Inequality in Central America, Mexico and the Caribbean

Gap analysis and overcoming strategies

Volume 2

Sandra Huenchuan
Miguel del Castillo Negrete
Editors

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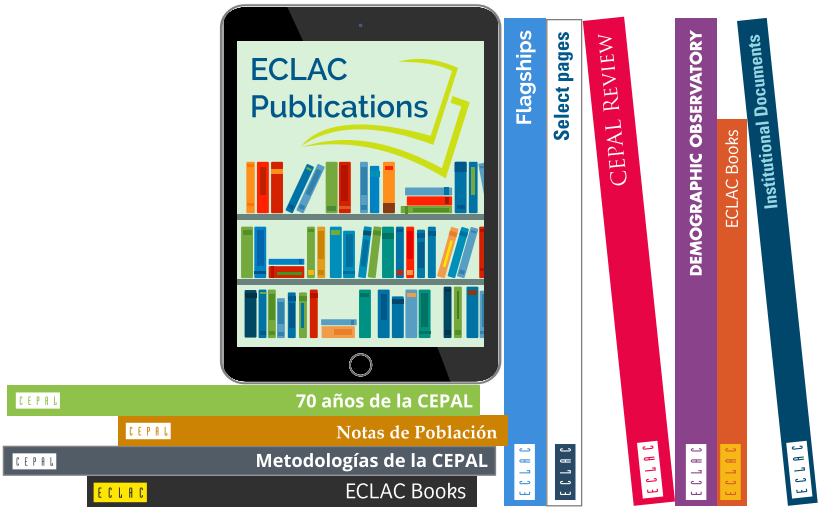

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This book was edited by Sandra Huenchuan and Miguel del Castillo, respectively officer and chief of the Social Development Unit at the ECLAC subregional headquarters in Mexico. The book is part of the "New Rurality and Structural Gaps" project carried out by the Mexican subregional headquarters of the Economic Commission for Latin America and the Caribbean (ECLAC) and funded by the International Fund for Agricultural Development (IFAD).

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Explanatory notes:

Three dots indicate that data are not available or are not separately reported.
A dash indicates that the amount is nil or negligible.
A full stop is used to indicate decimals.
The word "dollars" refers to United States dollars, unless otherwise specified.
A slash between years (e.g. 2022/2023) indicates a 12-month period falling between the two years.
Individual figures and percentages in tables may not always add up to the corresponding total because of rounding.

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Abstract

This book is part of the efforts of the subregional headquarters of the Economic Commission for Latin America and the Caribbean (ECLAC) in Mexico, to address inequality and promote sustainable development in the countries it serves. Inequality has been identified as an obstacle to sustainable development, as it limits access to opportunities, basic services, resources, and economic benefits, especially for historically excluded groups. In this regard, ECLAC proposes public policies that promote economic inclusion, income redistribution, access to education and training, social protection, and the generation of quality employment to address these inequality gaps. In addition, it stresses the importance of strengthening the role of the State in economic and social development, as well as promoting South-South cooperation to face common challenges.

The two volumes of this book compile 16 studies carried out under the project "New narratives for rural transformation in Latin America and the Caribbean", financed by the International Fund for Agricultural Development (IFAD). The papers address different issues in which inequality is expressed in the economic, social and environmental spheres, develop methodological proposals, case analysis and recommendations, and offer proposals in various areas of development.

The results of these studies reveal that inequality manifests itself in income distribution and wealth concentration, as well as gender, generational, ethnic and geographical asymmetries, and that, despite efforts to reduce poverty, these inequalities persist and could even worsen in the post-pandemic context if timely measures are not taken, and it is crucial that States take decisions to ensure the future of their societies, overcoming persistent inequalities and moving towards sustainable development with equality.

Chapter X
Analysis of different types of agriculture for a conceptualization of new rurality in northern Mexico: the case of Chihuahua

Víctor M. Quintana
Martín Solís

Introduction

Few states have been as vulnerable to climate change as the state of Chihuahua, located on the same latitude as the world's great deserts. Moreover, few states have benefited less from the North American Free Trade Agreement (NAFTA) than Chihuahua, which has very few comparative advantages. Nonetheless, in this century, the dynamism of the Chihuahuan agricultural and forestry sector has displayed notable dynamism. In some aspects, its pace is even speedier than that of the export maquiladora industry, a sector in which the state leads national employment.

Chihuahua is the leading national producer of alfalfa, yellow maize, apple, cotton, nuts, chilli and alfalfa. It ranks fourth in milk production and is a major producer of beef and the main exporter of live cattle. In 2021, the value of its agricultural production ranked 5th in the country, after Michoacán, Jalisco, Sinaloa and Sonora. The value of its production is close to 70 billion pesos per year.[1] However, this productive giant walks on feet of sand because of the enormous gaps that separate two agricultural regimes (rainfed and irrigation). Gaps are also wide between regions of the state producer strata and between populations of various ethnicities. There are gaps in, for instance, access to technology, natural resources and government support. The other sand foot is the sustainability of natural resources. The expansion of the agricultural and forestry sector has been at the expense of unrestricted exploitation of surface and groundwater and grasslands and the depletion of soils and forests. Thus, circular causation comes with climate change. As change becomes more evident, the intensive use of natural resources increases. The more intensively resources are spent, the more severe the climate change becomes.

On the other hand, the Chihuahuan rural environment is traversed by a host of dynamics, contradictions, impositions and resistance and survival strategies of the different agents that, over that vast state, coexist and confront each other. Newly-drilled deep wells have opened hundreds of thousands of hectares to irrigation. Open-pit mining operations have been launched. Drug trafficking has opened shop for the cultivation and transfer of drugs while keeping a side business as a clandestine exploiter of forests and controller of the communities. There is forced displacement of populations, concentration of land ownership and migration to the United States. Thus, remittances from migrants have grown to improve the living conditions of those who stay back. This mixture has created more inequality, which backlashes against the processes and policies that create it.

In this context, the first objective of this study is to build the theoretical and methodological tools that account for the complex transformations of rural Chihuahua. With this toolset, the study will then analyse the gaps that have been generated between types of producers, crops and regions. The second objective of this chapter is to propose an outline of public policies and programmes so that, together, government, communities and farmers are able to build a new rurality that is sustainable in

[1] In 2021, the exchange rate was around 20 Mexican pesos per US dollar.

the long term, reduces gaps and inequalities and ensures that the different stakeholders who converge in rural areas have the possibility of living in well-being and dignity, with what they earn from their work in the fields.

This study uses a methodology that combines qualitative and quantitative tools, accompanied by a systematic reflection of results. This analysis considers that, in the last two decades following NAFTA, the agricultural sector of Chihuahua has experienced total tax relief, together with structural adjustment policies, climate change and the presence of organized crime. Statistical monitoring of data from the agricultural and forestry sector was carried out, as well as interviews with key stakeholders to determine existing gaps in different strata of producers, regions, ethnic groups and genders. In addition, the study takes a look into the strategies of conflict and resistance that have occurred in rural areas during these two decades. Finally, this chapter presents public policy proposals that were prepared based on the general analysis of the dynamics of production, the existing gaps and the conflicts that currently exist. Those proposals take into account the opinion of several stakeholders.

After this introductory section, this study contains several more sections. The first one presents a brief analysis of the current discussion about the new rurality. The section describes the personal appropriation of a new South-South rurality and discusses how it is used to analyse the reality of the rural environment in Chihuahua and to make policy proposals. The second section combines quantitative and qualitative methods to approach the specific object of study: rurality in Chihuahua and the gaps that characterize it. Afterwards, it presents results for the quantitative analysis of the dynamics of the agricultural and forestry sector in Chihuahua from 2005 to 2020. The section also renders a qualitative analysis of the gaps between the two agricultural regimes (rainfed and irrigation) and the differences in access to water, different government subsidies and financing. Finally, it looks into gender gaps. Lastly, this chapter gives some general conclusions, which include comments on the diverse strategies and forms of social action in the Chihuahuan countryside.

A. Theoretical and contextual start line

1. A critical approach to new rurality

The new rurality theory cannot explain the transformations that the countryside has undergone in the state of Chihuahua, nor does it offer a normative framework for alternative development proposals. Several authors have exposed these limitations. The new rurality definition envisions a disputed territory, and it cannot fully capture the complexity, contradictions and dynamics of rurality. There is a proposal that can guide efforts to build a fair and sustainable rural world with the participation of rural agents on a daily basis. Such a proposal stands on a radical critique of savage capitalism. It is based on the articulation of ecological, technological and cultural processes. The proposal is grounded on interdisciplinary and transdisciplinary studies, and it also combines traditional and modern knowledge and promotes the resignification of the territory.

The new South-South rurality gives new value as social agents to individuals, inhabitants, farmers and Indigenous Peoples. Rooted in the sociology of absences stated by Boaventura de Sousa, this standpoint gives value to the farmer and indigenous knowledge, the creation of collective forms of social action to generate proposals aimed at coevolution and respect for cultural and ecological diversity, as displayed in many forms of indigenous production (Sousa, 2012). From this perspective, new social movements are very important, especially those that demand an alternative world organisation and are led by farmers and Indigenous Peoples. These movements are important because they incorporate as their main demands values such as justice, food sovereignty and human rights. They propose a relationship of interdependence between rural sectors and cities and a vision that combines the global and the local into the same sphere of thought and practice—the glocal. These movements demand a better world from down up, from the country to the city, from the local and the global (Touraine, 1997; Sánchez, 2012 and 2014).

Though their vision needs further development, as it still needs to refine its analytical categories and indicators, so far, it is the only one that can account for the dislocated rurality of the state of Chihuahua and the huge gaps, contradictions and conflicts that occur within the state. In addition, it is a vision that facilitates the development of effective proposals on the horizon of a utopia of justice and

sustainability. Accordingly, a conceptual framework of the rural world of Chihuahua must locate the exclusionary globalisation process in a historical-structural perspective and consider its effects on producers and its consequences—precarious work, the concentration of natural resources, migration and poverty. Looking through the eyes of the agents, the framework must identify the gaps between social classes, producer strata, types of agriculture, regions and sexes, including social struggles and movements and the resistance and survival strategies of the stakeholders.

2. Structural adjustment: exclusionary globalisation in the Mexican countryside and its effects

The turning point in the process of Mexican agriculture is the year 1982. In August of that year, the country declared bankruptcy, and the International Monetary Fund, the World Bank and the Department of the Treasury of the United States, the so-called "Consensus of Washington", imposed the First Package of Structural Adjustment Measures on Mexico. This package carried two consequences for agriculture. The first was a severe reduction of State participation in promoting sectoral economic development. This produced a dramatic fall in investment and agricultural spending and abolished the guarantee price system. In addition, the prices of inputs and machinery were freed. The second consequence was the unilateral and abrupt trade opening carried out during the 1980s, which in January 1994 consolidated, when the North American Free Trade Agreement (NAFTA) came into force.

Since then, a strategy focused on five main axes has been designed: (i) to discourage domestic production of staple foods and replace them with imports, to profit from the low international prices of basic grains in the international markets; ii) to concentrate the production of white maize in an elite of highly-subsidized large producers that supply domestic demand; (iii) to direct policy towards providing assistance to small producers without supporting their production; (iv) to promote non-traditional export activities to "conquer" the seasonal markets of the United States; and v) to support rural migration and use the foreign currency of remittances to balance public finances (Rubio and Moguel, 2018).

This process, far from being reversed or at least slowed down, accelerated from 2003 to 2016, benefiting large foreign and national agricultural companies. The processes also brought the expansion of foreign capital in the country through mining and megaprojects in energy and tourism. The development model changed towards neoliberalism, which carried about a severe public contraction of investment and spending in rural areas. Public expenditures concentrated on a small group of states, companies and producers, causing destructuring effects on the economy of productive units. Some of its consequences are the growth of the food dependency index, the fall in the income of producers despite price increases, the growth of poverty in the countryside and migration from the countryside to the cities and from Mexico to the United States.

NAFTA had serious consequences in Mexico, including the ruin of thousands of production chains and the bankruptcy of an agricultural sector focused on the domestic market. This, in turn, caused a decline in the proportion of the employed population in the agricultural sector between 1970 and 2015. In addition, there has been worrying overexploitation of natural resources, such as forests, soils, grasslands and water reservoirs, to increase production, which has generated the forced displacement of the population and the pollution of aquifers, thus contributing to the destruction of the region's ecosystems.

These undesired effects have also resulted in health problems in mothers and children due to the pollutants dumped by open-pit mining; Stavenhagen (2014) has described this situation as a serious violation of the human rights of Indigenous Peoples. On the other hand, drug trafficking and organized crime pervading the sector have been detected. Criminals grow narcotics and kidnap young people as labour to work their ranches and even finance drug production. All this caused a serious deterioration of the social fabric in the countryside, as it generated a drastic demographic reduction. As people of both sexes emigrated, families disintegrated, and community social networks weakened.

The correlation of forces shifted against small- and medium-sized farmers. The shift has many different factors. Some are technological since, with the decline of rural public investment, farmers could not keep the pace of innovation. Some factors are economical, as farming loses specific weight, both in volume and value. Some are sociodemographic, as the farmer population dropped down and aged, and their communities were destroyed. Finally, there is a political factor —the alliance between farmers and

the State was broken, and the weight of farmer organisations on important public decisions diminished considerably. Not being able to significantly influence the orientation of rural policy, farmers see how it primarily benefits transnational agricultural companies, domestic oligopolies and large export-oriented producers. Inequality gaps are the consequence of this destructuring.

3. The gaps: reproductive cause and effect

In Chihuahua, economic and social gaps are deepening and creating new disparities in rural areas that go beyond the gaps between rural and urban areas. Therefore, it is appropriate to adopt the gap approach, which is an analysis tool that applies empirical evidence to identify territorial disparities and design development policies to overcome them. Identifying and differentiating these gaps makes it possible to understand the various strategies, struggles and demands of rural agents and to locate the basic components of alternative development proposals.

4. Social action: the resistance and strategies of rural actors

This analysis is based on the assumption that rural families are not passive in the face of exploitation and exclusion, so they employ various resistance strategies, as proposed by James Scott and Guillermo Bonfil. These strategies include struggles and movements, economic development projects, grassroots cooperation and solidarity, as well as individual and collective responses in the context of the family unit. Four types of strategies stand out: self-consumption and agricultural production, participation in labour markets, change in access to land and women's access to property.

B. The Chihuahuan agricultural sector: dynamism and unsustainability

From both a synchronous and diachronic point of view, the agricultural sector of the Chihuahuan economy shows great dynamism and a growth rate even higher than that of other sectors of the economy. In Chihuahua, there are over one million cultivated hectares, considering both irrigation and rainfed land. In terms of the value of its agricultural production, it occupies the national fifth place: In terms of livestock and cattle production, it stands in the thirteenth place (see table X.1). According to SADER data, in 2019, 8.7% of the employed population in the state of Chihuahua worked in the primary sector: 81.8% in agriculture and 18.2% in cattle.[2] In absolute numbers, 119,887 people are employed in the agricultural sector and 26,729 in livestock. Of the total number of employed persons in the sector, 18.8% are women, and 81.2% are men (SADER/SIAP, 2019).

Table X.1
Chihuahua: area devoted to agriculture and cattle, 2019
(In hectares, pesos and tons)

Sector	Cultivated area (Ha)	Irrigation hectares	Rainfed hectares	Production value *(thousands of pesos)*	Production value ranking	Production *(tonnes)*
Agriculture	1 035 726	587 818	447 908	46 211 349	5th national place	19 925 080
Cattle				23 483 431	13th national place (2018)	1 449 159

Source: Prepared by the authors, on the basis of Ministry of Agriculture and Rural Development (SADER), Servicio de Información Agroalimentaria y Pesquera (SIAP), *Anuario estadístico de la producción agrícola 1980-2021*, 2019 [online] https://nube.siap.gob.mx/cierreagricola, and Secretaría de Desarrollo Rural (SDR), *Situación del agua y de la agricultura de riego en Chihuahua*, 2020.

The geographic and climatic conditions of Chihuahua make it very difficult to grow several crops in one single year, while climate change has severely reduced the area that can be farmed in the dry season of fall and winter (see table X.2). Chihuahua stands out in cotton, alfalfa, maize for fodder, apples,

[2] There was no availability of data for the fishing sector.

onions, oats and chilli, among other crops. Box X.3 shows the main crops and their places in the national ranking. Three products concentrate more than 90% of livestock production: beef, milk and live cattle (see table X.4).

Table X.2
Chihuahua: crops by cycle, area and value of production, 2019
(In number of crops, hectares and pesos)

Cycle	Number of crops	Cultivated area	Production value *(thousand pesos)*
Spring-Summer	37	787 487	23 356 567
Fall-Winter	18	36 476	2 052 325
Perennial	16	211 763	20 802 457
Total	71	1 035 726	46 211 349

Source: Prepared by the authors, on the basis of Ministry of Agriculture and Rural Development (SADER), Servicio de Información Agroalimentaria y Pesquera (SIAP), *Anuario estadístico de la producción agrícola 1980-2021*, 2019 [online] https://nube.siap.gob.mx/cierreagricola, and Secretaría de Desarrollo Rural (SDR), *Situación del agua y de la agricultura de riego en Chihuahua*, 2020.

