Mapping Shared Prosperity

Mexico-United States Social Progress Index

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Mexico-United States Social Progress Index

What is the Social Progress Index?

The **Social Progress Index (SPI)** is a measurement of social performance in a country's entities and is independent of factors that measure income or expenditure. The index is calculated from a range of social and environmental indicators that capture three dimensions of social progress:

Basic Human Needs, Fundamentals of Wellbeing, and **Opportunities.** The index ranges from 0 to 100, where 100 represents the highest possible level of social progress, while 0 represents the lowest possible level.

Although this measure is independent of monetizable indicators such as income, public expenditure, or economic activity, the SPI does not seek to replace them, but rather to complement them. Its main purpose is to assess those questions that really matter in people's lives: Do I have a home that provides me with protection? Do I have enough to eat? Do I have access to education?

México, ¿cómo vamos?, in collaboration with the ***Social Progress Imperative*** and ***INCAE,*** presents Mapping Shared Prosperity; a representation of the interconnected social progress of states in the United States and Mexico. Based on the data from the Social Progress Index for 2022, this map offers a subnational perspective on quality of life beyond economic indicators.

Dimension 1. Basic Human Needs	Dimension 2. Fundamentals of Wellbeing	Dimension 3. Opportunities
It provides an overview of the quality and availability of services and conditions necessary to provide a suitable standard of living for the population of each entity.	It evaluates the quality of education and information available in each entity, while also incorporating environmental components relevant to the health of its inhabitants.	It assesses the opportunities and tools that residents of each entity can access to achieve greater personal and professional development.
NUTRITION AND MEDICAL CARE	**BASIC EDUCATION**	**RIGHTS AND VOICE**
Define if people have enough food and access to basic medical care, taking into account indicators of mortality and nutrition.	It evaluates enrollment in basic education, as well as gender parity in schools, and determines if people have educational foundations to improve their lives.	It assesses whether people live free from restrictions and with rights, using variables of civic participation and property ownership.

Dimension 1. Basic Human Needs	Dimension 2. Fundamentals of Wellbeing	Dimension 3. Opportunities
WATER AND SANITATION It defines whether people can drink water and stay clean without getting sick, taking into account indicators of sanitation services and water services.	**INFORMATION AND COMMUNICATION** Define if people have free access to ideas and information from any part of the world, taking into account indicators of telephony, internet, and more.	**FREEDOM AND CHOICE** It considers whether people are free to make their decisions without restrictions, taking into account various indicators.
HOUSING It considers whether the population has adequate housing with basic services such as electricity and is built with sturdy materials.	**HEALTH** It defines whether people live long and healthy lives, using life expectancy, suicide rates, and other health variables.	**INCLUSIVE SOCIETY** It determines whether there are people excluded from society for various reasons such as sexual orientation, race, or gender.
SAFETY It uses indicators that show the level and perception of crime in each state to assess whether its inhabitants feel safe.	**ENVIRONMENTAL QUALITY** It assesses whether the state is using its resources sustainably, taking into account variables related to water usage, emissions of pollutants, and others.	**ADVANCED EDUCATION** It uses indicators of coverage and quality of higher education to assess the population's opportunities to achieve high levels of schooling.

