the study of the impact of the presence of an Army MO on the border strip, the three aspects surveyed—number of people, economy, economic, and social development—revealed a negative spiral trend. As much as the presence of these MO can generate population and economic impacts, there are still too few investments of any kind to keep the people needed for this spiral to be positive.

Table 10 – Evolution of the MHDI by FU of the Legal Amazon with Border Strip territory

STATES	ACRONIM FU	ARC	MHDI 1991	MHDI 2000	MHDI 2010
Rondônia	RO	Central	0,407	0,537	0,690
Acre	AC	Norte	0,402	0,517	0,663
Amazonas	AM	Norte	0,430	0,515	0,674
Roraima	RR	Norte	0,459	0,598	0,707
Pará	PA	Norte	0,413	0,518	0,646
Amapá	AP	Norte	0,472	0,577	0,708
Mato Grosso	MT	Central	0,449	0,601	0,725
Mean UF			**0,433**	**0,552**	**0,688**

Source: prepared by the authors, 2021.

Figure 3 – Cycle of consequences in the Legal Amazon Border Strip
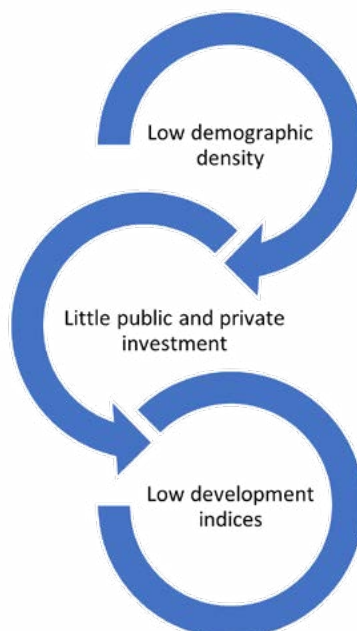
Source: prepared by the authors, 2021.

8 CONCLUSIONS ON THE STUDY OF THE BRAZILIAN ARMY'S PRESENCE ON LEGAL AMAZON BORDER STRIP

This study allowes us to build up a panoramic view, with statistical support, of how impactful (or not) the presence of an MO can be for municipalities.

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Although the demographic indices are lower when compared to other places in Brazil, it can be seen that they have a strong correlation with the presence of MO. It can be inferred that the presence strategy has influenced and continues to influence livelihoods on the border strip of the Legal Amazon Border Strip, contributing to the settlement of populations in the municipalities, to the extent that they are offered jobs with salaries that are in line with and even higher than the local averages.

The contribution of Aragón's studies (2013) stated that the Amazonian population is sufficient for its current status, including a sufficient presence of state institutions, which means that there is no reason to stimulating disorderly growth in the region. On the contrary, a population boom in these areas could mean an increase in urban violence, crime and an overload of state services, contributing to increased insecurity in an already problematic area.

On the other hand, the low demographic density makes it difficult for public and private investment to come in, favoring a cycle that is not very beneficial to the regional growth or development, which would consequently mean continued low investment.

Therefore, even if the presence of Army MO contributed to settling the local population on the Brazilian border in the Legal Amazon, particularly through the economic contribution, as statistically verified in the research, it would be imperative for the state to find solutions to address the social difficulties to better develop that geographical area. All of this, in contemporary times, is very much in line with the work of the last century on vivification.

The military presence in the Legal Amazon Border Strip has made a beneficial contribution to the composition of some of the local economic indicators. The municipal GDP figures point to this contribution. However, it is worth highlighting that this contribution to the economy comes from the public administration, with the payment of salaries to the military personnel who probably make the economy "spin" in some municipalities. It is quite possible that such remuneration is used to provide services or purchase items sold but not produced locally. This means that, as much as the local economy is influenced by soldiers, there are no major stimuli to produce wealth in the region in terms of the military presence, accommodating only the growth of the third sector of the economy. One possibility for another study is to look at the acquisition processes carried out by these MOs in companies based in the municipalities.

It should not be forgotten that this strategy of military presence aims, at first, to meet the demands of Defense and National Security, via an articulation of the MO. The economic and social contribution is in the background, developing at the expense the mission of defending national sovereignty and territory, even though economic and social development is related to strengthening national power and therefore has a strong bearing on defense issues.

Therefore, in order to break the cycle presented in Figure 3, it would be necessary for the state to pursue different public policies in order to solve the obstacles to regional and local development. As we have seen, the application of the military presence has an influence on the social indices (formal employment, income) and the economic sector (GDP) of that region. The main positive results are seen in the countrysude municipalities and the negative results in the state capitals. There is no significant contribution, at least according to the statistics of

this group of municipalities studied, to the increase in the MHDI. However, it is important to extend the study to all the municipalities in the Legal Amazon, in order to observe how they behave in municipalities where MOs with larger numbers of personnel are based, such as Tefé (AM), where the 16th Forest Infantry Brigade is based, or Marabá, where the 23rd Forest Infantry Brigade is based.

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