Table X.3
Chihuahua: main agricultural crops in the state, 2019
(Hectares)

Cultivation	Cultivated area 2019	Production 2019	Value in thousands of pesos	Ranking National 2018
Alfalfa	90 207	8 116 222	5 021 265	1
Cotton	137 110	605 782	7 628 568	1
Fodder oats	228 254	2 954 073	1 493 453	1
Oats	27 153	50 802	279 194	1
Onions	6 027	330 372	2 880 500	1
Chilli peppers	27 801	682 085	4 228 704	1
Apples	30 846	624 696	7 356 907	1
Walnuts	88 070	102 538	7 428 588	1
Yellow maize	150 316	992 023	3 608 979	1
Peanuts	5 605	19 252	255 491	2
Peaches	1 903	23 788	376 825	2
Beans	86 398	64 486	911 338	4
Oregano	15	44	21 136	4
Wheat	8 620	41 340	157 338	9
Melons	1 109	31 844	118 596	6
Fodder maize	37 868	788 214	511 343	7
White and blue maize	64 453	425 367	1 547 484	NA
Potatoes	1 449	43 402	374 153	8
Total state production	1 035 726	19 925 080	46 211 349	

Source: Prepared by the authors, on the basis of Ministry of Agriculture and Rural Development (SADER), Servicio de Información Agroalimentaria y Pesquera (SIAP), *Anuario estadístico de la producción agrícola 1980-2021*, 2019 [online] https://nube.siap.gob.mx/cierreagricola, and Secretaría de Desarrollo Rural (SDR), *Situación del agua y de la agricultura de riego en Chihuahua*, 2020.

Table X.4
Chihuahua: main livestock products in the state, 2019
(In units of weight, thousands of pesos and ranking)

Product	Production	Production value (thousand pesos)	National ranking
Milk *(Thousand litres)*	1 160 432	8 365 618	4
Beef *(Tonnes)*	85 405	7 304 227	4
Live cattle *(Tons)*	157 480	6 498 596	1 (export of calves)
Total		22 168 441	

Source: Prepared by the authors, on the basis of Ministry of Agriculture and Rural Development (SADER), Servicio de Información Agroalimentaria y Pesquera (SIAP), *Anuario estadístico de la producción agrícola 1980-2021*, 2019 [online] https://nube.siap.gob.mx/cierreagricola, and Secretaría de Desarrollo Rural (SDR), *Situación del agua y de la agricultura de riego en Chihuahua*, 2020.

Both the agriculture and cattle sectors in Chihuahua have shown great dynamism. In the agricultural subsector, the state of Chihuahua shows much more significant growth than the national average. While this average grew by 217% from 2009 to 2018, the subsector grew by 306% in Chihuahua. In the cattle subsector, the national average grew by 190% and in the state by 192%. When taking into account the growth of the general economy and the growth of the GDP of the primary sector in the five years from 2003 to 2018, it can be seen that the economy of Chihuahua has grown even more steeply (see table X.5).

Table X.5
Chihuahua: gross domestic product (GDP) of the primary and secondary sectors of the economy, 2003-2020
(Millions pesos and percentages)

Year	GDP primary	GDP secondary	Total GDP	1/3 *(percentages)*
2003	12 639.02	62 228.71	234 231.94	5.39
2005	17 126.94	71 107.90	280 959.11	6.09
2010	25 810.48	88 398.75	382 215.09	6.75
2015	40 414.36	182 030.83	587 826.60	6.87
2020	53 194.53	235 227.82	786 175.61	6.98

Source: Prepared by the authors, on the basis of National Institute of Geography and Statistics (INEGI), PIB y Sistema de Cuentas Nacionales de México, 2020 [online] https://www.inegi.org.mx/temas/pib.

1. Producers and rural property

In Chihuahua, there are 83,634 rural economic units (REUs) classified according to the standards of SAGARPA-FAO. The classification appears in table X.6. Like all Northern states, in Chihuahua, the family strata are fewer than the country's average, while business strata are more numerous. In Chihuahua, there are several forms of land ownership. Collective ownership in the form of *ejido* predominates as a proportion of the area. There are 914 ejidos with a total area of 9,287,348 hectares. Different agricultural agents coexist in them (see table X.7). In addition, there are other forms of collective ownership, such as the Mennonite agricultural colonies and other colonies of settlers.

Table X.6
Chihuahua: rural economic units (REUs) by strata as a proportion of total REUs
(Number of REUs and percentages)

Stratum	Chihuahua: REUs	Chihuahua: REUs by stratum *(percentages)*	MEXICO: REUs by stratum *(percentages)*
E1: Subsistence family agriculture not linked to the market	15 197	17.54	22.4
E2: Subsistence family agriculture with links to the market	34 719	40	50.6
E3: In transition	10 165	11.73	8.3
E4: Business with fragile profitability	11 336	13.08	9.9
E5: Thriving business	13 746	15.86	8.4
E6: Dynamic business	1 469	1.69	0.03
Total	86 634	100	100

Source: Prepared by the authors, on the basis of Ministry of Agriculture and Rural Development (SADER), Servicio de Información Agroalimentaria y Pesquera (SIAP), *Anuario estadístico de la producción agrícola 1980-2021*, 2019 [online] https://nube.siap.gob.mx/cierreagricola, and Secretaría de Desarrollo Rural (SDR), *Situación del agua y de la agricultura de riego en Chihuahua*, 2020.

Table X.7
Chihuahua: agricultural agents
(Number of people)

Certified agricultural nuclei	Men	Women	Total
Ejidatarios	85 373	31 169	116 542
Settlers	6 726	2 023	8 749
Tenants	4 919	1 832	6 750
Residents	2 685	1 110	3 793
Subtotal	99 703	36 134	135 837
Non-certified agricultural nuclei	Men	Women	Total
Ejidatarios	2 070	750	2 820
Settlers	2 173	788	2 961
Subtotal	4 243	1538	5 781
Total	103 946	36 672	141 618

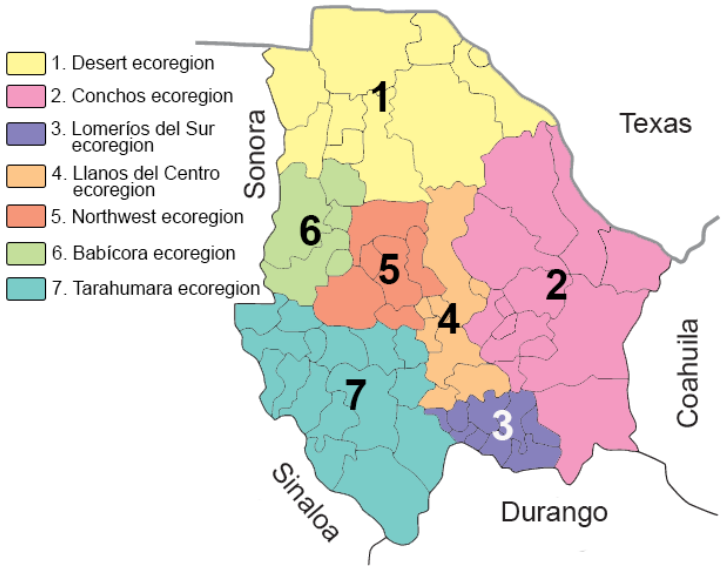
Source: Prepared by the authors, on the basis of National Agrarian Register (RAN), "Datos abiertos: Total de Sujetos por Calidad Agraria", 2022 [online] http://datos.ran.gob.mx/conjuntoDatosPublico.php.

In Chihuahua, there are 107 Mennonite colonies, 33 agricultural colonies, four cattle-production colonies and 33 commons. Many of these forms of social property have not been regularized and/or certified. As Chihuahuan agriculture has become more commercial and better capitalized, it has had to employ more labour to carry out the various tasks required by the crops. It is estimated that, in Chihuahua, between 80 and 90 thousand agricultural labourers are hired each year, who work around 11,435,815 days per year. An important part of them comes from the states of Guerrero, Oaxaca, Veracruz and Chiapas. There is also an important contingent from the indigenous communities of the Sierra Tarahumara. These people work alfalfa, chilli peppers, grain maize, apples, walnuts and cotton.

2. Regions and ecosystems of Chihuahua

For the purposes of this study, the state is divided into seven ecoregions according to ecological, productive and sociocultural characteristics (see map X.1).

Map X.1
Chihuahua: ecoregions in the state



Source: Prepared by the authors.

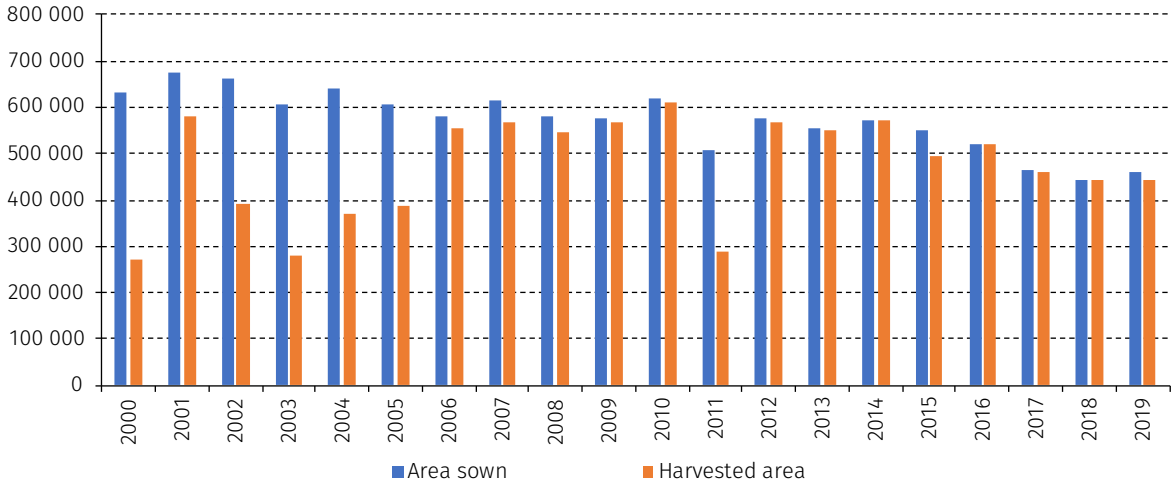
C. Water: a first gap that opens others

The location of the state of Chihuahua in the latitude of the great deserts of the planet makes it especially vulnerable to droughts and manifestations of climate change. This is key to understanding the evolution of the Chihuahuan agricultural sector and the dispute over access to natural resources and capital goods that give protection against dire circumstances. In Chihuahua, the gaps may become extremely wide between those who have the resources to resist the effects of climate change and those who lack these resources. In 25 of the 35 years from 1985 to 2020, annual precipitation has been less than 500 mm[3]. In 11 of these, it rained even less than 400 mm[3].

1. The gap between rainfed and irrigation agriculture

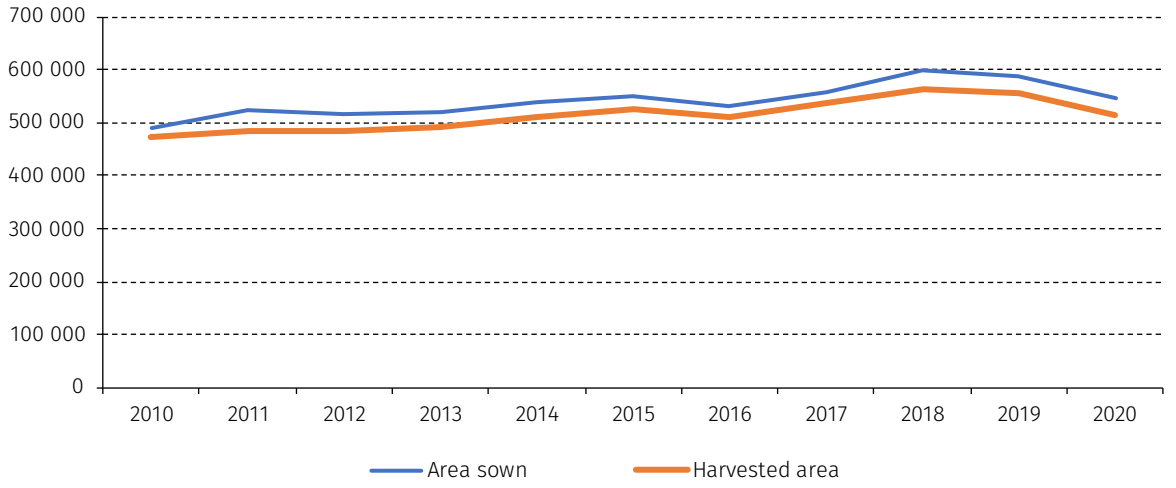
In the last 20 years, the cultivated area has generally remained stable. This statement can be misleading since as the number of mishaps grows, rainfed areas get smaller and more land opens up for irrigation. Figure X.1 shows how, between 2000 and 2019, the rainfed area decreased from 630,659 hectares to 461,827 in the last year. Also, each year the difference between the area that farmers sow and the area they harvest becomes smaller. This evinces that, to avoid risks, they are only planting on the number of hectares that they are most certain to reap. On the contrary, the irrigation area, both for cyclical and perennial crops, has been increasing: in 2010, it was 491,609, and in 2020 it peaked at 599,130 hectares (see figure X.2).

Figure X.1
Chihuahua: rainfed cultivated areas sown and harvested, 2000-2019
(Hectares)



Source: Prepared by the authors, on the basis of Ministry of Agriculture and Rural Development (SADER)/Food and Agriculture Information Service (SIAP), *Anuario estadístico de la producción agrícola*, 2019 [online] https://nube.siap.gob.mx/cierreagricola; and Secretaría de Desarrollo Rural (SDR), *Situación del agua y de la agricultura de riego en Chihuahua*, 2020.

Figure X.2
Chihuahua: irrigation cultivated areas sown and harvested, 2000-2020
(Hectares)



Source: Prepared by the authors, on the basis of Ministry of Agriculture and Rural Development (SADER)/Food and Agriculture Information Service (SIAP), *Anuario estadístico de la producción agrícola*, 2019 [online] https://nube.siap.gob.mx/cierreagricola; and Secretaría de Desarrollo Rural (SDR), *Situación del agua y de la agricultura de riego en Chihuahua*, 2020.

The dynamics of the rainfed and irrigation regimes have widened the gap between both of them. This can be clearly observed in the contribution of each regime to the value of production (see table X.8). Herein is the first gap between the irrigation agriculture regime and the rainfed regime. While in 2010, rainfed agriculture represented 55.7% of the cultivated area, in 2019, it had fallen to 42.9% (12 percentage points below). In the same period, irrigation agriculture grew from 44.2% of the cultivated area to 57% (13 percentage points above).

Table X.8
Chihuahua: comparison of cultivated area and production value between irrigation and rainfed agriculture, 2010-2019
(Hectares and percentages)

Regime	2010		2019		2010		2019	
	Surface sown *(hectares)*	Percentage	Cultivated area *(hectares)*	Percentage	Production value	Percentage	Value of production	Percentage
Irrigation	491 069	44.2	587 817	57.0	16 796 000	87.4	43 435 895	94
Rainfed	618 829	55.8	443 015	43.0	2 425 000	12.6	2 795 108	6.0
Total	1 109 898	100	1 030 832	100	192 221 000	100	46 231 003	100

Source: Prepared by the authors, on the basis of Ministry of Agriculture and Rural Development (SADER)/Food and Agriculture Information Service (SIAP), *Anuario estadístico de la producción agrícola*, 2019 [online] https://nube.siap.gob.mx/cierreagricola; and Secretaría de Desarrollo Rural (SDR), *Situación del agua y de la agricultura de riego en Chihuahua*, 2020.

The lack of sufficient and timely water has significantly affected the yield per hectare of crops. While in rainfed agriculture, white maize and beans depend on whatever the sky will give, the main irrigation crops, yellow or fodder maize, cotton, walnuts and apples, get plenty of water on time. This has a direct impact on the value of production: in 2010, rainfed agriculture accounted for 12.6% of the total value of production, while irrigation represented 87.4%, almost eight times more. But by 2019, the gap had widened even more, as the value of the production of rainfed agriculture was only 6%, and the remaining 94% corresponded to irrigation agriculture, that is, more than 15 times[3] the value of crops that live on rain. This means that, in economic terms, rainfed agriculture has hit rock bottom. This gap cannot be closed.

2. The gap in access to water concessions

What defines whether a plot of land will depend on rain or irrigation water is access to the concessions granted by the law, be it rights to surface water from dams, rivers, canals or lakes or concessions for drilling wells and groundwater extraction. The National Water Act of 1992 states that the exploitation and use of national waters must be done through concession titles granted by the Federal government through the National Water Commission (CONAGUA). In Chihuahua, water concessions for all types of uses amount to 5,491 cubic hectometres (Hm^3) per year. Of this volume, 3,367 Hm^3 corresponds to groundwater and 2,123.03 to surface water. The total volume granted for agricultural use is 4,796.49 Hm^3. In Chihuahua, agriculture uses 87% of the total concessions, while 75.7% is devoted to this use nationally. This means that Chihuahua exceeds the national average of water used for agriculture by 12 percentage points.

Of the 4,796.49 Hm^3 for agriculture, 2,750.33 Hm^3 corresponds to groundwater and 2,046.16 to surface water (CONAGUA, 2022). As for surface water, 1,408 Hm^3 is allocated to irrigation districts and 638.15 Hm^3 to irrigation units. The 2,750 Hm^3 of groundwater concessions are distributed among 13,073 concession titles that cover 14,594 users[4]. The gap becomes apparent when the number of surface and groundwater concessions is compared. It is estimated that there are around 33,000 irrigation users in Chihuahua. Of these, 18,575 user district surface water and 14,594 have been granted groundwater concessions. While each surface water user takes 110,156 cubic meters per year on average, groundwater users use 188,433 cubic meters, 71% more. Table X.9 classifies groundwater users into individual users, corporations and Mennonite colonies, showing how many wells there are for each group and the volume of extraction to which they are entitled.