The SPI and its relationship with growth

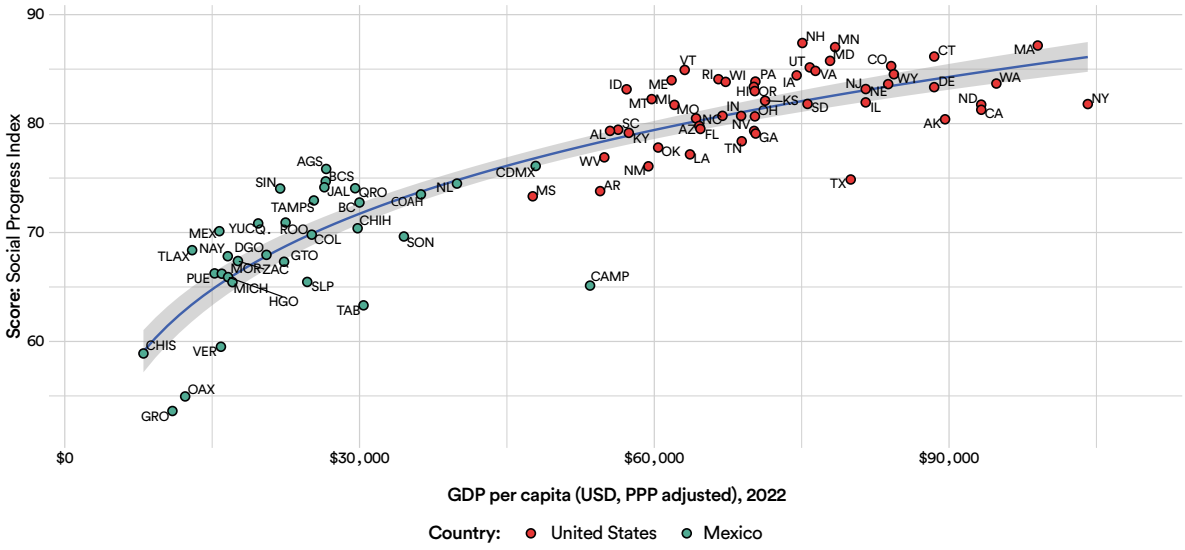
To study the relationship between the average income of a state and the **Social Progress Index** and its dimensions, we use the Gross Domestic Product (GDP) per state adjusted by purchasing power parity. This allows us to calculate a representative subnational GDP per capita that is comparable across Mexican and American territories.

From this model[1], we find that **income alone is not sufficient for an entity to have social progress, but it is indeed a necessary condition.** This idea is depicted in the following figure: entities that are above the model's line (and their confidence intervals), such as Aguascalientes, Jalisco, and Baja California Sur in the case of Mexico, or New Hampshire, Minnesota, and Utah in the case of the United States, show social progress above the expected given their per capita income, while those entities below the model's line, such as Veracruz, Guerrero, and Oaxaca in the case of Mexico, and Texas, California, or New York in the case of the United States, exhibit social progress below the expected given their per capita income.

1 In this model, the adjustment is made with a logarithmic regression that indicates a sort of stagnation in what the explanatory variable contributes to the dependent indicator. That is, there is a scenario of diminishing returns: there will be entities in which, no matter how much their GDP per capita is estimated to increase, this will not translate into a better score.

Social Progress Index

Correlation with GDP per capita adjusted for purchasing power parity



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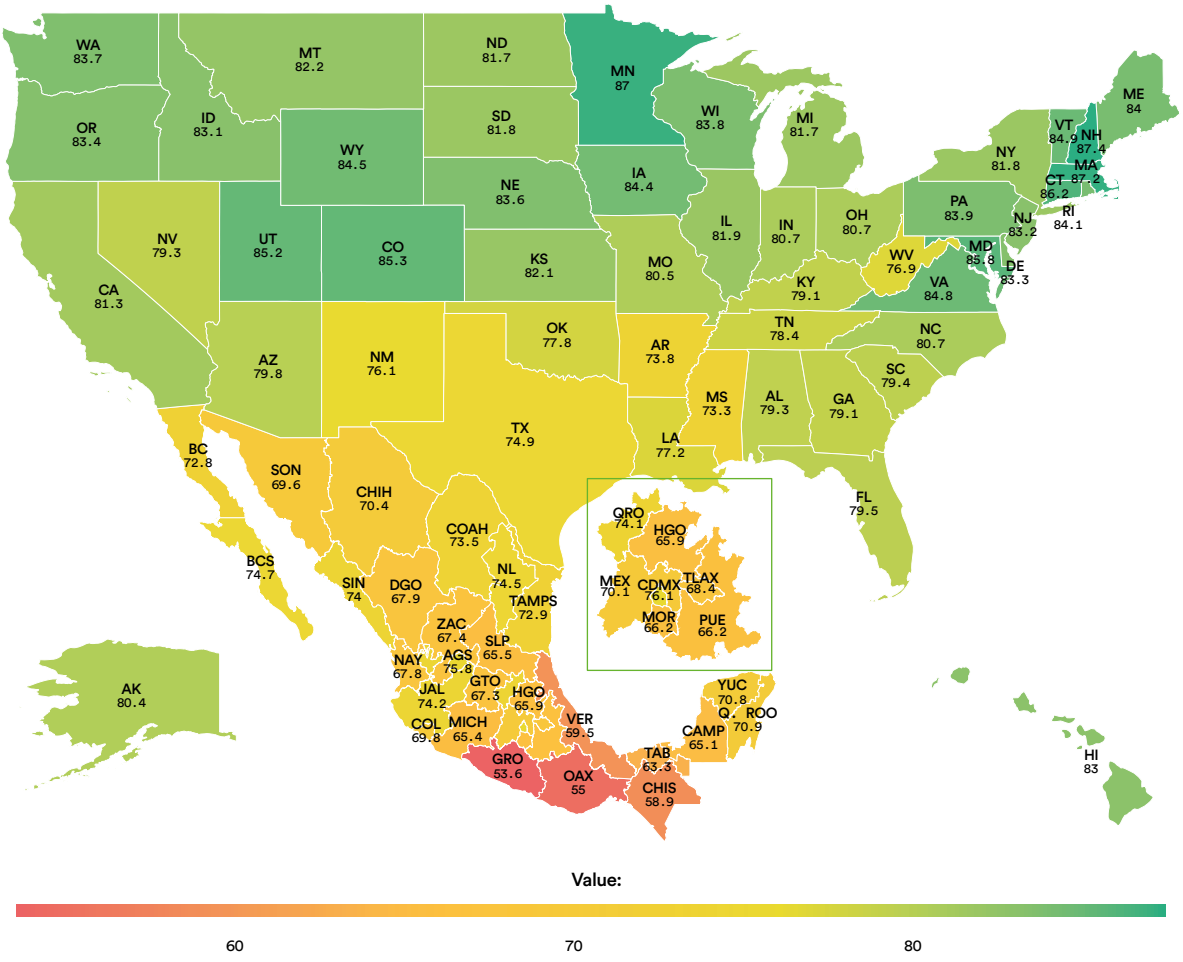
While a **high level of GDP per capita is a necessary condition for social progress, it is not sufficient** if it is not accompanied by **public policies** aimed at **leveraging available economic resources** in a sustainable manner to **promote inclusive social development.**

