AI Report

We predict this text is

Human Generated

AI Probability

3%

This number is the probability that the document is AI generated, not a percentage of AI text in the document.

Plagiarism

?

The plagiarism scan was not run for this document. Go to gptzero.me to check for plagiarism.

Report.pdf - 7/16/2025

Lucas Favaro

An Analysis of the Economic Impact of 50% U.S. Tariffs on Brazil

Lucas Favaro [12]July of 2025

Contents

Executive Summary

On 9 July 2025, the United States announced a 50% tariff on all Brazilian goods, to be effective starting August 1.
This report assesses which sectors, regions, and products are most exposed, and how much leverage each country holds.

Key takeaways:

Manufacturing - especially mineral fuels, iron \& steel, machinery, and aircraft dominates exports from Brazil to United States (US \ 30 bn/year).

: [1] MSc in Economics from the University of São Paulo.
Email: lucasfavaro97@gmail.com.
LinkedIn.
Portfolio.

[2] The complete data analysis script for this report can be found on my GitHub.

The Southeast, led by São Paulo (≈ 33 % share of exports), is the most exposed region.

The US holds stronger bargaining power, though it depends heavily on a few Brazilian goods like ferro-niobium and vegetable waxes.

Some implications:

São Paulo's industrial exporters face significant tariff exposure.

Brazil has limited leverage but can defend niche products with high US dependence.

1. Introduction and context

On July 9, 2025, Donald Trump announced 50% tariffs on imports of Brazilian products, to be implemented starting August 1.
Among the reasons Trump cited in a letter sent to President Lula for implementing this tariff are the trial of former President Jair Bolsonaro pending before the Supreme Federal Court (which Trump deems a "witch hunt"), the restrictions on social media imposed by the Brazilian Supreme Court, and the trade barriers in Brazil, stemming from both tariff and non-tariff policies.

In the letter, Trump also claims that such protectionist policies have generated unsustainable trade deficits for the United States.

However, this is incorrect, as Figure 1 below shows.

This figure shows Brazil's annual bilateral trade balance with the United States - that is, total Brazilian exports to the United States minus total Brazilian imports of American products.

The figure shows that since 2009, Brazil has had a trade deficit with the United States, not the opposite.

In 2022, Brazil's bilateral trade deficit was nearly US\15 billion.

In 2024, this deficit, while still present, was almost zero.

Beyond the alleged motivations outlined by Trump in his letter, some analysts suggest there are other motives for the implementation of these tariffs.

It's possible that Trump is retaliating against the Brazilian government's flirtation with the idea of implementing a new trade currency among the BRICS member countries (Norton, 2025).

In any case, regardless of the reasons, these tariffs will affect both the American and Brazilian markets, if effectively implemented.

The American market will suffer

because imported goods from Brazil will become more expensive, reducing consumption and putting pressure on inflation.

The Brazilian market will suffer because exports will decline, which will affect the income of exporters and their associated sectors, ultimately negatively impacting aggregate demand and the population's income [3].

Figure 1: Brazil's bilateral trade balance with the US, 2001-2024

With this in mind, the objective of this report is to analyze, at least partially, some important points related to the implementation of these tariffs.

More specifically, a sectoral analysis will be conducted to determine which sectors of the Brazilian economy export the most to the US (which will likely be the sectors most affected by the tariffs).

Next, a regional analysis will be conducted to identify the most affected Brazilian states, as well as the most affected sectors in each region.

Furthermore, a comparative analysis of the bargaining power of Brazil and the US will be conducted to determine which country has greater economic power over the other.

This is important because economic power is one of the main factors determining the leverage one country has over the other in a potential negotiation between them.

Finally, this analysis of bargaining power will be

complemented by a more specific analysis of which products the United States most depends on from Brazil.

2. Sectoral analysis

Considering that countries specialize in certain products within global value chains and that, within countries, different regions specialize in the production and export of different goods and services, changes in the international trade pattern generated by a tariff will generate heterogeneous effects across sectors and regions.

Therefore, a more detailed analysis of the existing bilateral trade pattern between Brazil and the United States is necessary to determine which sectors and regions will be most affected by the tariff.
This is what will be done in the next two sections of this report.