Table X.9
Chihuahua: volume of groundwater used by individual users, corporations and Mennonites
(Number of users and cubic meters)

	Corporations	Individuals	Mennonites	Totals
Users	3 327	6 715	4 194	14 594
Volume M^3/year	958 976 604.96	1 048 112 822.58	679 515 469.10	2 750 334 965
Average Use	288 240	156 085	162 020	188 456

Source: Prepared by the authors, on the basis of National Water Commission (CONAGUA), Registro público de derechos de agua, 2022 [website] https://app.conagua.gob.mx/sistemasdeagua/.

[3] The cut was made in 2019, but in 2020, the drought further collapsed rainfed production.

[4] A title may encompass more than one exploitation or well.

Clearly, even within the group of groundwater concessionaires, there are gaps in terms of the volume that they are allowed to extract. The 14,594 wells that appear in the Public Register of Water Rights (REPDA) are distributed as follows:

- 500 users have concessions of less than 100,000 cubic meters per year.
- 1,092 users, between 100,000 and 120,000 cubic meters.
- 782 users, from 121,000 to 150,000 cubic meters.
- 1 740 users, from 151,000 to 200,000 cubic meters.
- 1 734 users, from 201,000 to 250,000 cubic meters.
- 1 453 users, from 251 to 300 thousand cubic meters.
- 1 212 users, from 301,000 to 400,000 cubic meters.
- 395 users, from 400,000 to 500,000 cubic meters.
- 148 users, from 500,000 to 700,000 cubic meters
- 33 users, from 700,000 to 1 million cubic meters.
- 14 users, from 1 to 1.5 million cubic meters.

Users entitled to more than 1.5 million cubic meters are:

- 30 irrigation associations with access to 836 wells that extract a total of 400 million cubic meters per year.
- 6 large users that together have 186 wells that extract in total 53 million cubic meters.

A finer dissection reveals that water use concentrates on a group of Mennonite colonies, who are entitled to 30.73% of all wells (see table X.10). This annual volume of groundwater is enough to irrigate 275 thousand hectares. However, they are used on more than 500 thousand hectares of both perennial and seasonal crops. Apparently, there are many Mennonite producers. However, two considerations must be made. On the one hand, in Mennonite colonies, there are individuals and families who hold several concessions. On the other hand, in this century, Mennonite farmers and their families have drilled almost all wells.

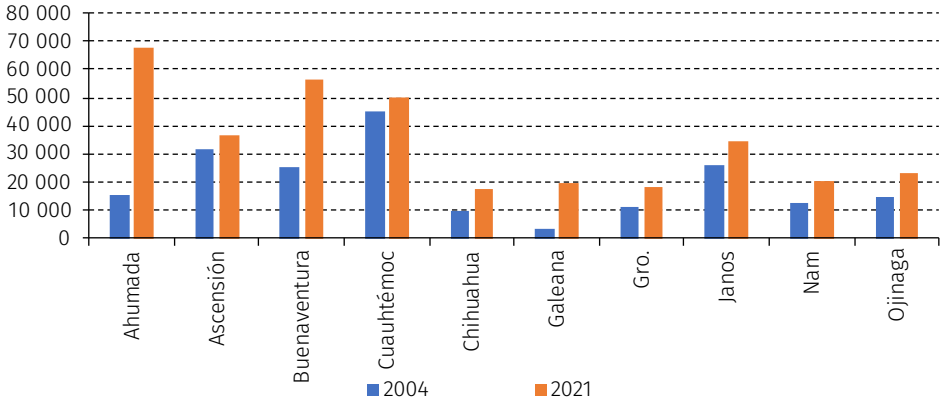
Table X.10
Chihuahua: percentage of wells and water volume granted to large companies and Mennonite colonies.
(Number, proportion and cubic meters)

Individuals or corporations	Wells	Percentages	Volume M^3/annual	Percentages
Mennonites	4 194	28.7	679 515 469.10	24.7
123 Large companies	569	3.9	167 700 242	6
Others	9 831	67.4	1 903 119 254	65.3
Total	14 594	100	2 750 334 965	96

Source: Prepared by the authors, on the basis of National Water Commission (CONAGUA), Registro público de derechos de agua, 2022 [website] https://app.conagua.gob.mx/sistemasdeagua/.

The issue becomes more complex when considering the dynamics of both irrigation modalities. While the area irrigated with surface water has been the same since 2004, there has been a very significant increase in the number of hectares irrigated with groundwater. The area irrigated with groundwater increased by 189,253 hectares between 2004 and 2021: from 378,500.9 to 567,753.9 hectares. This increase took place in 10 of the 67 municipalities of the state. They alone account for 149,688 of the additional 189,253 hectares irrigated with groundwater between 2004 and 2021. Of these municipalities, seven are in the desert: Ahumada, Ascensión, Buenaventura, Chihuahua, Galeana, Janos and Ojinaga. The rest, Cuauhtémoc, Guerrero and Namiquipa, are in the west of the state.

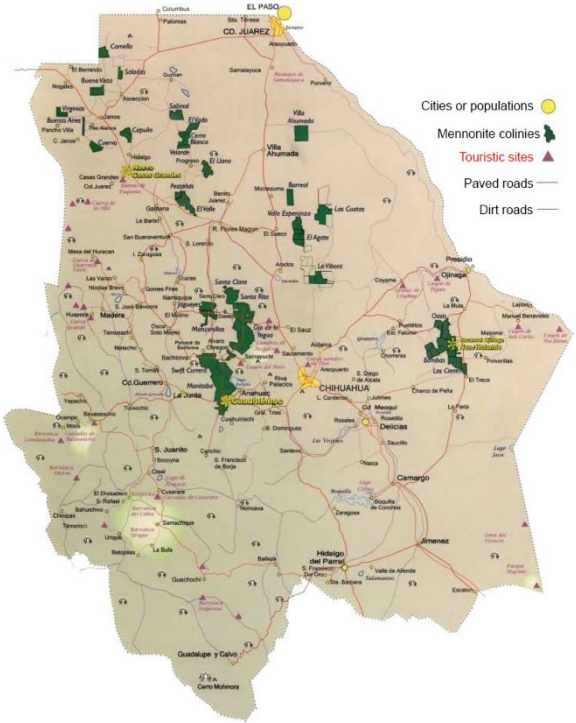
Figure X.3
Chihuahua: increase in the area irrigated with groundwater in selected municipalities, 2004 and 2021
(Hectares)



Source: Prepared by the authors, on the basis of Ministry of Agriculture and Rural Development (SADER)/Food and Agriculture Information Service (SIAP), *Anuario estadístico de la producción agrícola*, 2019 [online] https://nube.siap.gob.mx/cierreagricola; and Secretaría de Desarrollo Rural (SDR), *Situación del agua y de la agricultura de riego en Chihuahua*, 2020.

In all these municipalities, there is a strong presence of Mennonite farmers, who, since the beginning of this century, have been expanding from their original settlements in the municipality of Cuauhtémoc to Namiquipa and Guerrero and, from there, to municipalities in the desert (see map X.2). These farmers of German-Dutch origin bought land previously used for raising cattle, especially in the desert, where they drilled hundreds of wells to water their crops with centre-pivot irrigation. Table X.11 shows the opening of new lands to cultivation in various aquifers of the Chihuahuan desert, considered free-flow zones by the ban decreed in March 2013.

Map X.2
Chihuahua: territories in which the fields of the Mennonite people are located



Source: Prepared by the authors, on the basis of the Secretariat of Rural Development (SDR), Water and Irrigated Agriculture Situation in Chihuahua, 2020

Table X.11
Chihuahua: agriculture area on 8 desert aquifers

Aquifer	Number of users	Annual recharge m^3	Granted volume m^3	Agricultural area (ha)	Extraction m^3	m^3 ha	Available groundwater m^3
Laguna Santa Maria	31	45 200 000	8 938 080	38 653	461 800 000	11 947.33	-416 600 000
Los Juncos	211	133 600 000	63 195 000	57 305	831 300 000	14 506.9	-697 700 000
Laguna La Vieja	152	77 100 000	41 353 000	24 061	294 100 000	12 223.10	-217 000 000
Laguna de Tarabillas	52	36 400 000	17 483 000	33 046	323 500 000	9 789.38	-287 100 000
Laguna de Patos	48	11 000 000	8 211 058	16 219	107 900 000	6 652.69	-96 900 000
Laguna de Hormigas	60	25 500 000	16 250 880	20 052	294 500 000	14 686.81	-269 000 000
Laguna de Tres Castillos	12	18 800 000	2 785 500	9 384.5	83 100 000	8 855.03	-64 300 000
El Sabinal	129	37 500 000	28 376 828	11 180	58 100 000	5 196.78	-20 600 000
Total	695	385 100 000	186 593 346	209 900.50	2 454 300 000	83 858	-2 069 200 000

Source: Prepared by the authors, on the basis of Secretaría de Desarrollo Rural (SDR), *Situación del agua y de la agricultura de riego en Chihuahua 2020*, 2020.

The vast majority of these 209,900 hectares have been opened to cultivation by Mennonite farmers who have drilled the wells that irrigate them. This gives an idea of the enormous inequality in access to water by different social groups. On the other end are the indigenous producers of the Sierra. In the municipalities with the highest proportion of the Indigenous population, Batopilas, Bocoyna, Chínipas, Guachochi, Maguarichi, Morelos and Urique, there are no concessions for the use of groundwater, whether for individuals or for corporations. Also, there is no hydraulic infrastructure for irrigation other than the "informal irrigation" installed by criminal groups that produce drugs. The only exception is the municipality of Guadalupe y Calvo, where there are 17 permits for corporations. Most of these permits are used for extracting drinking water for the population (SDR, 2020). In this regard, the Ministry of Rural Development of the Government of Chihuahua stated the following:

> "The agriculture developed by the Mennonite producers in Chihuahua is an example of the lack of water planning. They currently have more than 700,000 hectares of irrigation and rainfed fields. Since 2000, they have cleared more land for agriculture and continue to drill wells. On six reservoirs that were classified as free-flow aquifers until 2013, the Mennonite colonies have 280,000 hectares of crops irrigated with groundwater. However, they only have 554 wells registered in REPDA, which would mean that each well irrigates 500 hectares [...], ten times the capacity of each well" (SDR, 2020).

Access to irrigation water is mostly given to highly profitable crops such as cotton, yellow maize, alfalfa, chilli peppers, or to perennials like pecan nuts, apples and peaches. These are not crops that strengthen food security or sovereignty, but rather businesses meant for profit. These seven crops represent 89.5% of the state area and 91% of the value of production. Walnuts are the crop that has most expanded in recent years because they adapt very well to the climate and soils of Chihuahua, and they yield large profit margins, though they consume enormous amounts of water. The area planted with walnut trees, which in 2010 was 53,082.62 hectares, by 2020 already covered 88,853.24 hectares, that is, an additional 35,824.62 hectares (67% increase).

Table X.12
Chihuahua: irrigated crops by area, production, value and yield

Cultivation		Surface (Ha)		Production (t)	Production value	Yield (udm/ha)	PMR ($/udm)
		Sown	Harvested				
Perennial crops	Alfalfa	90 181.50	90 181.50	8 150 234.20	5 269 859 931.38	90.38	646.59
	Walnuts	88 853.24	64 993.23	102 059.73	7 303 550 430.19	1.57	71 561.53
	Apples	33 877.11	32 374.61	627 050.28	5 865 033 277.44	19.37	9 353.37
	Peaches	2 478.00	2 137.00	34 194.00	488 197 996.20	16.00	14 277.30
Subtotal		215 389.85	189 686.34	8 913 538.21	18 926 641 635.21		
Annual crops	Cotton	123 839.30	94 954.33	445 386.59	6 280 850 599.91	4.69	14 102.02
	Maize	129 118.00	127 918.00	1 259 504.20	5 426 813 151.50	9.85	4 308.69
	Chilli peppers	25 140.00	25 140.00	586 934.49	4 183 985 989.34	23.35	7 128.54
Subtotal		278 097.30	248 012.33	2 291 825.28	15 891 649 740.75		
Total		493 487.15	437 698.67	11 205 363.49	34 818 291 375.96		

Source: Prepared by the authors, on the basis of Secretaría de Desarrollo Rural (SDR), *Situación del agua y de la agricultura de riego en Chihuahua 2020*, 2020.

In short, it seems that in Chihuahua, access to surface water is not as concentrated as it appeared to be and that use has not already reached the limit of the state's surface water resources. In contrast, access to groundwater, which has increased disproportionately, is mainly reserved for medium- and large- agricultural entrepreneurs. The reason is quite simple. Since there is very little public financing for creating or maintaining water infrastructure for farming, the only way to pay for it is with resources from private financial institutions. These funds involve high-interest rates, and thus, investments made with them must yield high returns.

This is only guaranteed by high-profitability crops, such as cotton, walnuts, chilli peppers and apples, cultivated on large extensions of land so that economies of scale drop costs down. In this way, only large companies and conglomerates of producers can survive and compete. In general, social sector producers, *ejidatarios* and small farmers, in general, cannot afford investments in well-drilling and water works. Of course, there are exceptions like the Baja Babícora colonies in the municipality of Namiquipa, where several small farmers of the same family grow maize by chipping in their lots of 25 hectares each to install centre-pivot irrigation systems, designed to work on at least 50 hectares.

D. The gap in access to government subsidies and support

In the context of structural adjustment and free trade programmes, the federal Ministry of Agriculture, Rural Development, Fisheries and Food (SAGARPA) modified its entire rural subsidy policy. The Ministry justifies these modifications, which began in 1983, with the argument that they protect Mexican farmers from the subsidies received by agriculture in the United States and Canada and the volumes they produce. This policy focused on direct money transfers through different programmes. For the purposes of this study, the following programmes will be examined: Procampo-Procampo Productivo-Producción para el Bienestar, Programa de Apoyos a la Comercialización, Programa Hidroagrícola and Programa Especial de Energía para el Campo.

1. Procampo-ProAgro Productivo-Producción para el Bienestar

The most ambitious programme was Procampo, direct money transfers open to all producers who had grown grains in the period immediately prior to the 1993-1994 registration. Procampo payments were allocated per hectare. In 2013, Procampo became ProAgro Productivo, which in the 2018-2024 administration mutated into Programa Producción para el Bienestar. According to the Centre for Sustainable Rural Development and Food Sovereignty (CEDRSSA) of the Mexican Congress, Procampo-ProAgro Productivo was the most important programme ever implemented for agriculture by the Federal Government in terms of coverage and budget. However, since its implementation and until 2018, it has gradually reduced its coverage, granting less support and benefiting fewer producers each year (CEDRSSA, 2020).

At the national level, the trend observed in Chihuahua is the same: declines in the number of beneficiaries, in the area covered by the programme and in the amount in pesos invested each year. Now, how was this programme distributed among the several types of producers? After dividing all producers into three large categories (self-consumption, transitional and commercial), Chihuahua occupied 22nd place in the proportion of self-consumption producers covered by ProAgro Productivo, which covered only 44% of those producers. On top of the list are Tabasco, Yucatán and Oaxaca, where coverage ranges between 94 and 96% of farmers that produce for self-consumption. In coverage of transitional producers, the state of Chihuahua ranks 15th from highest to lowest, with 31% of these producers covered by the programme. Chihuahua ranks 6th in ProAgro coverage of commercial producers, with 26% of them covered by the programme.

This indicates that, under all its names, self-consumption farmers and transitional farmers have been underrepresented, while commercial farmers were overrepresented. "Subsidios para la desigualdad", a famous study, noted that Procampo continues to exclude the majority of low-income farmers in Mexico who own less than 2 hectares of land. The reasons for this exclusion are unclear. Data from a household survey taken in low-income rural areas in 2004 tell that Procampo only serves 7% of those with less than 1 hectare, 19% of those with 1 to 2 hectares and 39% of those who own 2 to 5 hectares (Fox and Haight, 2010).

Procampo distribution is beginning to become less regressive, largely due to pressure from producer organisations and criticisms against the programme. In 2009, SAGARPA established a support limit of 100,000 pesos per individual per agricultural cycle. In 2014 Procampo changed its name to Proagro Productivo and established ceilings according to the size of the farm and the availability of water for irrigation. Thus, higher amounts were granted to farmers who produce for self-consumption (Robles Berlanga, 2017).

a) Producción para el bienestar: the black and white of a 4T programme.

In 2019, the government of Andrés Manuel López Obrador renamed ProAgro Productivo to Programa de Producción para el Bienestar. The newly-christened programme, now administrated by the Ministry of Well-Being, was meant to serve the poorest farmers. However, its budget was cut down, and the number of beneficiaries fell in the first year of implementation to increase gradually until 2022. The new Producción para el Bienestar programme has begun to have a redistributive effect on Chihuahua by targeting the poorest producers, with a limit of 20 hectares of rainfed land. In 2022, the vast majority of the beneficiaries (87%) were in the ecoregion most neglected by other programmes, the Sierra Tarahumara. In second place came the northwest and Babícora ecoregions, both of which have large numbers of rainfed farmers. The latter two places are predominantly irrigated regions in which the programme barely reaches 13% of farmers, even when adding those of Lomeríos del Sur y Llanos del Centro.