Social progress in Mexico and the United States

Social Progress Index

Social Progress Index USA-MEXICO



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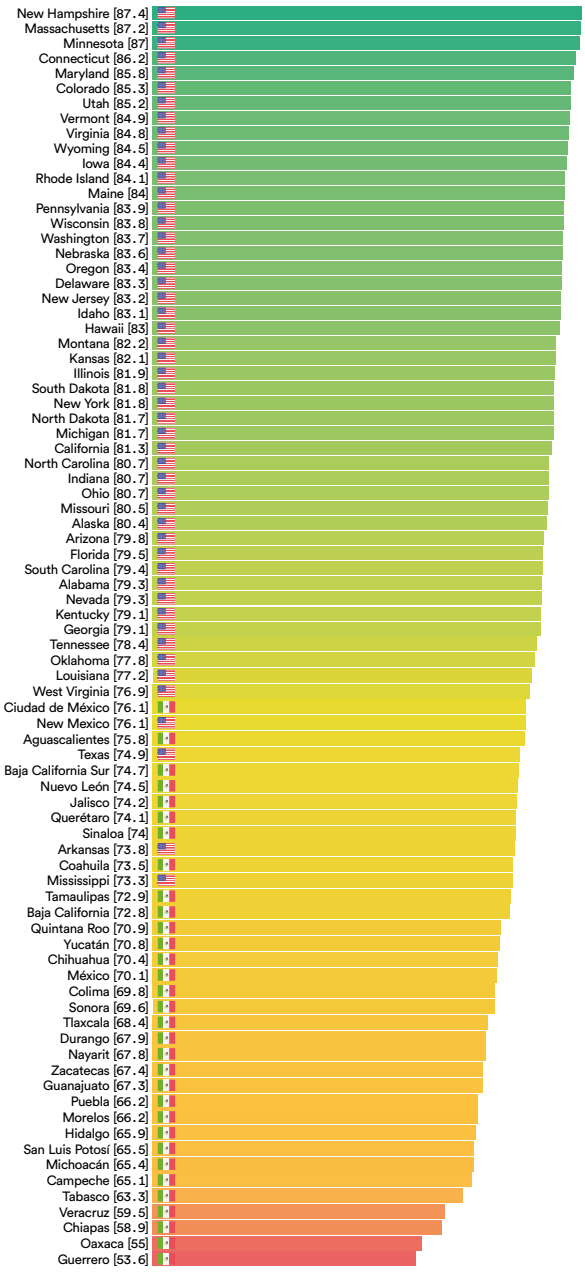
As anticipated in the previous section regarding the relationship between social progress and economic activity, the entities with the highest social progress are found in the United States. The top five performing entities are **New Hampshire, Massachusetts, Minnesota, Connecticut, and Maryland.** On the other hand, the five states with the worst performance are in Mexico: **Guerrero, Oaxaca, Chiapas, Veracruz, and Tabasco.**