Figure 2 shows the value of Brazilian exports to the US for each year from 2001 to 2024, with products broken down by sections of the International Standard Industrial Classification (ISIC).
There are four sections: agriculture, extractive industry, manufacturing industry, and other products.
The graph shows that, by far, the sector/section that exports the most to the US is manufacturing, which has been growing since the beginning of the series (with a few exceptions, mainly 2009 and 2020), reaching exports of more than US\30 billion to the United States in 2024.
In second place is the extractive industry sector, with exports of approximately US\6 billion in 2024.
The agricultural sector, despite being strong in Brazil, exports little to the US, given that this country also has an extremely competitive agriculture.

However, the data in Figure 2 are overly aggregated, which prevents a more detailed analysis.
Figure 3, in turn, presents a more disaggregated classification.
It shows the ten product categories most exported to the US in 2024, according to the Harmonized System 2 (HS-2) classification.
The figure shows that the main export category to the United States is mineral fuels and oils, with an export value of almost US\8 billion.
Next comes iron and steel, exporting just under US\6 billion, and mechanical machinery and equipment, with exports in 2024 of almost US\4 billion.

These graphs provide an idea of which sectors will be most affected by the tariffs.
By far, the most affected sector will be the manufacturing industry - particularly categories like iron, steel, mechanical machinery, and aircraft.

Figure 2: Annual exports from Brazil to the US by sector, 2001-2024

Source: Comex Stat.

Figure 3: Main product categories exported from Brazil to the US in 2024

3. Regional analysis

To provide a more complete picture, let's now focus on regional analysis to understand the heterogeneous effects of tariffs on different geographic locations in Brazil.
To begin, we can analyze the intensity of Brazilian exports to the US from each of Brazil's five major regions.

This is precisely what Figure 4 does.
It shows the evolution of Brazilian exports to the US by region, from 2001 to 2024.
The image shows that the region that exports the most to the US is the Southeast, with a growing trend in exports since the beginning of the series - again, with notable exceptions in 2009 (the Great Recession) and 2020 (the COVID-19 pandemic).

In 2024, this region exported US\30 billion to the US, significantly more than the second-placed South, which exported only US\5 billion.

Figure 4: Evolution of Brazilian exports to the US by region, 2001-2024

Source: Comex Stat.

There is a near-perfect overlap between the Southeast region in Figure 4 and the manufacturing sector in Figure 2, suggesting that the Southeast region's manufacturing sector will be heavily impacted by the tariffs.

But within the Southeast region, which exactly are the main exporting states?
Figure 5 answers this question.
It shows the percentage of Brazil's exports to the US by state in 2024.
From the figure, it is clear that the state that exports the most to the US is

São Paulo, with a total export share of approximately 33%.
Note that the four Southeast states are precisely the four states that lead the ranking, which again indicates the significant impact that tariffs will have on the region.

Figure 5: Percentage of Brazil's exports to the US by state in 2024

We now turn to consider the question of which product category will be most affected within each state.
Figures 6 and 7 help answer this question.
They show the category that exported the most to the US in 2024 in each state, according to the HS-1 classification.
From Figure 6, we can see that the main product category exported to the United States from the Central-West region is live animals and animal products (such as beef, chicken, and live cattle).
São Paulo stands out for its machinery and electronics category (such as piston engines and static converters).

In turn, Figure 7 shows that the main category of product exported from each state in the North and Northeast regions varies greatly among states.
For example, the leading category in the states of Paraíba, Pernambuco, Alagoas, and Amapá is "food, beverage, and tobacco", while in Rio Grande do Norte, Piauí, Tocantins, and Rondônia, it is "live animals and animal products".

Figure 6: Product category most exported to the US in 2024 in each state, Central-West, South and Southeast regions

Source: Comex Stat.

Figure 7: Product category most exported to the US in 2024 in each state, North and Northeast regions

Source: Comex Stat.

It can therefore be concluded that the region most affected by the tariffs will be the Southeast, particularly the state of São Paulo.
In this state, the product category likely to be most affected by the tariff (as it was the largest export category in 2024), will be machinery and electronics.