In short, although the several versions of programmes that give support to low-income self-consumption farmers (Procampo, ProAgro Productivo, Producción para el Bienestar) have served many beneficiaries, support has been biased towards a group of states: Tamaulipas, Sinaloa, Chihuahua and Sonora, in the north, and also Jalisco and Zacatecas. Until 2018, the programme as applied in Chihuahua reached more commercial or transitional producers than self-consumption farmers. Thanks to social pressure, important adjustments and reorientations were made to help the poorest producers. However, the programme's budget began to be cut down as of 2012. When the programme was transformed into Producción para el Bienestar, its budget grew once more, and redistributive actions were taken to support the poorest rainfed producers.

2. Commercialisation Programmes

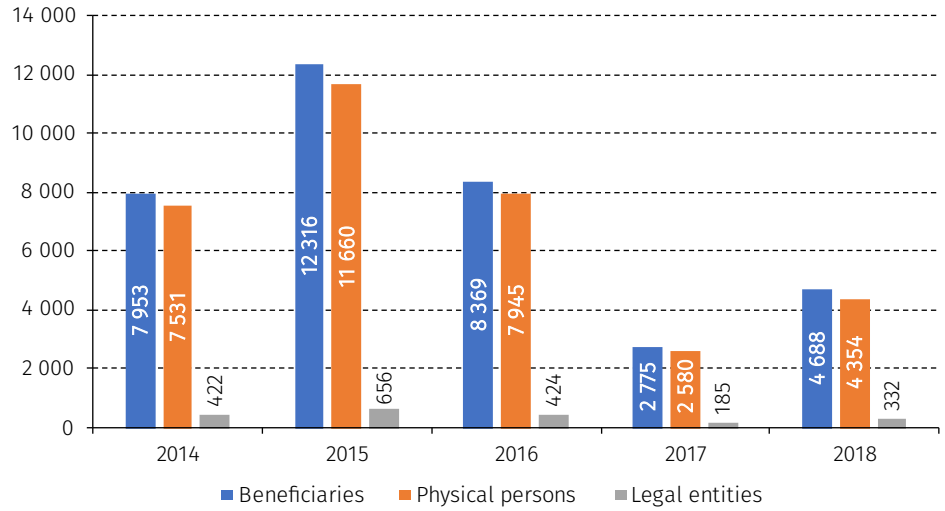
A programme to support commercialisation called Programa de Apoyos a la Comercialización was launched in 1991 to offset the elimination of guarantee prices under NAFTA. The main purpose of the programme was to improve the organisation and development of agriculture markets by providing incentives and services for the commercialisation of crops grown in Mexico (ASERCA, 2019). The programme operated with four components: (i) incentives and services for the commercialisation of crops, (ii) market risk management, (iii) trade promotion and integration of a network of commercial links, and (iv) promotion of exports of agricultural, aquaculture and fishery products. These functions were coordinated by an agency instituted for that purpose: Agency for Commercialization Services and the Development of Agricultural Markets (ASERCA).

The commercialisation incentives were intended to benefit producers and consumers by providing stability to the prices of agricultural products, fighting against intermediation and guaranteeing fair trade conditions. The incentives were distributed through a number of different schemes: contract farming, emerging incentives for commercialisation, complementary target income incentives and incentives for training and specialized technical assistance (ASERCA, 2018). In 2015, these incentives reached the peak number of beneficiaries in Chihuahua (individuals and corporations). From there on, the numbers began to fall but had a slight rebound in the last year of their existence (2019). In that year, the programme benefited 12,316 individuals, which were reduced by 62% in its last year of operations. The number of corporations that received benefits fell by 49%. As can be seen, corporations and associations were much less affected.

From 2014 to 2018, the programme supported the commercialisation of five crops: cotton, beans, maize, sorghum and wheat. Maize took 67% of the total budget for the five-year period. It was followed by cotton, with 13%; beans, 11%; wheat, 7%; and sorghum, 2%. Maize was the crop that received the most support. In Chihuahua, all maize is an irrigation crop. Water for yellow maize, grown by commercial farmers on farms of at least 50 hectares and destined mostly for fodder and industrial processing, comes from underground reservoirs. Mennonite settlers excel in this culture.

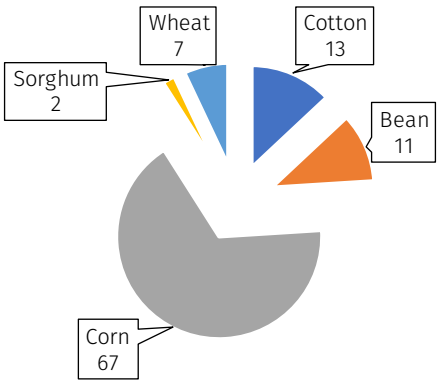
The second crop by the amount of support received was cotton, which is also irrigated from the underground. Cotton accounted for 13% of the budget. Most of this crop is cultivated in the large areas of the desert ecoregions, followed by Conchos. Mennonite settlers grow most of it. Beans, which are preferably watered with rain, only took up 11% of the total budget for the five years of this analysis. This reveals the enormous gap between highly commercial cultures, such as maize and cotton, and those of farmer producers, who, although already linked to the market, do not have the financing or the technical means that maize and cotton growers can count on.

Figure X.4
Chihuahua: beneficiaries of the commercialisation programme (individuals and corporations), 2014-2018
(Number of people)



Source: Prepared by the author, on the basis of Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA)/Agencia de Servicios a la Comercialización y Desarrollo de Mercados Agropecuarios (ASERCA), *Listado de beneficiarios del Programa de Apoyos a la Comercialización*, 2019 [online] https://www.gob.mx/aserca/documentos/listado-de-beneficiarios-del-programa-de-apoyos-a-la-comercializacion.

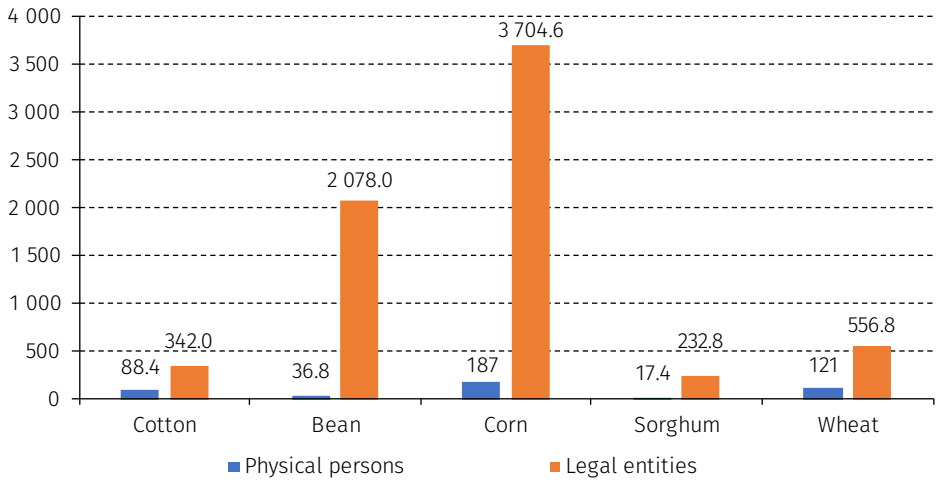
Figure X.5
Chihuahua: percentage distribution of commercialisation support for five crops, 2014-2018
(Percentages)



Source: Prepared by the author, on the basis of Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA)/Agencia de Servicios a la Comercialización y Desarrollo de Mercados Agropecuarios (ASERCA), *Listado de beneficiarios del Programa de Apoyos a la Comercialización*, 2019 [online] https://www.gob.mx/aserca/documentos/listado-de-beneficiarios-del-programa-de-apoyos-a-la-comercializacion.

In the five-year period under review, many more individuals than corporations received the benefits of the commercialisation programme. On average, 3,706 maize producers received support each year, followed by beans producers, with 2,078. Regarding the average number of corporations, maize producers stand out again. They are followed by wheat-growing firms, with 121, and cotton growers, with 88.4. This shows that more associations and corporations produce these three crops, while beans and sorghum are rainfed crops grown by individual farmers.

Figure X.6
Chihuahua: average number of individuals and corporations served by commercialisation programmes, 2018-2024
(Average)



Source: Prepared by the authors, on the basis of Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA)/Agencia de Servicios a la Comercialización y Desarrollo de Mercados Agropecuarios (ASERCA), *Listado de beneficiarios del Programa de Apoyos a la Comercialización*, 2019 [online] https://www.gob.mx/aserca/documentos/listado-de-beneficiarios-del-programa-de-apoyos-a-la-comercializacion.

The figure clearly shows the gap between the individuals that receive support according to each crop. Considering that a person could receive benefits for one or more years, this study calculates the average annual amount received by individuals and corporations. It also calculates the support they received as a proportion of the total. The individuals that received the highest amounts were cotton

growers, who got 136 549 pesos per year. Next came maize producers, with 92,807 pesos. Meanwhile, bean producers, generally rainfed farmers, received only 29,705 pesos, that is, four and a half times less than cotton producers and three times less than maize producers (see figure X.7).

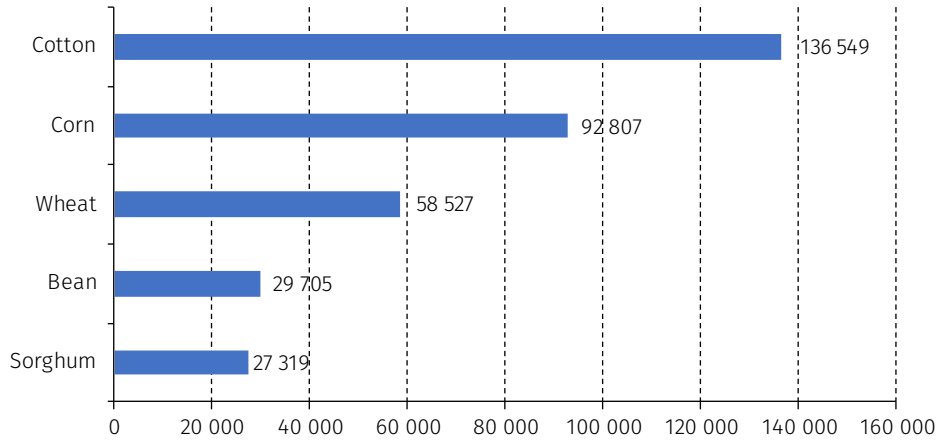
As a partial conclusion, it can be stated that, in Chihuahua, the commercialisation programme focuses on irrigated maize and cotton producers in the northwest, desert and Conchos regions. Although the total amount granted to bean producers is slightly less than that of cotton, the number of producers is much larger. During these years, Chihuahua followed the same uneven trend as the rest of the country.

In his study on farm subsidies, Robles Berlanga (2017) concludes that:

> "in 2010, the states of Sinaloa, Tamaulipas, Sonora, Chihuahua and Baja California received 73% of the total amount distributed through the programme. The situation has not changed since then. By the end of the first semester, Tamaulipas, Sinaloa, Sonora, Jalisco and Chihuahua concentrated 86.2% of commercialisation benefits in 2015 and in 2016. Those same states received 64.7% of the budget" (Robles Berlanga, 2017, p. 10).

Therefore, at both the state and national levels, the programme did not help to reduce the gaps between producers or between regions. Instead, it concentrated its benefits on medium or large companies and farmers. It was a regressive programme eliminated by the Andrés Manuel López Obrador administration.

Figure X.7
Chihuahua: average commercialisation benefits received by individuals, 2014-2018
(Current pesos)



Source: Prepared by the authors, on the basis of Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA)/Agencia de Servicios a la Comercialización y Desarrollo de Mercados Agropecuarios (ASERCA), *Listado de beneficiarios del Programa de Apoyos a la Comercialización*, 2019 [online] https://www.gob.mx/aserca/documentos/listado-de-beneficiarios-del-programa-de-apoyos-a-la-comercializacion.

3. The Irrigation Technologies Programme: efficient use of water

The irrigation technologies programme sought to increase efficiency in the use of water for agriculture by supporting the modernisation of irrigation. The target populations were individuals or corporations engaged in agriculture who were entitled to water use rights. The programme helps farmers to pay for the acquisition of modern irrigation systems. It began in 1996 within the Alianza para el Campo Programme. As of 2008, it became part of the Productive Assets Programme. Chihuahua is one of the states that received the most resources from this programme. During 2013-2016, it distributed 862,332,000 pesos among farmers in Chihuahua, of which 794,685,000 were assigned to individuals and 67,467,000 to corporations.[5]

[5] The four-year period from 2013 to 2016 is the timeframe during which the most comprehensive and reliable information could be obtained.

During the period under review, 1 436 individuals and 55 corporations were assisted. The former received an average of 506 320 pesos, while corporations received 1 354 423 pesos. However, the real gap lays in the distribution of resources between different ecoregions. The largest amounts went to the desert and Conchos regions, where there are more irrigation districts and units, both for surface and underground water. Both regions concentrated 83% of the resources spent by the programme (59% in the desert and 24% in Conchos). Far behind are the northwest region (7%), Llanos del Centro (4.45%), Lomeríos del Sur (3.65%), Babícora (1.36%) and Sierra Tarahumara, with a tiny percentage (0.17%). In other words, 4.1 out of every 5 pesos went to farmers in the irrigated areas of the desert and Conchos regions, while rainfed regions barely reached 50 cents. Still worse, the self-consumption farmers of the Sierra Tarahumara did not receive even one cent out of every 5 pesos.

As a partial conclusion, it can be said that, although it cannot be denied that the programme for irrigation technologies provides undeniable benefits that contribute to more efficient use of water, it does not promote better access to water for self-consumption rainfed producers. Besides, though this programme was designed to reduce the use of water to sustainable levels, producers do not use smaller volumes but rather tend to extend the surface they cultivate.

4. The Special Programme for Energy Used in Agriculture

The special programme for energy used in agriculture targets individuals and corporations who pump water for irrigation. The programme entitles them to quotas of electric power at a subsidized price to incentivize the primary processes of agricultural activities. The condition is that they are up to date with their obligations towards the Federal Electricity Commission (CFE) and the National Water Commission (Programa Especial de Energía para el Campo en materia de energía eléctrica de uso agrícola: reducción de tarifas eléctricas, 2022). In 2010, the study *Subsidios para la desigualdad: las políticas públicas del maíz en México a partir del libre comercio*, noted that:

> "the Electricity subsidy for agriculture, used mainly for pumping water for irrigation in the northern states, represented 10 672 million pesos in 2008, the most generously subsidized use of electricity in Mexico, priced at 28% of the cost (versus 90-100% for the industrial sector); in addition to its regressive allocation, which is a consequence of the distribution of hydrological resources in Mexico, the subsidy has contributed to a significant and unsustainable increase in the over-exploitation of water resources" (Muñoz and others, 2005; Guevara and others, 2007; Kessler and others, 2007, cited by Scott 2010).
>
> Seven years later, Robles Berlanga stated the following conclusions:
>
> "Based on the 2015 expenditures report issued by SAGARPA: (i) total subsidies amounted to 24 thousand 655 million pesos, more than what was disbursed by three other programs, Procampo, Apoyos a la Comercialización and Progan, in one year; (ii) the programme benefits only producers who use pumps for irrigation since in 2015 it granted benefits to 65,530 users, that is, only 1.7% of all productive units with agricultural activity and 10.4% of units with irrigation; (iii) the programme distributed 78.5% of its budget in six states: Chihuahua, Guanajuato, Jalisco, Coahuila, Michoacán and Durango; (iv) on average, the programme gave 376,000 pesos to each producer, a substantial subsidy for this type of production; (v) Mexico City, Sinaloa, Sonora, Tabasco, Tamaulipas, Tlaxcala, Veracruz, Yucatán and Zacatecas did not receive any benefits from this programme (2017)".

The same author says that the state of Chihuahua alone acceded to more than a third of the total support in 2015.

In 2020, the annual consumption of electrical energy for agricultural use in the state of Chihuahua was 4,175,587 megawatts/hour (MWH), which would have had a commercial value of 6,096,357,000 pesos, priced at the agricultural irrigation fee for medium voltage, whose cost is 78 cents per kilowatt/hour plus distribution and capacity charges, which raises it to 1.46 pesos per kilowatt/hour. However, producers only paid 53 cents per kilowatt/hour, thanks to the subsidized rate they get from the federal government through CFE. Thus, the total cost of electric power for agricultural use in Chihuahua in 2020 was 2,213,061,000 pesos. So the total annual subsidy that the government applied to the rate in Chihuahua during 2020 amounted to 3.88 billion pesos, which constitutes a "mega subsidy", much higher than others that the federal government grants to agriculture in the state. The average annual subsidy per well is 231,382 pesos (see table X.13).

These are the same beneficiaries that have been appearing throughout this study: commercial producers of walnuts, alfalfa and apples, a typical crop of the northwest region, in which Chihuahua is the national leader and which is mostly in the hands of large producers. The programme also helps growers of yellow maize, also one of the crops in which Chihuahua leads nation-wide and which, to a large extent, is grown by Mennonite farmers.

This programme grants great privileges to producers in the desert, northwest and Conchos ecoregions. They are granted an average subsidy of 231,382 pesos per well. As already mentioned, there are individuals and corporations that have up to 300 wells, which makes for a scandalous amount to be received as a subsidy by one single large farmer. The largest subsidy that the federal government grants to agriculture in Chihuahua is given to— optimistically assuming just one producer per well— 16,783 producers. However, the total number of rural production units in the whole state amounts to more than 86,000 —at best, the subsidy reaches only one in five production units, but these units are located in the three regions that already benefit the most from other subsidies.