Social Progress Index

Social Progress Index USA-MEXICO



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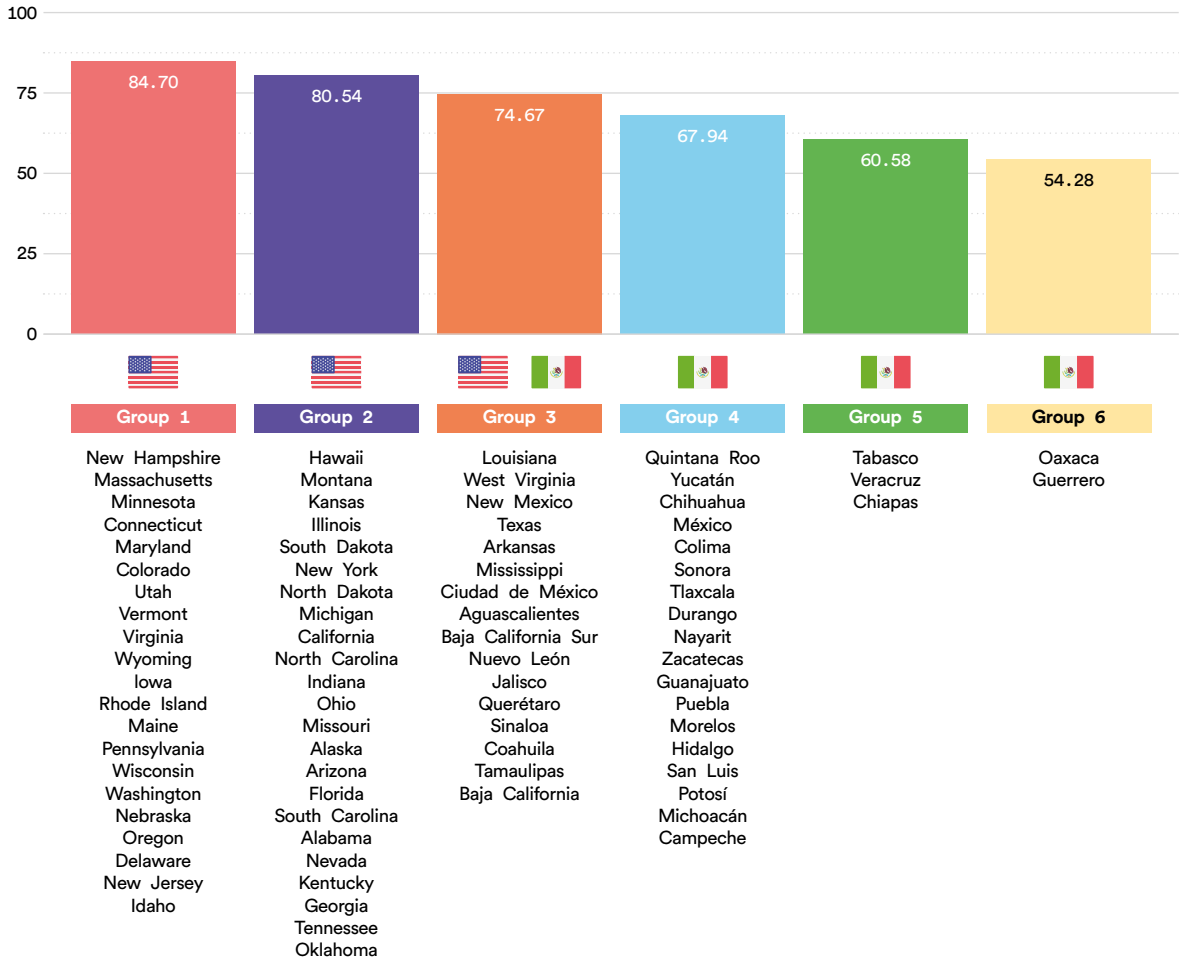
There is a significant gap in terms of social progress observed on both sides of the border along the Rio Grande. There is a difference of **33.8** points on the SPI index between the entity with the highest social progress in the United States, New Hampshire, with 87.4 points, and Guerrero, with 53.6 points, the entity with the lowest social progress in Mexico.