4. Comparing the bargaining power between the two countries

Let's take the analysis a step further to consider the extent to which the US economy is important to the Brazilian economy and vice versa.
This analysis will help answer, for example, the real capacity of the US to harm Brazil with these tariffs, as well as the harmful effect of tariffs on the United States itself.

An import tariff harms both the exporting country, as it reduces sales abroad and thus the income of exporters, and the importing country, as it makes domestic products more expensive, reducing consumers' real income.
We can call the first channel the "export channel", and the latter the "import channel".

Consider the following question: suppose country X implements an import tariff on country Y and vice versa (in a trade war with reciprocal tariffs).
Which country will be most harmed by this trade war?
Note that both countries will be harmed in both ways: via the import channel of their own tariff and via the export channel of the other country's tariff.
Overall, which will be least harmed and thus have greater bargaining power in potential negotiations?

We can operationalize these two channels to answer this question.
Consider the United States as the reference country for this exercise.
Let's analyze two points:

Export channel: how much the country's economy depends on exports to the US compared to how much the US economy depends on exports to the country;

Import channel: how much the country's economy depends on imports from the US compared to how much the US economy depends on imports from the country.

We'll analyze each of these aspects below.
Trade flow data between countries are from 2022 and taken from the World Integrated Trade Solution (WITS), while GDP data (with constant 2021 international prices and purchasing power parity) are also from 2022 and taken from the World Bank.

4.1.
Export channel

If a country's economy depends on exports to the US more than the US economy depends on exports to the country, then it can be said that the US has more bargaining

power than the country in question in the export channel, because in this case the US has more capacity to harm the country by affecting its exports through the implementation of an import tariff than vice versa.

In mathematical notation, consider the following metrics:

$$\begin{gathered} \frac{X_{i, USA}}{GDP_i} \\ \frac{X_{USA, i}}{GDP_{USA}} \end{gathered}$$

where $X_{j, k}$ represents the total exports of country j to country k, and GDP_j represents the GDP of country j.

Thus, we have:

If (1) > (2), then the US has more bargaining power than country i through the export channel;

If (1) < (2), then country i has more bargaining power than the US through the export channel.

Figure 8, below, shows the metric (1) on the x-axis and the metric (2) on the y-axis for the 29 largest economies in the world besides the US.
The dashed diagonal line is the 45-degree line.
Note that if a country is above the 45-degree line, then (1) < (2), meaning that the country in question has more bargaining power than the US.
As can be seen, no country is above this line.
Thus, we can conclude that, through the export channel, the US has more bargaining power than any other country in the world, including Brazil.

Figure 8: Bargaining power of countries in relation to the US considering the export channel

Source: WITS and World Bank.

4.2.
Import channel

If a country's economy depends on imports from the US more than the US economy depends on imports from that country, then the US can be said to have more bargaining power than the country in question through the import channel.

In mathematical notation again, consider the following metrics:

$$\begin{aligned}$$

$$
\begin{aligned}
& \frac{M_{LUSA}}{GDP_L} \\
& \frac{M_{USA,i}}{GDP_{USA}}
\end{aligned}
$$

where $M_{j,k}$ represents total imports of country j from country k. GDP_j, as before, represents the GDP of country j.

Thus, we have:

If (3) $>$(4), then the US has more bargaining power than country i through the import channel;

If (3) $<$(4), then country i has more bargaining power than the US through the import channel.

Figure 9: Bargaining power of countries in relation to the US considering the import channel

Source: WITS and World Bank.

Figure 9 presents the metric (3) on the x-axis and the metric (4) on the y-axis for the 29 largest economies in the world besides the US.
Again, one should pay attention to the 45-degree line, as countries above this line are countries in which (3) $<$(4), that is, they are countries that have more bargaining power than the US in the import channel.
Unlike in the export channel, there are now two countries with more bargaining power

than the US: China and Russia [4].
Brazil, again, has less bargaining power than the US, as indicated in the figure.

4.3.
Aggregating both channels

We can combine the two channels to better understand the leverage other countries have over the US.
We can add (1) to (3) and (2) to (4), to obtain the following result:

If (1)+(3)$>$(2)+(4), then the US has more bargaining power than country i;

If (1)+(3)$<$(2)+(4), then country i has more bargaining power than the US.

Figure 10: Difference between the bargaining power of the US and the other 29 largest economies in the world

Source: WITS and World Bank.