Table X.13
Chihuahua: costs of electricity for agricultural irrigation, with and without subsidies. 2020
(Pesos)

Total annual consumption *(Megawatts/hour)*	Cost in pesos with RAMT fee: 1.46 pesos kw/h	Cost in pesos with subsidized fee (9N fee): 53 cents kw/h	Total subsidy in pesos *(savings for producers)*	Total of wells with 9n fee	Annual subsidy in pesos per well
4 175 587	6 096 357 000	2 213 061 000	3 883 295 910	16 783	231 382

Source: Prepared by the authors, on the basis of Ministry of Agriculture and Rural Development (SADER)/Servicio de Información Agroalimentaria y Pesquera, *Anuario estadístico de la producción agrícola 1980-2021*, 2019 [online] https://nube.siap.gob.mx/cierreagricola/ and Ministry of Rural Development (SDR), *Situación del agua y de la agricultura de riego en Chihuahua*, Dirección de Agronegocios, 2020.

In 2021, the whole budget of federal programmes related to agriculture amounted to 6,854,370,000 pesos, considering expenditures made by SAGARPA, LICONSA[6] and the Ministry of Well-Being. But only on energy subsidies for agriculture, 5,436,010,000 were spent. Almost four out of every five pesos (79%) that the federal government invests in Chihuahua go to no more than 16,783 producers. The remaining budget (1,418,010,000) is allocated between 70,000 rural production units. It is important to mention that this programme is four times larger than the total number of social programmes for rural populations.

This programme also poses a serious risk to the sustainability of water and soil. Robles Berlanga (2017) concludes his analysis of this programme by citing a study by the Mario Molina Centre that says that the growth rate of overexploited aquifers is not sustainable and that this situation is exacerbated by current electricity subsidies for water pumping. In addition, this subsidy benefits mainly the richest farmers since 53.7% of the total amount of the subsidy corresponded to decile X, with an average of 409,000 pesos per user, while decile I received on average only 113 pesos per year.

5. The rural finance gap

The structural adjustment programme contracted the State credit system for agriculture. Credit became unavailable for producers who were considered "unprofitable". But "unprofitable" producers were self-consumption rainfed farmers living in extremely arid zones, many of whom are indigenous. Under NAFTA, credit to the agriculture, forestry and fishing sectors fell from 6.5% of the total to 1.4% in the first year of the treaty. By 2007, rural credit reached 2.5% of the rural production units in the country (Quintana, 2013a).

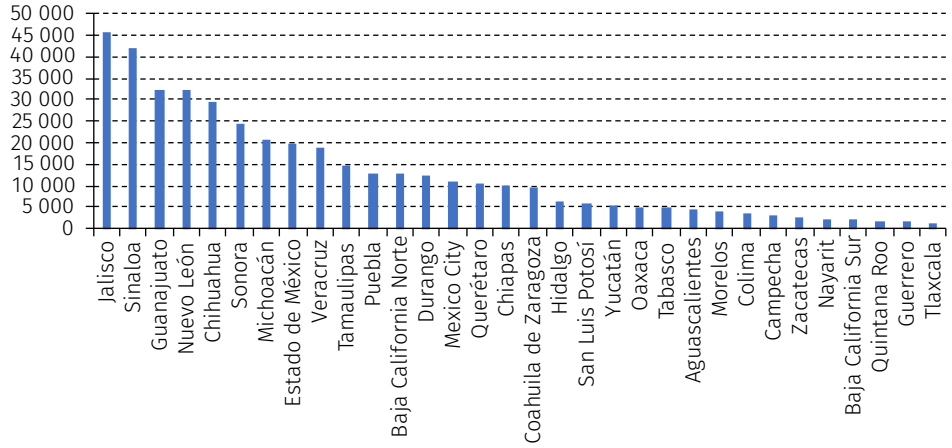
Though credit to the countryside recovered little by little, it clearly sought new clients —the more prosperous rural production units in the more developed states. For example, the Bank of Mexico's agriculture trusts (FIRA) had very significant growth. In 2005 FIRA had a total balance of 49,102 million pesos and a cash flow of 62,486 million pesos. By 2020, the total balance amounted to 232,956 million pesos and the flow to 416,297 million (FIRA, 2020). Chihuahua is among the states that receive the most funds from FIRA (see figure X.8). In 2020, Chihuahua ranked a national fifth in terms of funds received

[6] Predominantly state-owned enterprise.

from FIRA, with more than 7% of the total. Something similar happened with the resources of the National Fund for Development (FND).

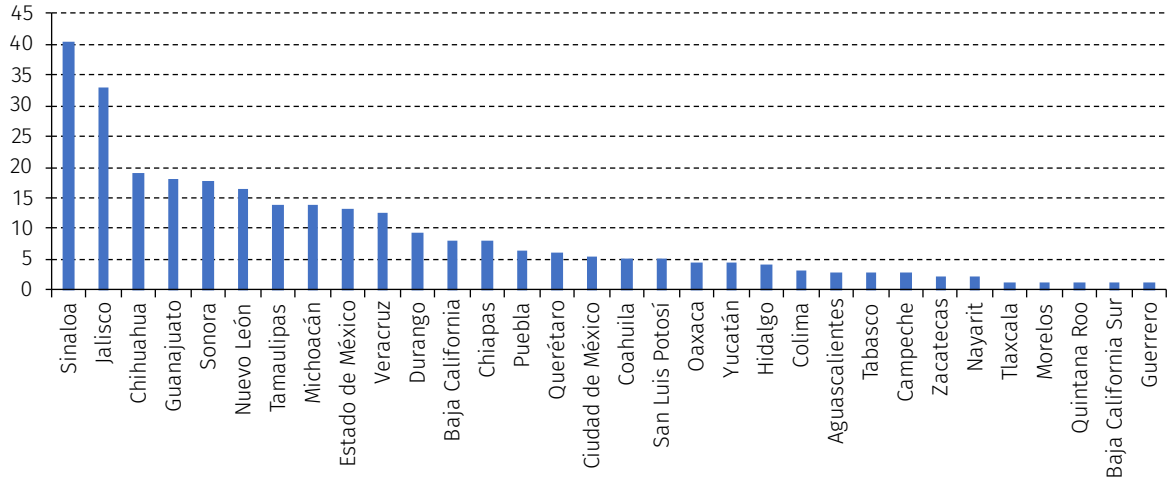
That year, only six states (Sinaloa, Jalisco, Chihuahua, Guanajuato, Sonora and Nuevo León) concentrated half of FND resources. Now, how has credit to farming evolved in the state of Chihuahua? According to FIRA data, farming has been a very dynamic sector: in the six years from 2014 to 2020, the total balance of the loan portfolio practically doubled. This portfolio includes loans to agriculture, cattle, forestry and fishing, among other rural activities. The loans increased from 7,464.5 million pesos in 2014 to 15,561.06 million in 2020. If only credit for agriculture in primary activities is taken into account (that is, without considering transformation activities), there was a very significant increase during the period: farming loans grew 65% in the period, while those for cattle raising increased by 78%.

Figure X.8
Mexico: total flow of financing by state, 2020
(Million pesos)



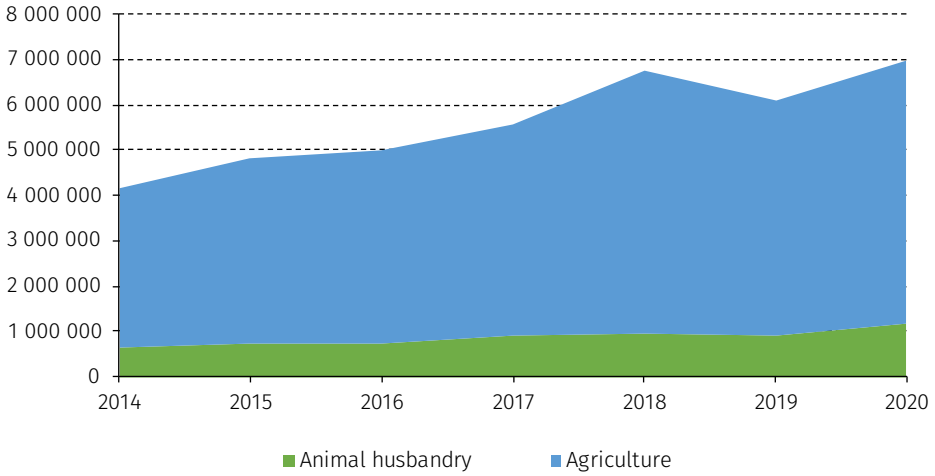
Source: Prepared by the authors, on the basis of Mexican Trust Fund for Agribusiness and Fisheries (FIRA), *Memorias de sostenibilidad*, 2020 [online] https://www.fira.gob.mx/Nd/MemoriasSostenibilidad2020.pdf?2020-ago.

Figure X.9
Mexico: total flow of financing by state, 2018
(Billion pesos)



Source: Prepared by the authors, on the basis of Centre for Studies for Sustainable Rural Development and Food Sovereignty (CEDRSSA), *La importancia de la banca de desarrollo en el sector agropecuario*, 2020 [online] http://www.cedrssa.gob.mx/post_la_importancia_de_la_-n-banca_de_desarrollo-n-_en_el_sector_agropecuario.htm.

Figure X.10
Chihuahua: amount of financing for primary activities in agriculture 2014-2020
(Million pesos)



Source: Prepared by the authors, on the basis of Mexican Trust Fund for Agribusiness and Fisheries (FIRA), *Memorias de sostenibilidad*, 2020 [online] https://www.fira.gob.mx/Nd/MemoriasSostenibilidad2020.pdf?2020-ago.

Credits were granted mainly to producers of yellow maize, cotton, apple and chilli. In the central-south zone of the state, they focused on milk production and the export of live cattle. The producers that benefited most were farmers in the irrigation regime of the northwest, desert and Conchos and Northwest regions, who are mostly engaged in commercial agriculture. Credit unions, such as the Unión de Crédito de los Agricultores de Cuauhtémoc, which has many Mennonite members, had a total portfolio of 7,004.5 million pesos as of June 30, 2022.

The conclusion of the analysis of access to rural finance in Chihuahua is not very different from that of the gap in government subsidies. Be it public or private funds, primary sector activities follow the same logic of regional concentration and privileged producers. All other gaps are determined by the exclusion of economic units that produce for self-consumption in the rainfed regime and the concentration of resources in irrigation production units in the northwest, desert and Conchos regions. In no way is rural finance used as a lever to narrow gaps.

6. The gender gap in the Chihuahuan countryside

In the Chihuahuan countryside, the gender gap in public policy begins with the information gap. Until very recently, the different programmes did not provide information disaggregated by gender. In addition, some of the sites that were visited do not give access to their register. The scant information available is recorded below.

- Access to land: in the various forms of ownership or possession of land, women get to participate in up to 30%, and that is only in the case of *"avecindadas"*. For other forms, they reach at most 27% (see table X.14).
- Access to water: According to the register of water concessions, women have only 2,087 out of 16,190 concession titles, which represents 12.89% of the total. Many of them have concessions under their names to allow the men in the family to hold more titles.
- Access to the energy subsidies of SADER (the special programme for energy for agricultural irrigation): the total number of individuals that benefit from the programme amounts to 10 834. Of these, 1,713 are women (16%), while 9,121 are men (84%) (REPDA data)

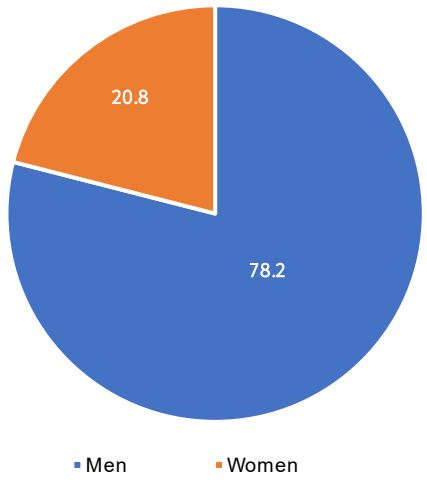
- Access to Procampo Productivo: in the last register published for this programme in the Spring-Summer cycle of 2013, for every four men, one woman received benefits (see figure X.11).
- Access as milk producers to the programme for social supplies: of 203 producers in the social sector registered in Chihuahua, 116 are women and 87 men. Of 54 Mennonite producers, seven are women, and 47 are men (Programa de Abasto Social Chihuahua 2022).

Table X.14
Chihuahua: women who have some form of access to land in Chihuahua
(Number of people and percentage)

Owners or possessors	Men	Percentages	Women	Percentages	Total
Ejidatarios	87 405	73	31 919	27	119 324
Settlers	8 899	76	2 811	24	11 710
Tenants	4 919	73	1 832	27	6 715
Residents (*avecindados*)	2 685	70	1 110	30	3 795
Total	103 946	73	36 672	27	141 618

Source: Prepared by the authors, on the basis of the National Agrarian Register (RAN), "Datos abiertos", 2022 [online] http://datos.ran.gob.mx/conjuntoDatosPublico.php.

Figure X.11
Chihuahua: women beneficiaries of Procampo, Spring-Summer 2013
(Percentages)



Source: Prepared by the authors, on the basis of Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA)/Agencia de Servicios a la Comercialización y Desarrollo de Mercados Agropecuarios (ASERCA), *Listado de beneficiarios del Programa de Apoyos a la Comercialización*, 2019 [online] https://www.gob.mx/aserca/documentos/listado-de-beneficiarios-del-programa-de-apoyos-a-la-comercializacion

The government of Andrés Manuel López Obrador has established clear guidelines to increase the participation of women as beneficiaries of agricultural programmes in Mexico. SADER operating rules established that at least 18% of the beneficiaries of the Programa Producción para el Bienestar in 2019 must be women. In 2020 and 2021, they had to be no less than 25%. These goals have been exceeded in all the years. In 2021, the programme gave women 3,374,999,996 pesos. In addition, the importance of women in farming gets more recognition, and several states grant benefits to women from municipalities with indigenous populations. The latest changes show a greater role for women after decades of privilege for men as beneficiaries of agricultural programs.

One final note on the financial gaps in Chihuahua. The expansion of agriculture in the state turns on two pivots: the extraction of groundwater and access to government subsidies. This is the only explanation for the apparent bonanza of the sector in a very dry state. Reference has already been made to the overexploitation of water, so some considerations about subsidies will now be addressed. Large investments are required to clear land, level ground, drill wells, and install irrigation systems. Some funds come from the financial resources of agricultural companies. However, this study found that large amounts of capital come from the enormous resources that the different federal government programmes provide to farmers.

Excepting Procampo and its variants and Producción para el Bienestar, which seeks to target poorer producers, all the other programmes were deeply regressive, benefiting producers on the irrigation regime in the more developed regions of the state. Energy subsidies, although not granted in cash but through discounts on electricity bills, mean a significant financial sacrifice for the federal government.

This positive discrimination in favour of commercial producers and developed regions is not an exception but rather follows the national trend already analysed by various papers, for example, the already mentioned "Subsidios para la desigualdad". Most measures have favoured large capital-intensive grain production, failing to reach small-scale producers. Benefits concentrate in the richest states, such as Tamaulipas, Sinaloa, Chihuahua and Sonora, reflecting the extent of their farmland assets. In addition, programs such as Procampo and Apoyos Diesel also contributed to the unequal distribution of GPA (Fox and Haight, 2010).

In the same vein, the conclusion of FUNDAR points out the problems that underlay the distribution of SAGARPA benefits mean that small producers do not receive the support they should. So a large portion of the benefits ends in the hands of large producers in the north of the country. The subsidies granted by SAGARPA tend to benefit the most capitalized producers in the country while penalising the least capitalized farmers and poor farmers. The rural subsidy policy, as it is currently designed and implemented, accentuates inequality and poverty in the Mexican countryside.

In addition, SAGARPA benefits concentrate in only five states that receive 40% of total resources: Sinaloa, Tamaulipas, Sonora, Jalisco and Chihuahua (González y Benumea, 2013). It is very important to insist that three very important social sectors are totally left out of all forms of subsidy and support: women, Indigenous Peoples and agricultural day labourers. The government of President López Obrador has done something to reverse this trend by reorienting rural policy towards the poorest producers and eliminating the commercialisation programme. However, the programme that provided aid to day labourers has disappeared, and the special energy programme, which benefits mainly well-to-do farmers, is still standing.

E. Conclusions and recommendations

The rural areas of Chihuahua display characteristics that promote capitalist modernization and integration into national and international markets. The regions with the best conditions for commercial agriculture, which lay on vast plains with plentiful water, concentrate on the production of cotton, almonds, alfalfa, yellow maize, apples, chilli peppers, cattle, fresh milk and cheese. However, public spending has been directed primarily towards 20,000 of more than 80,000 rural economic units, favouring enterprises, Mennonite settlers and large companies while neglecting the poorest regions and producers. This economic action of the State has become a major factor of social and economic inequality, which has led to high environmental and social costs, including overexploitation of aquifers, soil erosion and loss of biodiversity.

In addition, the cost of inputs, equipment and energy has increased, and the region is vulnerable to climate change due to intensive farming practices and water-intensive crops such as alfalfa, walnuts and yellow maize. The agricultural model is based on the expansion of meat and dairy consumption and supplying inputs to the processed food industry. This model leads to the subordination of rural areas to cities. Its social cost results in the exclusion of peripheral regions from development, leading to poverty and crime. It has also caused the displacement of communities, especially in the Sierra Tarahumara region. The region also faces other threats, such as the advancement of transnational mining companies,

which generate temporary economic benefits, but also deplete forests and surface and underground water and create cycles of poverty.