However, entities on both sides of the border show signs of convergence in terms of social progress between Mexico and the United States. To identify these entities, the k-means algorithm was applied to conduct an exploratory analysis on the clustering of states from both countries according to their SPI level. This technique allows for the identification of patterns and categorization of states into homogeneous groups based on similarities in their social progress indices, offering a detailed view of how socio-economic and environmental conditions cluster across borders. This analysis facilitates the identification of groups of states with similar challenges and strengths, and also provides an empirical basis for the design of specific and targeted public policies and development strategies.

Social Progress Index
Fundamentals of Wellbeing



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From this analysis, 5 groups of entities can be identified. In **group 3,** composed of 16 entities, is where the convergence process previously mentioned is observed. In entities in the central and northern regions of Mexico, such as Mexico City, Aguascalientes, Baja California Sur, Nuevo León, Jalisco, Querétaro, Sinaloa, Coahuila, Tamaulipas, and Baja California, social progress is similar to that observed in entities in the southern and eastern United States, such as Louisiana, West Virginia, New Mexico, Texas, Arkansas, and Mississippi.

If you want to learn more about social progress in Mexico and the United States, check out our complementary publication **What is needed to improve well-being and competitiveness in the United States and Mexico?**

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Annex

Methodology for Rescaling the Components of the Social Progress Index (SPI) at the State Level in the United States and Mexico for Comparison with National-Level Data.

The Social Progress Index (SPI) goes beyond economic indicators such as Gross Domestic Product (GDP) by measuring the social and environmental well-being of a country and being able to determine the ability of countries to transform economic prosperity into socio-environmental well-being. This multidimensional index is based on 12 thematic components that cover basic human needs, foundations of well-being, and opportunities. The SPI not only seeks to assess the current state of social progress but also to inspire actions to improve it. Its multidimensional approach allows governments, businesses, and civil society organizations to identify areas where more progress is needed and make informed decisions to achieve more equitable and sustainable development. Since 2014, the SPI has been measured globally to quantify the level of social progress of 170 countries. Also since 2014, a subnational methodology has been developed to adapt the SPI to the national realities of each region, country, city, community, or company.

National-level data provides quantification of the average level of performance in a country. However, most countries have geographic areas that show superior or inferior performance in certain aspects of social progress, and these variations can be extreme; that is, social progress is unevenly distributed in most countries. In this sense, to improve social progress in a country, it is necessary to identify not only the components that require improvement but also where, geographically in the country, these weaknesses are most concentrated. Hence, the application of the Social Progress model at the subnational level can be a valuable tool in this process.

Additionally, the actionability design principle of the SPI consists of not only measuring social progress comprehensively but also enabling and guiding effective actions towards its improvement. This method ensures that the SPI is more than just a set of indicators to generate a report; it is a dynamic tool intended to inform decisions and policies with the ultimate goal of promoting social and environmental development. At the subnational level, this principle is particularly relevant as it allows us to adapt the analysis and recommendations to the specific realities and unique challenges of each region within a country. By prioritizing actionability according to the specific context of each country, subnational SPI exercises provide a solid basis for building robust data tools, aimed not only at deep understanding of the current state of social progress but also at designing strategies and concrete actions that effectively respond to local needs. Thus, the SPI becomes a key instrument for policymakers, urban planners, and community leaders, providing critical insights that support informed decision-making to improve society's well-being.

In this regard, both the state-level index for the 50 states of the United States and the SPI for the 32 states of Mexico were initially designed as independent projects, each aimed at addressing specific issues and needs within their respective national contexts. Without an original intention of making cross-border comparisons between the states of both countries, these projects seek to deepen the understanding and improvement of social progress at the local level.

Following the standard methodological steps of SPI calculation, the rescaling process consists of generating values ranging from 0 to 100 points at the component level, where these values are constructed from the determination of a vector of utopias and dystopias used to calibrate the indicators when standardized on the same scale, so that in the end the SPI has values from 0 to 100, where 0 means the

lowest possible level of social progress in a geographical unit if all indicators match the lowest value determined in the dystopia. In contrast, the value of 100 is the highest score in social progress that a geographical unit can achieve if it obtains the highest score in all indicators, being the utopia. These utopias and dystopias are usually calculated from the statistical distribution of indicators in a given context. In the case of the projects of the United States and Mexico, each indicator was scaled considering its own national context through the vector of utopias and dystopias[2].