Figure 10 presents these results for the 29 largest economies in the world excluding the US.

The calculation used to obtain these values was [(1)+(3)]-[(2)+ (4)], with the value presented in percentage points (p.p.).
Thus, if the bar is positive, then

the US has more bargaining power than the country in question; if it is negative, then it has less.
Note that the only country with more aggregate bargaining power than the US is China [5].
Brazil, indicated in green, has less power.

The exercises conducted throughout this section, while providing a preliminary answer to the question of which country has more potential to harm the US economy than vice versa, cannot be taken as the final word on the subject because they have certain limitations.

First, the exercise does not consider the political factors of the countries.
Therefore, it does not take into account the ability of the country's leaders to stress the economic environment without facing serious risks of being ousted from power.
It is to be expected that leaders of democratic countries have less freedom to stress the country's economy than leaders of dictatorial countries, as their leadership depends more on popular approval than the latter.
Taking this into account, it is to be expected that China's economic "firepower" over the US is even greater than that calculated above.

Furthermore, the exercise does not take into account the ability of countries to substitute their imports.
In other words, it does not consider the heterogeneity of producers and the strategic importance of imported products.
If a large portion of the product that country X imports from Y can be easily replaced by imports from other countries, then analyses like these overestimate Y's economic power over X.
On the other hand, if only a small fraction (or none at all) of the product that X imports from Y can be replaced, then Y's economic power over X is underestimated.

A concrete example: this type of analysis would suggest that the US's economic power over Taiwan is much greater than vice versa, but the chips that the US imports from Taiwan cannot be replaced by any other country.
Since chips are an extremely important product for the US economy, Taiwan's economic power over the US is much greater than the numerical analysis above suggests [6].

: [5] This is a relevant result for what many geopolitical analysts have been considering as a new Cold War.
On this subject, see Allison (2017), Brands (2022), and Doshi (2021).

[6] For a detailed analysis of this issue, see Miller (2022).

In light of this, in the next section we will seek to address, at least partially, this problem.
We will conduct a more detailed analysis of Brazil's exports to the US to identify which products originating from Brazil are most essential to the US.
By doing so, we will have a somewhat more complete answer to the question of relative bargaining power between the two countries.

5. Global market share of each product exported from Brazil to USA

First, let's analyze which US imports have Brazil as their main trading partner.
In other words, let's calculate the following metric:

$$\alpha_{i}=\frac{m_{i, Brazil}}{m_{i, World}}$$

where $m_{i, Brazil}$ are the US imports of product i from Brazil and $m_{i, World}$ are the US imports of product i from all countries in the world.

Figure 11: Share of American imported products that come from Brazil, top 10 products

Source: The Atlas of Economic Complexity.

Figure 11 shows the calculation of equation (5) for the ten products with the highest α_{i} values.
In other words, these are the ten products imported from the US whose largest fraction comes from Brazil.
The products are broken down by HS-6, and the source

is the Atlas of Economic Complexity for the year of 2017[7].
The graph shows that 100 % of tankers imported from the US in 2017 came from Brazil, 98.5 % of brewing/distilling dregs, and so on.

The analysis is still incomplete, as it does not consider potential substitute countries for Brazil in product trade.
For example, 100% of tankers imported from the US in 2017 came from Brazil, but this does not necessarily mean that the US depends exclusively on Brazil for tanker imports: if other countries also export tankers, the US could import them from those countries instead of importing from Brazil.

Therefore, to make the analysis more complete, it is necessary to consider Brazil's market power in international product trade.
Figure 12 does just that.
It displays the values of the ten products for which the world most depends on Brazil, considering only the 1,237 products that the US imported from Brazil in 2017.
It derives from the following metric:

$$\beta_{i}=\frac{\sum_{j=1}^{n} m_{i j, Brazil}}{\sum_{j=1}^{n} \sum_{k=1}^{n} m_{i j k}}$$

where $m_{i j, Brazil}$ represents imports of product i by country j from Brazil, and $m_{i j k}$ represents imports of product i by country j from country k (obviously, with $j \neq k$).