F. Public policy proposals

Public policies must care for people, communities and nature to promote a dignified life, with justice and participation for all and within social, geographic, ethnic and cultural diversity. Public policy must move gradually but solidly towards a new agroecological model —New South-South Rurality. To this end, it is urgent to resize the Chihuahuan agricultural sector and adapt it to the capacity permitted by the sustainability of natural resources. Cultivated areas must be reduced, crops changed, and decent living conditions must be the priority for the regions and social groups that today are excluded from the current model for agriculture. To do this, three sets of policies must be put in place:

- Policies that put an end to the depletion of natural resources and establish governability and governance and generate dynamics that dampen the effects of climate change: The objective is to guarantee governability by the Mexican State and the rule of law to protect natural resources: water, soil, forests, biodiversity. Governance must be built with the participation of civil society: producers, consumers, academics and researchers. New drilling of wells in overexploited aquifers should be forbidden. Illegal wells and intakes in all regions of the state should be closed. Governance requires the involvement and participation of different levels of government and civil society, especially rural and urban water users. Planning and reorganisation are needed, first of all, for the use of water, but also of natural resources such as forests, soil and biodiversity.
- Public policies for redistributive justice that make effective the rights of individuals and communities in the most disadvantaged regions and excluded social groups: The basic premise is that all levels of government must be willing to redistribute the expenditures they have made so far and redirect them to the areas and sectors that have been systematically marginalized or relegated from public policy. Policies should concentrate on eight programs to improve the situation in the Sierra Tarahumara and other marginalized areas of Mexico. The first programme should focus on food security and sustainable agriculture, while the second one ought to create a strategic food reserve and preserve the genetic diversity of native maize. The third programme should focus on creating decent jobs in tourism and agriculture, while the fourth programme should seek to improve security and justice for the people of the region. The fifth programme should aim at helping people who have been displaced from their homes, while the sixth one must seek to improve conditions for farmworkers. The seventh programme ought to promote gender equality, and the eighth one must focus on fostering a social economy for rural areas.
- Public policies that generate and add value to agricultural production. These policies should reserve as much value as possible for producers and communities, to improve the living conditions of the different regions: The premise is to make the agricultural sector environmentally and socially sustainable, changing the model that has been followed up to now in Chihuahua. This will require reducing water extraction and the areas that are being planted and irrigated. Such policies should also reduce the burden that animals place on pasture land, among other necessary measures. In the short run, such policies will immediately imply a reduction in rural employment. New jobs must be created as compensation. These jobs should retain more value in the region. Among other actions, this study proposes to replace water-consuming crops with more sustainable ones, such as grapevines, pomegranates and sorghum. Public policy should seek to promote the establishment of companies that use local raw materials and boost sustainable tourism and encourage eating habits based on healthy products produced locally. In addition, it should seek to take advantage of the remittances sent by Chihuahuans abroad to generate regional economies and finance diverse projects.

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Dr. Carlos Durán: Director in Agrodinámica Nacional, farmer.

Lic. Jesús Emiliano García: Director in Unión Campesina Democrática, Chihuahua.

Lic. Manuel Márquez: Director in Agrodinámica Nacional, farmer.

Sr. Fernando Ortega: Director Frente Democrático Campesino de Chihuahua, former mayor of Santa Isabel, former president of Sistema Producto Frijol, Chihuahua.

Farmers belonging to FDC-El Barzón.

Personal files

Víctor M. Quintana S.

Martín Solís Bustamante

Chapter XI
Access to clean cooking fuels and technologies in Guatemala and Honduras: assessment and recommendations

José Manuel Arroyo Sánchez
Pablo José Cabrera Porres
Mario Rubén Zelaya Aguilar

Introduction

The use of some form of energy is required in most modern economic activities. In addition, many of the utilities and technologies present in modern homes require energy: drinking water, lighting, power for electric and electronic devices (stoves, ovens, blenders, washing machines, dryers, hair dryers, TVs, Internet modems, etc.), heating, air conditioning, water heating, refrigeration and cooking, among others. Considering the importance of energy for the full development of people in modern society, the United Nations launched the Sustainable Energy for All (SEforALL) initiative in 2011, which aims to achieve universal access to sustainable energy by 2030. This objective was incorporated as one of the 17 Sustainable Development Goals (SDGs) in recognition of the central role of energy in development. SDG 7 sets out three targets related to universal energy access, renewable energy and energy efficiency (see table XI.1).

Table XI.1
Targets and indicators of SDG 7 of the 2030 Agenda for Sustainable Development

Sustainable Development Goal 7 Ensure access to affordable, reliable, sustainable and modern energy for all	

Targets	Indicators
7.1 Ensure universal access to affordable, reliable and modern energy services.	7.1.1 Proportion of population with access to electricity
	7.1.2 Proportion of population with primary reliance on clean fuels and technology
7.2 Increase substantially the share of renewable energy in the global energy mix	7.2.1 Renewable energy share in the total final energy consumption
7.3 Double the global rate of improvement in energy efficiency	7.3.1 Energy intensity measured in terms of primary energy and GDP

Source: Prepared by the authors, on the basis of United Nations, "Sustainable Development Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all", Sustainable Development Goals Knowledge Platform, 2019 [online] https://sustainabledevelopment.un.org/sdg7.

Target 1 of SDG 7 has significant implications for the eradication of poverty, whose analysis involves several dimensions: low income, educational deficits, lack of access to health services, lack of access to social security, household overcrowding and poor housing quality, lack of access to healthy food, social polarisation, inadequate or non-existent access to paved roads and lack of access to basic services at home (CONEVAL, 2019). Drinking water, sanitation services, electricity and cooking fuels are usually considered when analysing the poverty dimension of the lack of basic services at home (CONEVAL, 2019).

Electricity and cooking fuels, as basic services, are essential for the well-being of households, enabling lighting, food refrigeration, heating, water heating, environmental comfort, clothes washing and drying, communications and entertainment, among other services. Target 1 of SDG 7 proposes two indicators to monitor access to electricity and to clean cooking fuels and technologies. The first is the proportion of population with access to electricity; and the second is the proportion of population with primary reliance on clean fuels and technology.

The first indicator refers to electricity coverage, whereas the second points to access to clean fuels and technologies used for cooking, heating and water heating, such as electricity, piped natural gas, LP gas, biogas and alcohol-based fuels (e.g. ethanol) (United Nations, 2019). It is important to note that, in this study, when referring to access to clean fuels and technologies for cooking, this also includes fuels and technologies used for heating and water heating. The most significant problem associated with the need for more access to and use of clean fuels and technologies is indoor air pollution. According to WHO, air pollution caused by open fires and inefficient cookstoves that burn wood, charcoal, crop waste, dung and coal in poorly ventilated places is responsible for hundreds of thousands of deaths worldwide (WHO, 2018).

In 2019, the gross mortality rates attributed to household air pollution in Guatemala and Honduras (standardised by age) were 63 and 77 deaths per 100,000 inhabitants, respectively. This is in contrast with the levels achieved globally and in Latin America and the Caribbean for the same year, which were 52 and 15 deaths per 100,000 inhabitants, respectively (DESA, 2023). These figures are not surprising, considering that, in 2020, only 50% of the population of Guatemala and Honduras relied primarily on clean fuels and technologies (DESA, 2023). That is, the main cooking fuel in the case of both countries is fuelwood, usually burned in inefficient, traditional stoves that cause indoor air pollution.

In this context, the purpose of this study is to analyse access to clean cooking fuels and technologies in Guatemala and Honduras and to provide recommendations to promote access to and use of clean fuels and technologies, and to reduce the use of fuelwood. After Haiti, the two countries have the highest percentages of population using fuelwood as the main cooking fuel in Latin America and the Caribbean, which not only affects the health of families without access to clean fuels and technologies, but also has negative impacts on their education and productivity.

A. Access to electricity and clean fuels and technologies globally and in Latin America and the Caribbean

In 2020, global electricity coverage reached 90.5%. In developed countries electricity coverage reached 100% of the population. In North Africa, Asia and Latin America and the Caribbean, access to electricity was between 91% to 100%. The regions with the lowest electricity coverage in 2020 were Oceania (excluding Australia and New Zealand), where 68.5% of the population had access to electricity, and Sub-Saharan Africa, where electricity coverage reached 48.1% (see table XI.2).

Table XI.2
Regions of the world: population with access to electricity, 2010, 1015 and 2020
(Percentages)

Region	2010	2015	2020
World	83.2	86.6	90.5
Developed countries (except Europe)[a]	100.0	100.0	100.0
Europe	100.0	99.1	100.0
Sub-Saharan Africa	33.1	38.8	48.1
North Africa	87.2	89.1	91.2
West Asia	95.2	95.8	96.5
Central Asia	99.7	99.6	100.0
South Asia	74.3	85.3	96.0
East Asia	98.6	99.0	99.2
South-East Asia	88.5	92.8	95.5
Oceania (except Australia and New Zealand)	36.2	54.4	68.5
Latin America and the Caribbean	95.9	97.3	98.5

Source: Prepared by the authors, on the basis of Department of Economic and Social Affairs (DESA), "Statistics – SDG Indicators Database", 2023 [online database] https://unstats.un.org/sdgs/dataportal/database.
[a] United States of America, Canada, Cyprus, Israel, Japan, Australia and New Zealand.

Primary reliance on clean fuels and technologies has progressed less than electricity coverage. As shown in Table 3, in 2020, 69% of the world's population relied primarily on clean fuels and technologies. The proportion of the population with primary reliance on clean fuels and technologies in developed countries was 95%, whereas the share in North Africa and West Asia was over 90%.

In the case of East Asia, Central Asia and Latin America and the Caribbean, the share was between 80% and 90%, while in South Asia and South-East Asia the population share was between 60% and 70%. In 2020, the regions with the lowest primary reliance on clean fuels and technologies were Oceania (except Australia and New Zealand) and Sub-Saharan Africa, where the share reached 15% and 17% of their population, respectively. Though universal access to electricity is not without its challenges, the above statistics show that universal use of clean cooking fuels and technologies seems to be further away from being achieved.

Table XI.3
Regions of the world: population with primary reliance on clean fuels and technologies, 2010, 2015 and 2020
(Percentages)

Region	2010	2015	2020
World	57	63	69
Developed countries and regions[a]	>95	>95	>95
Developing regions	48	56	64
Sub-Saharan Africa	12	13	17
North Africa	87	89	91
West Asia	92	93	93
Central Asia	85	86	86
South Asia	35	46	62
East Asia	60	71	81
South-East Asia	45	59	69
Oceania (except Australia and New Zealand)	12	13	15
Latin America and the Caribbean	85	87	88

Source: Prepared by the authors, on the basis of Department of Economic and Social Affairs (DESA), "Statistics – SDG Indicators Database", 2023 [online database] https://unstats.un.org/sdgs/dataportal/database.
[a] United States of America, Canada, Europe, Cyprus, Israel, Japan, Australia and New Zealand.

Before continuing with the assessment of the countries under study, the next section will define what is meant by clean cooking fuels and technologies, as well as their contributions to health, education, gender equality, productivity and the environment.

B. Definition of cooking fuels and technologies that are considered clean

Any fuel or technology that meets the emissions standards set in the World Health Organization (WHO) guidelines for indoor air quality is considered "clean". This includes electricity, gas (natural and LP), ethanol, solar cookstoves and the highest-performing improved biomass cookstoves (DESA 2018). Improved biomass cookstoves are a technology with higher energy efficiency and lower emissions of air pollutants than traditional biomass cookstoves that use fuelwood, charcoal and agricultural waste (DESA, 2018).

Among the fuels that WHO does not recommend for cooking, due to their high levels of indoor air pollution, are kerosene, coal and dung, as well as biomass fuels such as fuelwood, charcoal or agricultural waste. Although improved biomass cookstoves can use the latter, their performance varies greatly depending on their design and materials. Also, most improved cookstoves do not meet WHO guidelines (DESA, 2018).

A large proportion of the population of Guatemala and Honduras (about 50%) still uses fuelwood for cooking (DESA, 2023). Therefore, improved biomass cookstoves could serve as a transition technology, considering that they are generally more efficient and produce fewer emissions than traditional cookstoves. In some cases, they even meet the emissions guidelines established by WHO.

C. Impact of access to clean cooking fuels and technologies on health, education, productivity and the environment

Using polluting and inefficient technologies based on fuelwood, coal and kerosene for cooking, lighting and thermal comfort severely affects the health of household members, especially women and children, due to indoor air pollution. Pollutants emitted indoors by inefficient cookstoves include toxic substances, such as particulate matter ($PM_{2.5}$ or smaller), black carbon, carbon monoxide, methane, polycyclic aromatic hydrocarbons (PAHs) and volatile organic compounds (WHO, 2016).

Further research is needed to know the specific mechanism by which indoor air pollutants produced by combustions affect people. Nonetheless, there is robust epidemiological evidence of the health risks derived from exposure to indoor air pollution and that those risks are strongly correlated with poverty, as a large proportion of poor households rely on the collection of solid biomass fuels (such as fuelwood) for cooking that are available in nature at no cost (WHO, 2016).

According to the World Health Organisation (WHO, 2016), indoor air pollution is the main environmental health risk factor globally and polluting cooking fuels and technologies cause 4.3 million premature deaths per year, which amounts to a quarter of all global deaths from stroke, 17% of adult deaths from lung cancer, 15% of deaths from ischaemic heart disease and a third of deaths from chronic obstructive pulmonary disease (COPD).

The use of modern energy services for cooking, water heating, thermal comfort and lighting may reduce exposure to indoor air pollutants and decrease fuelwood collection in households where it is used for cooking, thus contributing to improving the health of household members, particularly that of women and children, who are potentially more exposed to indoor air pollution.

Improved health of household members resulting from using clean fuels and technologies for their various energy services at home will contribute to a better quality of life and a healthy longevity. In addition, greater longevity can lead to "an increase in labour supply and in productivity because, firstly, workers are potentially available for a longer time period and, secondly, healthy workers may invest in and update their skills more since their return will occur over a longer working life" (O'Mahony and Samek, 2016).

Greater well-being of families (by decreasing illnesses and improving their health) is likely to translate into better cognitive development, learning, schooling and production of ideas, as opposed to poor health, which decreases people's analytical potential, especially during childhood, through the following channels (Madsen, 2012):

- Increased absenteeism and reduced likelihood of being enrolled in school in the case of sick and malnourished children.
- Reduced learning ability resulting from lack of concentration in the classroom, cognitive impairment, stigma and poor coping skills.
- Reduced capacity for lateral thinking, creativity and entrepreneurship.

As Goldin (2016) puts it, when referring to the recent history of humankind, improved health reflects in higher incomes because, on the one hand, adults may work longer and more intensively throughout their lives and, on the other hand, children may go to school longer and learn more. In this respect, using clean cooking fuels and technologies may result in improvements in education by freeing up time from activities such as cooking and fuelwood collection that could be used for education and training, particularly for women and children.

In the framework of human capital theory (i.e., the stock of the labour force's skills) (Goldin, 2016), people's productive capacities increase with the enhancement of their skills, which depend on aspects such as education, training and health. For example, better health contributes to higher returns to education and training, which, in turn, may increase productivity and economic growth.

In sum, the elimination of polluting fuels and technologies (e.g., fuelwood, coal and kerosene) contributes to the reduction of disease, which may translate into greater aptitude for learning and innovation and improvements in productivity. In addition, the use of clean cooking fuels and technologies enhances the benefits of education and training by allowing more time for such activities. This is the case for many women who spend long hours in the kitchen, hence cutting the time they spent cooking may help them engage in activities that contribute to their education or other productive work, supporting their empowerment.

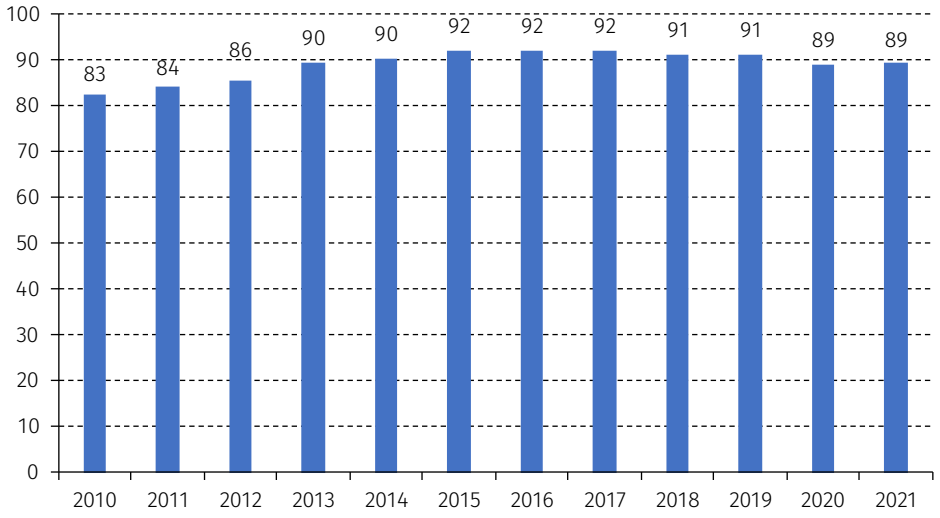
Although the promotion of clean fuels and technologies has focused on indoor air pollution, it is also important to note that the use of fuelwood and charcoal for cooking, water heating, heating and lighting has effects on the environment through the emission of greenhouse gases (GHG). As pointed out by Holdren and Smith (2000), although solid biomass fuels are renewable, their GHG emissions can be higher than those of fossil fuels, including kerosene or LP gas. Even if sustainably harvested, many cycles of biomass fuels are not GHG neutral due to their generation of products of incomplete combustion. Therefore, in order for biomass fuels to be GHG neutral, their efficiency of combustion should be near 100% (Holdren and Smith, 2000). In the case of solid biomass fuels such as fuelwood and charcoal, these may also impact the ecosystems where they are collected and contribute to deforestation (Holdren and Smith, 2000).