However, given the close economic, social, and cultural integration between the United States and Mexico, there has arisen the need to adopt a methodological strategy that allows comparing the SPI values, as well as its dimensions and components. For this purpose, component-level rescaling considering binational integration is required. This rescaling process not only facilitates a comparative view between the states of both countries but also offers the opportunity to identify synergies and areas of collaboration that can strengthen social progress in the region.

For the implementation of this rescaling, recourse is made to an analysis based on the use of well-defined benchmarks or reference units, which are crucial to ensure the reliability and consistency of results when making comparisons. This process has already been carried out in previous subnational projects[3] to compare geographical units within the same country but with different subnational SPIs. In the specific case of this methodology, it is the first binational exercise and global data from 2011 to 2024 from the United States and Mexico have been used as respective benchmarks[4]. These reference units are chosen because their social progress profiles and data narratives are widely known, which allows us, first, to test the reliability and accuracy of the collected data in terms of a higher contrast level (for example, contrasting a region versus an entire country); and secondly, it helps us calibrate the model given the social progress results obtained for this reference unit.

This methodology not only considers the need to understand and analyze variations in social progress performance within the same country but also incorporates a benchmarking approach to ensure the coherence and validity of the analysis. By rescaling SPI data at the state level to align with national components, based on clear reference units, a more detailed and nuanced analysis of social progress is facilitated, highlighting specific areas and regions that require focused attention. It is also important to mention that this rescaling process does not alter the distributions of the original data or the ordering of the states, it only generates a new scale that allows comparison while maintaining consistency in two areas: 1) the distribution of social progress within each country; and 2) the differences in social progress between each country.

From a mathematical perspective, this methodology can be considered as a monotonic transformation[5]. This is because the rescaling process adjusts the values of each state by a constant sum (the difference in means between national and state-level data), ensuring that the relative order of states according to their SPI scores remains the same before and after the adjustment.

2 Methodology of the Social Progress Index:https://www.socialprogress.org/methodology

3 SPI Amazonia (2014). https://www.researchgate.net/publication/331047194_Indice_de_Progresso_Social_na_Amazonia_Brasileira_IPS_Amazonia_2014

4 Global SPI 2024 results: https://www.socialprogress.org/2024-social-progress-index/

5 Sampson (1993) https://www.jstor.org/stable/4355752

A monotonic transformation is one that preserves the order of the data. In this case, if a state A has a higher SPI score than a state B before rescaling, A will still have a higher score than B after rescaling. This type of transformation is crucial to maintaining the integrity and interpretation of SPI data when making comparisons, ensuring that the relative differences between the units of analysis are preserved even after adjusting the scores to make them comparable in a binational framework.

The steps for this process are as follows:

Step 1: Determination of reference units (benchmarks)
The global SPI values of the United States and Mexico are selected as the reference units due to their integrity and representativeness in terms of social progress profiles.

Step 2: Calculation of means for each component
For each of the 12 components of the SPI, both state-level and national-level means are calculated for the United States and Mexico.

Step 3: Calculation of the difference in means
The difference between the national mean and the state mean of each component is calculated.

Step 4: Rescaling Implementation
Using the determined difference in means, a linear transformation is applied to the values of each component at the state level.

Step 5: Implementation
This process is repeated for each of the 12 components of the SPI, ensuring that the comparison between state and national-level data is coherent and based on a common scale. And with the new values of the components, the values of the dimensions and the Social Progress Index are recalculated.

Table 1. Descriptive Statistics of the Original SPI vs. the Rescaled SPI

	Obs	Mean	Standard Deviation	Min	Max
orig SPI Mex	32	66.02	6.23	50.86	78.87
orig SPI US	50	56.34	3.40	47.97	62.28
resc SPI Mex	32	68.37	5.73	53.62	76.11
resc SPI US	50	81.66	3.36	73.32	87.40

Source: Own calculations with data from the SPI United States and SPI States of Mexico.

The methodology of rescaling the components of the Social Progress Index (SPI), using national benchmarks from the United States and Mexico, emerges as a fundamental tool for delving into the study of the relationships between the states of both countries and their levels of trade integration. This methodological strategy opens up a new binational research agenda for action, focused on understanding how cross-border economic interactions impact and correlate with social progress at the state level.