Thus, from Figure 12, we can conclude that, among the 1,237 products the US imports from Brazil, ferro-niobium is the one with the largest market share: 72.4 % of all ferro-niobium traded worldwide comes from this country.
Next comes "vegetable waxes, not triglycerides" with 60 %, and so on.

By combining metrics (5) and (6), we can now get a more precise idea of the degree of US dependence on Brazil for each product imported from this country.

We can create a sort of dependency index (DI) for the US economy for each Brazilian product i imported by the United States as follows:

$$DI_{i} = 100 \, \alpha_{i} \, \beta_{i}$$

If $DI_{i}=100$, then US's dependence on Brazil for a specific product is maximum: only Brazil is capable of supplying the US with that product through international trade.
If $DI_{i}=0$, then US's dependence on Brazil is minimal: the US does not import the product from Brazil at all.

Figure 12: Fraction of imported products in all countries that were produced in Brazil, top 10 products

Source: The Atlas of Economic Complexity.

Figure 13 shows the ten products with the highest index.
These can be considered the ten products for which the US is most dependent on Brazil.
"Vegetable waxes, not triglycerides" tops the list, with a score of 50.9.
Ferro-niobium comes in second, with 49.9 points, and so on.

In practice, what do these results represent?
They show which products will likely be least affected by tariffs: even if their price rises, the magnitude of the decline in US imports of these products will be minimal, since the dependency index calculated in this section can be seen as a proxy for the price elasticity of US demand for Brazilian products.
The higher the index, the more inelastic is the demand, and thus the smaller the impact of tariffs on trade volume.

Figure 13: Index of US economy's dependence on Brazilian products, top 10 products

With the exercise above, we can also return to the question of bargaining power between countries to address the issue of exclusivity in the export of each product by each country, an issue that was left aside in the previous section.
By taking the arithmetic mean of all values of (7) where $DI_{i}>0$ (that is, considering only products imported from Brazil by the US), we can arrive at a metric of US dependence on Brazil in international trade.
Doing so, we arrive at a value of 0.68.
If we do exactly the same thing but reverse the roles, that is, considering the products imported from the US by Brazil [8], we arrive at a index value of 2.84.
Thus, once again, we are forced to conclude that Brazil is more dependent on the US - and therefore has less leverage - than vice versa.

It is worth noting that the exercises developed in this section also have some limitations, two in particular.
The first is that they do not consider the portion of the country's internal absorption produced within the country itself [9].
For example, consider in the exercise a product with an DI of 100.
This does not necessarily mean that all of the absorption of this product by the US only comes from Brazil, as it is possible that the US

: [8] That is, if we calculate α_{i}, β_{i}, and DI_{i} replacing Brazil with USA and vice versa.

[9] Domestic absorption is defined as the sum of a country's aggregate consumption, aggregate investment, and government spending (Alexander, 1952).

itself produces part of the internal absorption [10].
Second, the exercises did not weight the value of imports by the country's GDP (in particular, from US GDP in equation (5)).
Therefore, the dependency index outlined here should be seen more as a concept associated with the price elasticity of demand for the product's imports than with the importance that the Brazilian product in question has on the US economy as a whole.

6. Conclusion

The objective of this report was to highlight some key aspects of the trade relationship between the US and Brazil in order to understand the impacts of the 50% tariffs imposed by the United States on products imported from Brazil.
It was found that the manufacturing industry is the sector that exports the most to the US, and that the Southeast region - particularly São Paulo - is the region with the highest export value.
Therefore, it is expected that the negative impact of the tariffs will be felt relatively more by the manufacturing industry, and that the Southeast region of the country will be hit the hardest.

Metrics were also created to analyze the extent to which the US holds economic power over Brazil and vice versa.
Through two different exercises (sections 4 and 5), it was concluded that the US holds much more economic power over Brazil than vice versa.
In other words, even if the US is negatively affected by the tariffs, Brazil is likely to be much more affected.

Furthermore, it was concluded that even if trade intensity between the two countries decreases after the tariffs, the adverse effect on some Brazilian products is expected to be less significant, as the US is highly dependent on Brazil for imports of such products.
In particular, exporters of products such as vegetable waxes, ferro-niobium, and orange juice are expected to be less affected than other exporters.