The use of clean cooking fuels and technologies that are also efficient and use renewable energy sources will help reduce indoor air pollution and GHG emissions. Unlike fossil fuels (natural or LP gas), electricity generated from renewable energy sources, biogas and technologies such as the most efficient improved cookstoves —that use sustainably harvested biomass— have the potential to reduce the carbon footprint of household energy services. In light of the definition of what are considered clean cooking fuels and technologies and their potential benefits, the level of access in Guatemala and Honduras will be assessed in the following section.

D. Access to clean cooking fuels and technologies in Guatemala

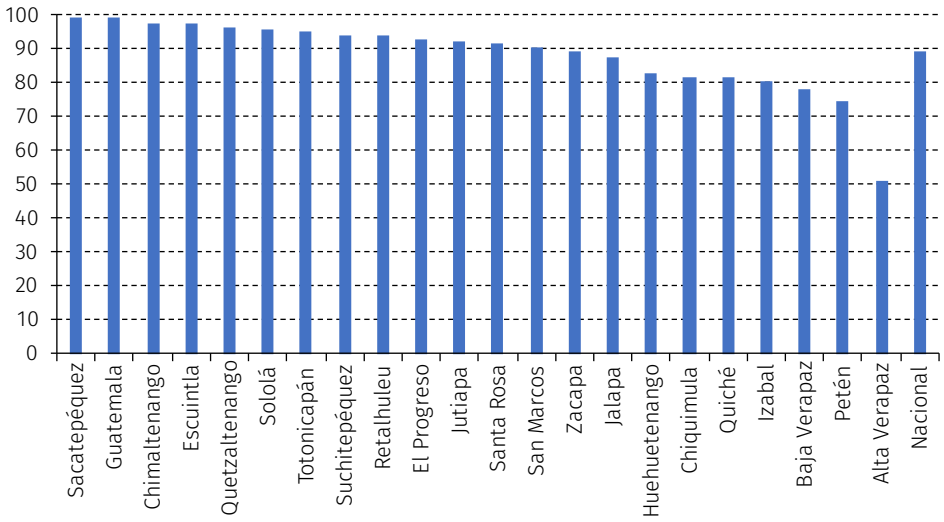
Electricity coverage in Guatemalan households increased from 82.7% to 89.3% between 2010 and 2021 (see figure XI.1). By 2021, this proportion was over 80% for the entire territory, except in Alta Verapaz, Baja Verapaz and Petén (see figure XI.2). Despite progress in electricity coverage, the energy balances of Guatemala show that fuelwood as a proportion of total primary energy balance has increased in recent years. In 2012, fuelwood represented 63.4% of primary energy sources, but by 2019 this proportion had increased to 72.5% (see figure XI.3). Therefore fuelwood is Guatemala's main primary energy source, mostly used in households, particularly for cooking.

Figure XI.1
Guatemala: electricity coverage index, 2010-2021
(Percentages)



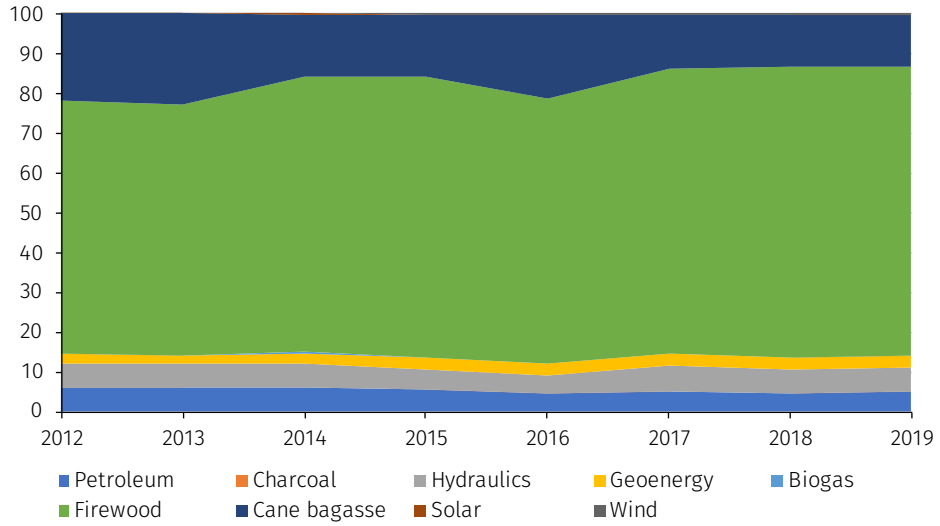
Source: Prepared by the authors, on the basis of Comisión Nacional de Energía Eléctrica (CNEE), *Informe Estadístico 2021, Gerencia de Planificación y Vigilancia de Mercados Eléctricos*, Guatemala, 2021 [en línea] https://www.cnee.gob.gt/xhtml/informacion/Docs/Informe%20estad%C3%ADstico%20GVP%20final%20(1).pdf y Ministry of Energy and Mines (MEM), *Índice de cobertura eléctrica 2021*, Gobierno de Guatemala, 2022 [online] https://mem.gob.gt/que-hacemos/areaenergetica/publicaciones/estadisticas/cobertura-electrica/.

Figure XI.2
Guatemala: departmental electricity coverage index, 2021
(Percentages)



Source: Prepared by the authors, on the basis of Ministry of Energy and Mines (MEM), *Índice de cobertura eléctrica 2021*, Gobierno de Guatemala, 2022 [online] https://mem.gob.gt/que-hacemos/areaenergetica/publicaciones/estadisticas/cobertura-electrica/,

Figure XI.3
Guatemala: primary energy sources, 2012-2019
(Percentages)



Source: Prepared by the authors, on the basis of the energy balances of the Ministry of Energy and Mines (MEM), *Índice de cobertura eléctrica 2021*, Guatemala, Gobierno de Guatemala, 2022 [online] https://mem.gob.gt/que-hacemos/area-energetica/publicaciones/estadisticas/cobertura-electrica/.

In the case of final energy consumption at the residential level in Guatemala, there are four fuels and technologies used:

(i) Fuelwood, a primary energy product mostly used without any transformation

(ii) Electricity, a secondary product, either imported or generated nationally from primary sources (for instance, hydroelectricity, sugarcane bagasse, wind and solar energy)

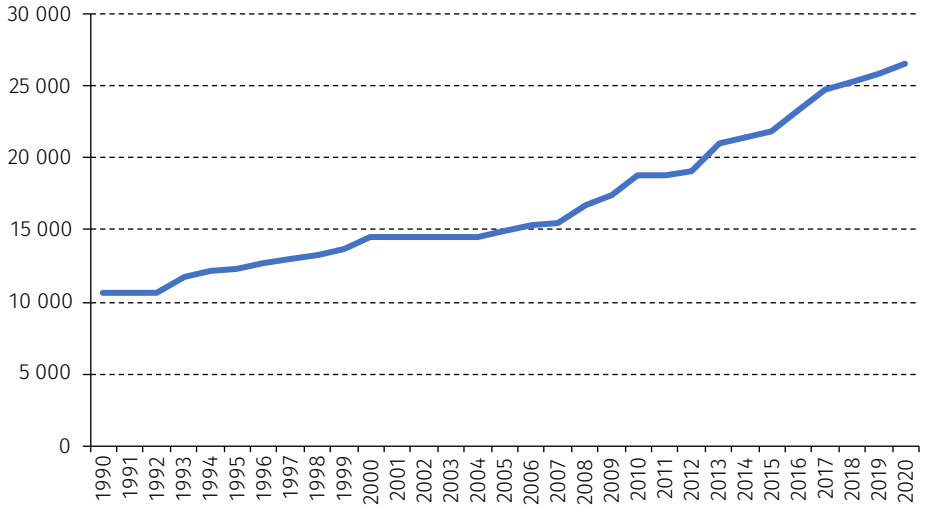
(iii) LP gas, a secondary product, entirely imported

(iv) Kerosene, a secondary product, entirely imported

In 2019, Guatemala's final energy consumption at the residential level consisted of: electricity 4.28%, LP gas 4.78%, kerosene 0.05% and fuelwood 90.89% (MEM, 2020). MEM (2019b) reports that in 2016, 272,139 households had no access to electricity. Instead, the lighting needs were covered through candles and kerosene lamps. For other household needs fuelwood was used: 27.51% for heating, 2.10% for water heating and 70.39% for cooking.

Though the country's energy policies have prioritised increasing electrification, fuelwood will remain the most important energy source for Guatemalan households in the short and medium terms, particularly in rural communities. According to UN estimates (DESA, 2023), fuelwood consumption in Guatemalan households went from 10.7 million cubic meters in 1990 to 26.6 million cubic meters in 2020 (see figure XI.4), confirming that household fuelwood consumption has increased.

Figure XI.4
Guatemala: household fuelwood consumption, 1990-2020
(Thousand cubic meters)



Source: Prepared by the authors, on the basis of Department of Economic and Social Affairs (DESA), "Statistics – SDG Indicators Database", 2023 [online database] https://unstats.un.org/sdgs/dataportal/database.
Note: Figures from the years 1990 to 1999, 2006 to 2012 and 2017 to 2020 are estimates.

The 2014 National Survey of Living Conditions (ENCOVI), Guatemala's most recent household survey, provides insight into other aspects of households' fuelwood and energy consumption. Data from the 2014 ENCOVI also allows for the possibility of analyses at the departmental level and the identification of the regions with the highest levels of energy poverty. According to the 2014 ENCOVI (see table XI.4), 85.45% of Guatemalan households used electricity. However, eight departments were below this national average: Huehuetenango (84.09%), Quiché (80.13%), Baja Verapaz (77.30%), Jalapa (76.38%), Izabal (75.89%), Chiquimula (73.92%), Petén (65.76%) and Alta Verapaz (40.88%).

Table XI.4
Guatemala: household access to electricity and fuelwood use for cooking, 2014
(Percentages)

Department	Electricity	Fuelwood
Guatemala	96.28	31.51
El Progreso	87.82	70.31
Sacatepéquez	94.46	60.73
Chimaltenango	92.66	81.32
Escuintla	91.35	66.58
Santa Rosa	88.11	87.59
Sololá	91.68	92.22
Totonicapán	91.63	93.20
Quetzaltenango	94.56	62.35
Suchitepéquez	91.72	84.20
Retalhuleu	89.70	84.75
San Marcos	**89.02**	**85.76**
Huehuetenango	**84.09**	**85.79**
Quiché	**80.13**	**88.47**
Baja Verapaz	**77.30**	**90.92**
Alta Verapaz	**40.88**	**95.97**

Department	Electricity	Fuelwood
Petén	65.76	87.07
Izabal	75.89	63.92
Zacapa	89.99	75.16
Chiquimula	73.92	77.06
Jalapa	76.38	85.69
Jutiapa	86.95	80.98
National	85.45	70.10

Source: Prepared by the authors, on the basis of Instituto Nacional de Estadística (INE) (2014), *Encuesta Nacional de Condiciones de Vida (ENCOVI) 2014*, t. I, Guatemala, 2016 [online] https://www.ine.gob.gt/sistema/uploads/2016/02/03/bwc7f6t7asbei4wmuexonr0oscpshkyb.pdf.

The 2014 ENCOVI reported that 70.10% of Guatemalan households used fuelwood for cooking. However, 17 out of 22 Guatemalan departments showed levels above the national average, in four departments the proportion stood above 90% of households (Alta Verapaz, Totonicapán, Sololá and Baja Verapaz), and in 10 departments the proportion was over 80% of households. The same survey (see table XI.5) also reveals that 50.3% of urban households and 94% of rural households used fuelwood for cooking. Moreover, 50.3% of non-poor households, 87.5% of poor households and 98.6% of households in extreme poverty used fuelwood for cooking.

Purchases of fuelwood for cooking occurred in 47.2% of Guatemalan households. However, the practice was more common in urban areas, where 65.2% of households purchased fuelwood, while roughly 50% of households in rural areas collected or cut the wood used for cooking. Furthermore, 60.5% of non-poor households and 45.9% of poor households purchased fuelwood for cooking, whereas 56.3% of households in extreme poverty collected or cut the wood used for cooking. These results show that, in 2014, nearly 50% of Guatemalan households that used fuelwood for cooking purchased it. For a large proportion of non-poor, poor and extremely poor households, the purchase of fuelwood represents a considerable expense and a high percentage of their energy expenditures.

Table XI.5
Guatemala: use of fuelwood for cooking and method for obtaining fuelwood at the household level, 2014
(Percentages)

Area and poverty condition	Used fuelwood for cooking	Method for obtaining fuelwood	
		Purchased	Collected/cut
Total	70.1	47.2	38.7
Area			
Urban	50.3	65.2	21.4
Rural	93.8	35.7	49.7
Poverty			
Extreme poverty	98.6	28	56.3
Poverty (not extreme)	87.5	45.9	38.8
No poverty	50.3	60.5	27.7

Source: Prepared by the authors, on the basis of Instituto Nacional de Estadística (INE) (2014), *Encuesta Nacional de Condiciones de Vida (ENCOVI) 2014*, t. I, Guatemala, 2016 [online] https://www.ine.gob.gt/sistema/uploads/2016/02/03/bwc7f6t7asbei4wmuexonr0oscpshkyb.pdf.

According to the 2014 ENCOVI, for the four lowest income deciles in Guatemala, fuelwood purchases accounted for more than 50% of their energy expenditures, whereas for all income deciles, they accounted for about 40% of their energy expenditures. Fuelwood expenses for the first six income deciles were above 2% of their total income, the average for all income deciles. For the first and second income deciles, fuelwood purchases represented 15.9% and 9% of their total income, respectively (see table XI.6).

Table XI.6
Guatemala: fuelwood expenditures as a share of energy expenditures and total income, by income decile, 2014
(Percentages)

Income decile	Fuelwood expenditures as percentage of energy expenditures	Fuelwood expenditures as percentage of total income
1	72.7	15.9
2	68.5	9.0
3	63.6	6.9
4	54.1	4.6
5	47.5	3.8
6	39.9	2.7
7	34.2	2.0
8	23.8	1.1
9	14.1	0.5
10	6.5	0.1
Average	39.90	2.0

Source: Prepared by the authors, on the basis of Instituto Nacional de Estadística (INE), *Encuesta Nacional de Condiciones de Vida (ENCOVI) 2014*, t. I, Guatemala, 2016 [online] https://www.ine.gob.gt/sistema/uploads/2016/02/03/bwc7f6t7asbei4wmuexonr0oscpshkyb.pdf.

The 2018 XII National Population and VII Housing Census (2018 Census) shows that 44.8% of households used propane (a type of LP gas) and electricity as their main sources of energy for cooking (see table XI.7). Of these households, 97.5% relied on propane. The proportion of households using propane and electricity for cooking was 66.4% in urban areas, but only 15.4% in rural areas. Although at the national level almost 45% of households used propane and electricity as their main energy source for cooking, in 15 out of the 22 departments of Guatemala this proportion was lower.

Table XI.7
Guatemala: households using propane and electricity as main energy sources for cooking, 2018
(Percentages)

Department	Total	Urban	Rural
Guatemala	88.9	92.5	46.5
El Progreso	53.7	71.5	33.2
Sacatepéquez	68.4	70.6	51.2
Chimaltenango	34.2	51.8	11.1
Escuintla	63.0	75.0	43.6
Santa Rosa	41.5	60.2	25.0
Sololá	15.2	21.4	5.1
Totonicapán	14.2	22.3	4.5
Quetzaltenango	46.2	64.6	14.0
Suchitepéquez	36.3	51.2	21.5
Retalhuleu	35.5	45.0	22.0
San Marcos	20.4	48.1	9.6
Huehuetenango	18.3	45.8	5.8
Quiché	10.5	24.2	3.4
Baja Verapaz	24.7	44.4	9.9
Alta Verapaz	12.0	28.7	3.5
Petén	27.8	51.4	9.5
Izabal	48.3	72.2	28.6
Zacapa	47.9	66.2	31.7
Chiquimula	31.0	57.3	14.0
Jalapa	28.2	37.5	12.3
Jutiapa	36.9	48.6	24.6
National	44.8	66.4	15.4

Source: Prepared by the authors, on the basis of Instituto Nacional de Estadística (INE), *XII Censo Nacional de Población y VII de Vivienda, Informe de resultados 2018*, Guatemala, 2019 [online] https://www.ine.gob.gt/sistema/uploads/2021/11/19/202111192139096rGNQ5SfAlepmPGfYTovW9MF6X2turyT.pdf.

The 2018 Census also reveals that 54.5% of Guatemalan households used fuelwood and charcoal as their main cooking fuel (see table XI.8), of which 99.5% used fuelwood and only 0.05% used charcoal. In urban areas, 32.7% of households used fuelwood and charcoal as their main energy source for cooking, while in rural areas the proportion was 84%. At the national level, almost 55% of households used fuelwood and charcoal as their main energy source for cooking; however, in 15 of the 22 departments this proportion was higher and in nine departments it exceeded 70% of all households.