By providing a standardized and rigorous comparative framework, the identification of shared patterns and challenges, as well as unique opportunities for the design of joint policies and strategies,

is facilitated. This perspective is not only crucial for policymakers and academics interested in the dynamics of trade integration but also for organizations and communities seeking to promote sustainable and equitable development. By researching these relationships, valuable insights can be generated that contribute to strengthening collective well-being and fostering more effective binational cooperation, aimed at achieving shared social and economic progress objectives.

Cluster Analysis among States

To further enrich the analysis and understanding of the dynamics of social progress in the context of trade integration between the United States and Mexico, the k-means algorithm was applied to conduct an exploratory analysis on the clustering of states from both countries based on their rescaled SPI level. This technique allows for the identification of patterns and categorization of states into homogeneous groups based on similarities in their social progress indices, offering a detailed view of how socio-economic and environmental conditions cluster across borders. This analysis facilitates the identification of groups of states with similar challenges and strengths, and also provides an empirical basis for the design of specific and targeted public policies and development strategies.

The k-means technique is a clustering algorithm used to group a set of n observations into k clusters. The grouping is based on the properties of the observations, so that the variance within each group or cluster is minimized[6]. The k-means algorithm starts by selecting k points as cluster centroids according to the characteristics of the dataset and specific objectives of the analysis. Next, each observation is assigned to the cluster whose centroid is closest to the observation in terms of Euclidean distance. Once all observations have been assigned, the centroids are updated to match the mean of the observations within each cluster. This process is repeated until the centroids converge, meaning that no significant changes occur in their position[7].

The k-means method is particularly useful in identifying homogeneous groups within a multidimensional dataset. It has been used in a wide variety of applications, such as market segmentation, image analysis, or bioinformatics. In the SPI methodology, it has been used to define groups of geographical units by level of social progress or to find clusters of economies similar when calculating strengths and weaknesses analyses.

In the study of the Social Progress Index (SPI) for the states of the United States and Mexico, or binational SPI, the k-means algorithm is employed to discern natural groupings among these states, using the SPI as the primary variable of analysis. The objective is to classify the states into groups with similar levels of social progress, identifying shared patterns. The process begins with the normalization of SPI data to ensure adequate comparability between the units of analysis.

Subsequently, an initial value for k is selected based on Lloyd's algorithm with squared Euclidean distances to calculate the k-means clustering for each value of k[8]; combined with the splitting procedure

6 Hartigan, J. A., & Wong, M. A. (1979). A k-means clustering algorithm. Journal of the Royal Statistical Society. Series C (Applied Statistics), 28(1), 100–108.

7 Kanungo, T., Mount, D. M., Netanyahu, N. S., Piatko, C. D., Silverman, R., & Wu, A. Y. (2002). An efficient algorithm for clustering large data sets. In Proceedings of the 2002 ACM SIGMOD international conference on Management of data (pp. 103–114). ACM.

8 James, G., Witten, D., Hastie, T., & Tibshirani, R. (2013). An introduction to statistical learning with applications in R (Vol. 112). Springer. (Chapter 9: Clustering)

to determine the initial centers of each k>1. Thus, the resulting clustering is deterministic, with the outcome depending solely on the number of clusters, ensuring consistency in the results whenever the same number of clusters is used. This feature is crucial for comparative studies and for the reproducibility of research.

Through successive iterations, the algorithm reassigns states to clusters based on proximity to centroids, recalculating centroids after each reassignment. This process continues until convergence is reached, defined as the point at which the reassignment of states to clusters does not produce significant changes in the composition of the groups. The Calinski-Harabasz criterion was used to identify the number of clusters, aiming to obtain the lowest variance within each group.

When applying this methodology to the binational SPI database, 6 clusters were obtained grouped as follows[9]:

Table 2. Description of the clusters of the binational SPI.