Finally, it is worth emphasizing that trade relations between Brazil and the US are embedded in a highly dynamic and complex economic and geopolitical context, meaning

that no analysis, no matter how careful, can fully predict the effects of a pernicious economic policy such as a trade tariff.
Therefore, this report is not the final word on the subject, but rather a preliminary and partial analysis.
Nevertheless, such kind of analysis is essential for economic agents and policymakers to prepare for the uncertain times ahead.

Reference

Alexander, S.S. (1952) 'Effects of devaluation on a trade balance', IMF Staff Papers, 2(2), pp. 263-278.

Allison, G. (2017).
Destined for War: Can America and China Escape Thucydides's Trap?
Boston: Houghton Mifflin Harcourt.

Brands, H. (2022).
The Twilight Struggle: What the Cold War Teaches Us about GreatPower Rivalry Today.
New Haven: Yale University Press.

Doshi, R. (2021).
The Long Game: China's Grand Strategy to Displace American Order.
Oxford: Oxford University Press.

Miller, C. (2022).
Chip War: The Fight for the World's Most Critical Technology.
New York: Scribner.

Norton, B.
(2025).
US gov't is very afraid of BRICS and dedollarization, Trump insiders reveal.
That's why he's attacking Brazil.
Geopolitical Economy.
Available at: https://geopoliticaleconomy.com/2025/07/14/us-afraid-brics-dedollarization-trump/ (Accessed: 16 July 2025).

High Human Impact ●●●●●● High AI Impact

FAQs

What is GPTZero?

GPTZero is the leading AI detector for checking whether a document was written by a large language model such as ChatGPT. GPTZero detects AI on sentence, paragraph, and document level. Our model was trained on a large, diverse corpus of human-written and AI-generated text, with a focus on English prose. To date, GPTZero has served over 10 million users around the world, and works with over 100 organizations in education, hiring, publishing, legal, and more.

When should I use GPTZero?

Our users have seen the use of AI-generated text proliferate into education, certification, hiring and recruitment, social writing platforms, disinformation, and beyond. We've created GPTZero as a tool to highlight the possible use of AI in writing text. In particular, we focus on classifying AI use in prose. Overall, our classifier is intended to be used to flag situations in which a conversation can be started (for example, between educators and students) to drive further inquiry and spread awareness of the risks of using AI in written work.

Does GPTZero only detect ChatGPT outputs?

No, GPTZero works robustly across a range of AI language models, including but not limited to ChatGPT, GPT-4, GPT-3, GPT-2, LLaMA, and AI services based on those models.

What are the limitations of the classifier?

The nature of AI-generated content is changing constantly. As such, these results should not be used to punish students. We recommend educators to use our behind-the-scene Writing Reports as part of a holistic assessment of student work. There always exist edge cases with both instances where AI is classified as human, and human is classified as AI. Instead, we recommend educators take approaches that give students the opportunity to demonstrate their understanding in a controlled environment and craft assignments that cannot be solved with AI. Our classifier is not trained to identify AI-generated text after it has been heavily modified after generation (although we estimate this is a minority of the uses for AI-generation at the moment). Currently, our classifier can sometimes flag other machine-generated or highly procedural text as AI-generated, and as such, should be used on more descriptive portions of text.

I'm an educator who has found AI-generated text by my students. What do I do?

Firstly, at GPTZero, we don't believe that any AI detector is perfect. There always exist edge cases with both instances where AI is classified as human, and human is classified as AI. Nonetheless, we recommend that educators can do the following when they get a positive detection: Ask students to demonstrate their understanding in a controlled environment, whether that is through an in-person assessment, or through an editor that can track their edit history (for instance, using our Writing Reports through Google Docs). Check out our list of several recommendations on types of assignments that are difficult to solve with AI.

  Ask the student if they can produce artifacts of their writing process, whether it is drafts, revision histories, or brainstorming notes. For example, if the editor they used to write the text has an edit history (such as Google Docs), and it was typed out with several edits over a reasonable period of time, it is likely the student work is authentic. You can use GPTZero's Writing Reports to replay the student's writing process, and view signals that indicate the authenticity of the work.
 See if there is a history of AI-generated text in the student's work. We recommend looking for a long-term pattern of AI use, as opposed to a single instance, in order to determine whether the student is using AI.