	Number of States	Cluster centers or averages (SPI)
Cluster 1	22	80.4
Cluster 2	16	74.7
Cluster 3	22	84.6
Cluster 4	17	67.9
Cluster 5	3	60.6
Cluster 6	2	54.3

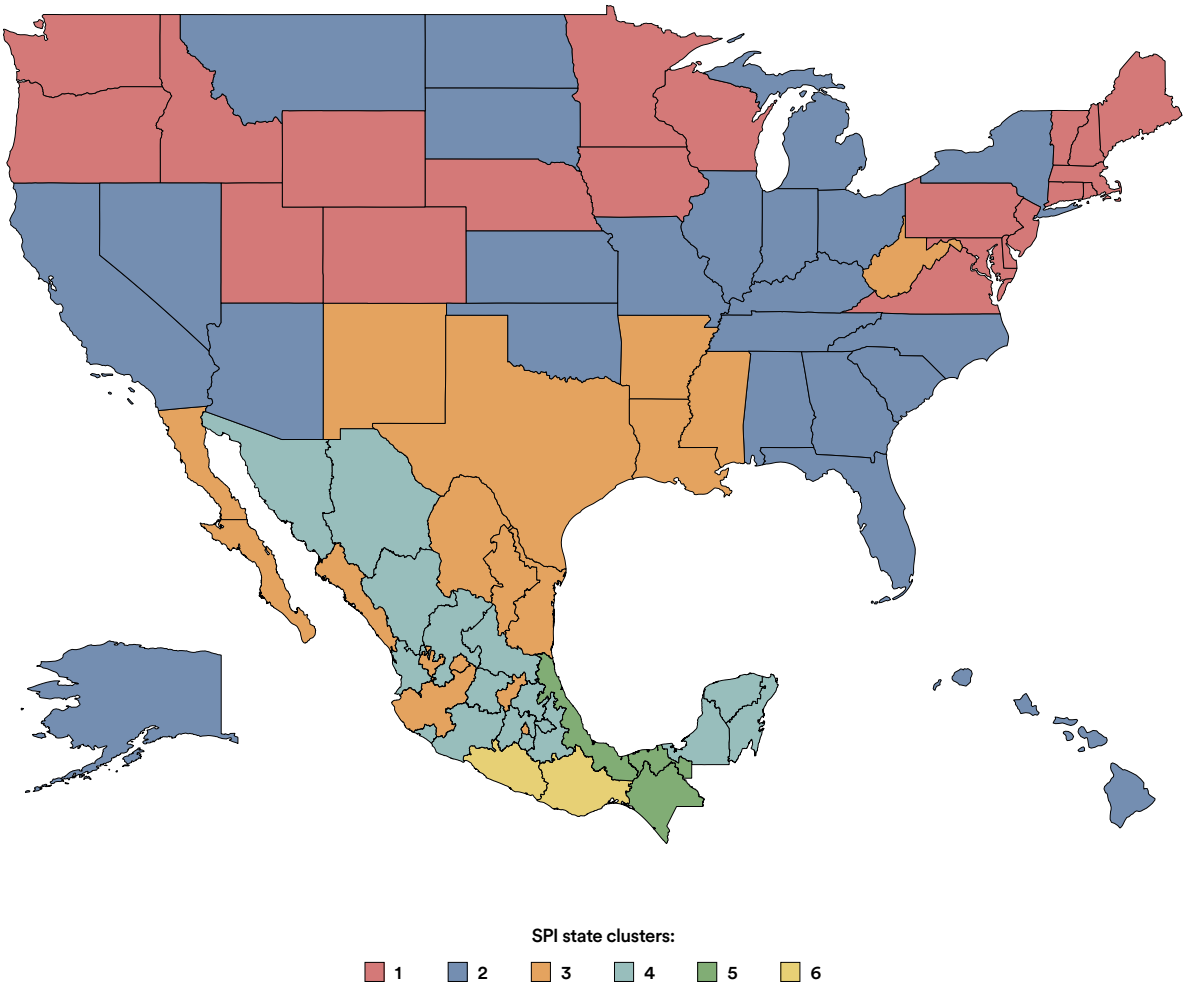
Source: Own calculations with data from the SPI United States and SPI States of Mexico.

This method not only allows the identification of similarities and discrepancies in social progress between the states of both countries but also facilitates a deeper understanding of how these characteristics are distributed across different regions, thereby providing an empirical basis for future research and policies aimed at improving social welfare in these contexts.

9 An analysis of variance (ANOVA) was applied to identify if there are significant differences between the means of the clusters. When applying ANOVA in the context of cluster description, the aim is to examine the variation within each group compared to the variation between groups for each variable of interest. The results showed an F-value of 14.65 and a p-value of 4.79E-10, indicating a significant difference between the means of the clusters, and the clustering process has been robust.

Cluster map of the Binational SPI.

SPI USA - MEXICO



Source: Own calculations with data from the SPI United States and SPI States of Mexico.