Table XI.8
Guatemala: households using fuelwood and charcoal as main energy sources for cooking, 2018
(Percentages)

Department	Total	Urban	Rural
Guatemala	10.4	6.8	53.0
El Progreso	45.2	27.0	65.9
Sacatepéquez	31.1	29.0	48.4
Chimaltenango	65.4	47.8	88.6
Escuintla	35.4	23.3	54.8
Santa Rosa	57.3	38.5	73.9
Sololá	84.2	77.9	94.6
Totonicapán	85.6	77.4	95.4
Quetzaltenango	53.3	34.8	85.5
Suchitepéquez	62.5	47.4	77.5
Retalhuleu	63.4	53.8	76.8
San Marcos	79.1	51.1	90.0
Huehuetenango	81.4	53.6	93.9
Quiché	89.2	75.2	96.4
Baja Verapaz	74.5	54.2	89.7
Alta Verapaz	87.7	70.8	96.3
Petén	71.5	47.6	90.1
Izabal	50.0	25.6	70.0
Zacapa	50.5	32.0	67.0
Chiquimula	68.0	41.8	85.0
Jalapa	71.2	61.9	87.2
Jutiapa	61.9	50.0	74.5
National	54.5	32.7	84.0

Source: Prepared by the authors, on the basis of Instituto Nacional de Estadística (INE), *XII Censo Nacional de Población y VII de Vivienda, Informe de resultados 2018*, Guatemala, 2019 [online] https://www.ine.gob.gt/sistema/uploads/2021/11/19/202111192139096rGNQ5SfAlepmPGfYTovW9MF6X2turyT.pdf.

The 2014 ENCOVI recorded that 70.1% of households used fuelwood for cooking and the 2018 Census indicates that 54.5% used fuelwood and charcoal as their main cooking fuels. These figures could be indicative of a decrease in the number of households using fuelwood as their main energy source for cooking, given that the proportion of households that used fuelwood was 57.3% in the 2002 XI National Population and VI Housing Census.

According to United Nations estimates (DESA, 2023), Guatemala's proportion of population with primary reliance on clean fuels and technology rose from 41% in 2000 to 43% in 2015 and then to 50% in 2020. Nonetheless, the proportion in Guatemala was below the world average (69%), the developing regions average (64%) and the Latin American and Caribbean average (88%). Therefore, despite the increased use of clean fuels and technologies, there is still a large number of households that use fuelwood as their main energy source for cooking, as evidenced by its sustained consumption growth.

Although electricity coverage in Guatemala was estimated at 97% of households in 2020 (DESA, 2023) and official data indicated that 89.26% of households had access to electricity in 2021 (MEM, 2022), these levels are still lower than the average for Latin America and the Caribbean (98.5%) in 2021. Even so, it is important to distinguish between the availability of electricity and its actual use. In this regard, there is evidence of electricity underconsumption by households in Guatemala: in 2019, only 4.28% of final energy consumption at the residential level corresponded to electricity, and, according to information from the 2018 Census, 48% of households had a refrigerator and 20% had a washing machine.

Though the absence of a refrigerator or a washing machine in Guatemalan households may be the result of a lack of income to purchase these appliances, the fact is that their mere absence implies a lower electricity demand. According to information from the 2018 Census, LP gas was the main energy source for cooking in 43.7% of households. However, in 2019, LP gas represented just 4.78% of energy consumption at the residential level, which may indicate that fuelwood is still used as a secondary energy source for cooking, even in households with primary reliance on LP gas.

Generally speaking, although progress has been made in the adoption of clean cooking fuels and technologies, around 1.6 million Guatemalan households (50% of the total) still use fuelwood as their main cooking fuel. Even households with primary reliance on other fuels (mostly LP gas) use fuelwood as a second option for cooking, as the high and growing consumption of fuelwood at the residential level in Guatemala seems to indicate.

E. Access to clean cooking fuels and technologies in Honduras

Electricity access in Honduras reached 87.19% of households in 2020 (see table XI.9). Sixteen out of eighteen departments presented an electricity access index (IAE, its Spanish acronym) over 70%, while twelve of the eighteen departments had an index above 80%. The exceptions were the departments of El Paraíso (68.47%) and Gracias a Dios (25.02%). At the municipal level, 78.52% of Honduran municipalities had an electricity access index above 70%, while 64.09% had an index above 80%. However, in 21.49% of the municipalities, the index was below 70% (see table XI.10).

Table XI.9
Honduras: electricity access index (IAE) by department, 2020
(Percentages)

Department	IAE
Atlántida	90.91
Choluteca	77.36
Colón	84.35
Comayagua	86.54
Copán	88.22
Cortés	97.50
El Paraíso	68.47
Francisco Morazán	92.95
Gracias a Dios	25.02
Intibucá	77.19
Islas de la Bahía	96.32
La Paz	73.33
Lempira	82.04
Ocotepeque	92.30
Olancho	79.44
Santa Bárbara	89.04
Valle	87.75
Yoro	84.50
National	87.19

Source: Prepared by the authors, on the basis of Secretaría de Energía (SEN), *Informe de cobertura y acceso a la electricidad en Honduras: un camino para el acceso universal a la energía. Datos a diciembre del 2020*, Dirección General de Electricidad y Mercados-Secretaría de Estado en el Despacho de Energía, Gobierno de la República de Honduras, 2021.

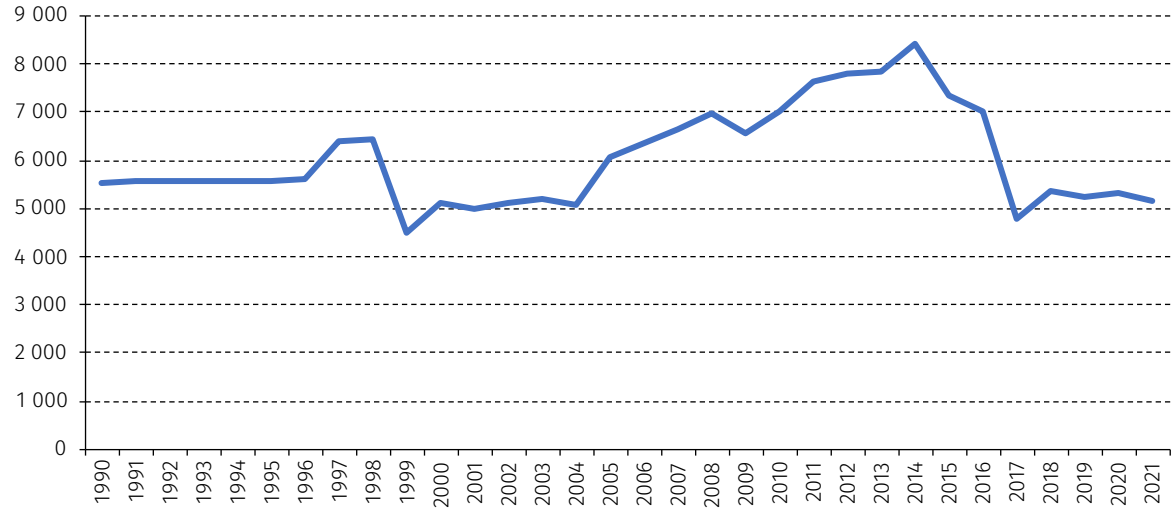
Table XI.10
Honduras: number of municipalities according to their electricity access index (IAE), 2020
(Numbers and percentages)

Access		Municipalities	
More than	Up to	Number	Percentage
Without access		2	0.67
0	10	2	0.67
10	20	1	0.34
20	30	0	0.00
30	40	3	1.01
40	50	10	3.36
50	60	23	7.72
60	70	23	7.72
70	80	43	14.43
80	90	96	32.21
90	100	95	31.88

Source: Prepared by the authors, on the basis of Secretaría de Energía (SEN), *Informe de cobertura y acceso a la electricidad en Honduras: un camino para el acceso universal a la energía. Datos a diciembre del 2020*, Dirección General de Electricidad y Mercados-Secretaría de Estado en el Despacho de Energía, Gobierno de la República de Honduras, 2021.

The energy balance of Honduras in 2021 shows that fuelwood accounted for 56% of the primary energy supply, well above hydro (12%), geothermal (11%), sugarcane bagasse (8%), biofuels (7%), solar photovoltaic (4%) and wind (2%) (Salgado and others, 2022). Fuelwood represented 35% of total final energy consumption, whereas diesel accounted for 21%, gasoline for 19%, electricity for 15%, LP gas for 5%, fuel oil for 2%, kerosene for 2% and sugarcane bagasse for 1%.

Figure XI.5
Honduras: household fuelwood consumption, 1990-2021
(Thousand cubic meters)

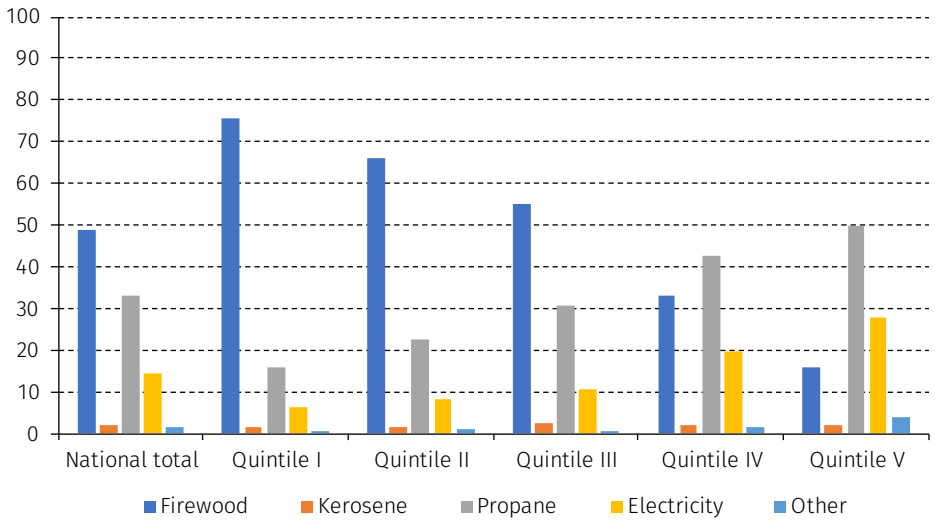


Source: Prepared by the authors, on the basis of Department of Economic and Social Affairs (DESA), Statistics – SDG Indicators Database, 2023 [online database] https://unstats.un.org/sdgs/dataportal/database.
Note: Estimates from 1990 to 2014.

Although a large part of the population has access to electricity in Honduras, it only accounted for 15% of the residential sector's energy consumption, while LP gas accounted for 5%, kerosene for 1% and fuelwood for 79% (Salgado and others, 2022). It has been identified that fuelwood is mostly consumed in rural households for cooking, due to the lack of access to LP gas or electricity, and because it is a resource that can be collected at no cost or purchased at a relatively low price. Furthermore, it was identified that peri-urban and, to a lesser extent, urban households also use fuelwood for cooking, despite having access to LP gas and electricity (Salgado and others, 2022).

Nevertheless, Honduras has managed to reduce fuelwood consumption at the residential level. In 1990, fuelwood consumption in Honduran households was estimated at 5.5 million cubic meters and reached a peak in 2014, when consumption was estimated at 8.4 million cubic meters. After 2014, consumption declined, reaching 5.2 million cubic meters in 2021. Despite the decline in fuelwood consumption at the residential level, according to the 2021 Permanent Multipurpose Household Survey (EPHPM), 49% of Honduran households used fuelwood as their main cooking fuel, whereas 33% used propane (a type of LP gas), 15% electricity and 2% kerosene (see figure XI.6). However, for the lowest income quintiles, the proportion of households that used fuelwood as their main cooking fuel was 55% for quintile 3, 65.9% for quintile 2 and 75.8% for quintile 1.

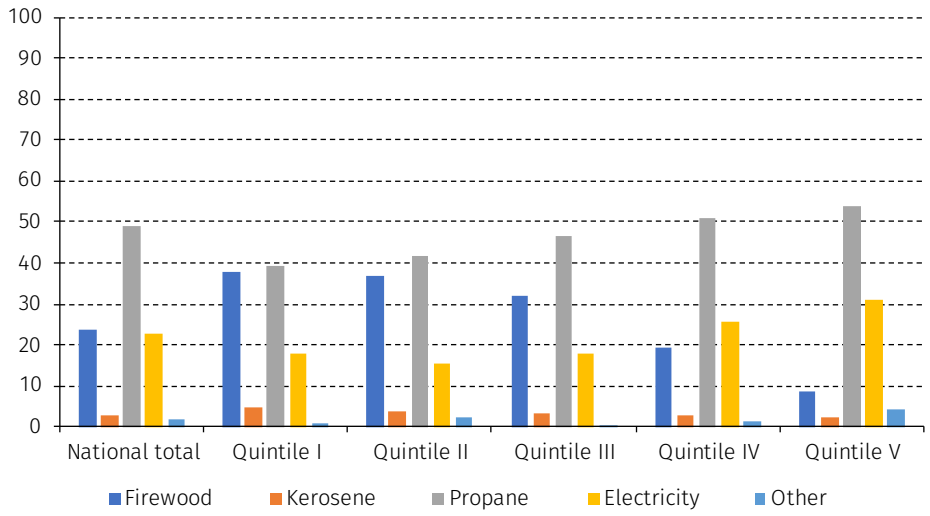
Figure XI.6
Honduras: main cooking fuel in households, total and by income quintile, 2021
(Percentages)



Source: Prepared by the authors, on the basis of Instituto Nacional de Estadística Honduras (INE), "EPHPM, LXXII Encuesta Permanente de Hogares de Propósitos Múltiples", Honduras, 2021 [online] https://www.ine.gob.hn/V3/imag-doc/2021/11/INE-EPHPM-2021.pdf.

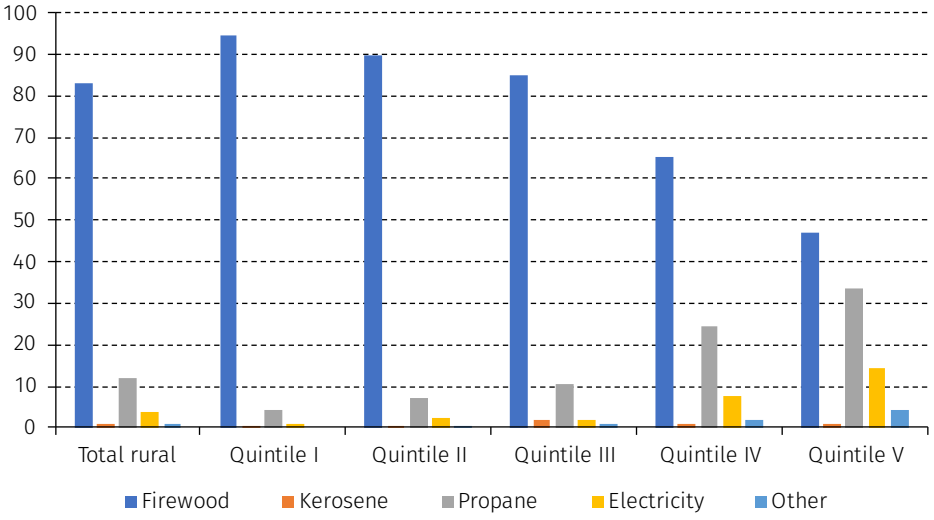
In the case of urban areas (see figure XI.7), most households used propane as their main cooking fuel (49%) in 2021, followed by electricity and fuelwood (23% each) and kerosene (3%). However, a higher proportion of urban households in income quintiles 3 (32.1%), 2 (37%) and 1 (37.6%) used fuelwood as their main cooking fuel. In rural areas (see figure XI.8), 83% of households used fuelwood as their main cooking fuel in 2021, while 12% of households used propane, 4% used electricity and 1% used kerosene. The proportion of rural households that used fuelwood as their main cooking fuel was 84.7% for income quintile 3, 90% for income quintile 2 and 94.5% for income quintile 1.

Figure XI.7
Honduras: main cooking fuel in urban households, total and by income quintile, 2021
(Percentages)



Source: Prepared by the authors, on the basis of Instituto Nacional de Estadística Honduras (INE), "EPHPM, LXXII Encuesta Permanente de Hogares de Propósitos Múltiples", Honduras, 2021 [online] https://www.ine.gob.hn/V3/imag-doc/2021/11/INE-EPHPM-2021.pdf.

Figure XI.8
Honduras: main cooking fuel in rural households, total and by income quintile, 2021
(Percentages)



Source: Prepared by the authors, on the basis of Instituto Nacional de Estadística Honduras (INE), "EPHPM, LXXII Encuesta Permanente de Hogares de Propósitos Múltiples", Honduras, 2021 [online] https://www.ine.gob.hn/V3/imag-doc/2021/11/INE-EPHPM-2021.pdf.

According to United Nations estimates (DESA, 2023), only 31% of the Honduran population had primary reliance on clean fuels and technologies in 2000. By 2020, the proportion had risen to 48%. This result reflects the reduction of household fuelwood consumption observed since 2014 (see figure XI.5).

Although the level of access to electricity in Honduras was estimated by the United Nations at 93.2% of the population for 2020 (DESA, 2023) and reported by the Government of Honduras as 87.2% for the same year (SEN, 2021), it is very likely that there is an underconsumption of electricity in most rural households and in a large part of the lowest income urban households, considering that fuelwood

represented 79% of final energy consumption at the residential level (Salgado and others, 2022). However, progress has been made in providing access to clean fuels and technologies in urban areas, where propane and electricity were the main cooking fuels in 72% of households.

Honduras' progress in access to clean fuels and technologies is an important achievement, although fuelwood is still the main cooking fuel for almost half of Honduran households. This proportion is even higher among households with the lowest income levels, reaching more than 75% for households in the lowest income quintiles. In rural areas, that proportion is as high as 83%.

F. Conditions limiting the use of clean cooking fuels and technologies in Guatemala and Honduras

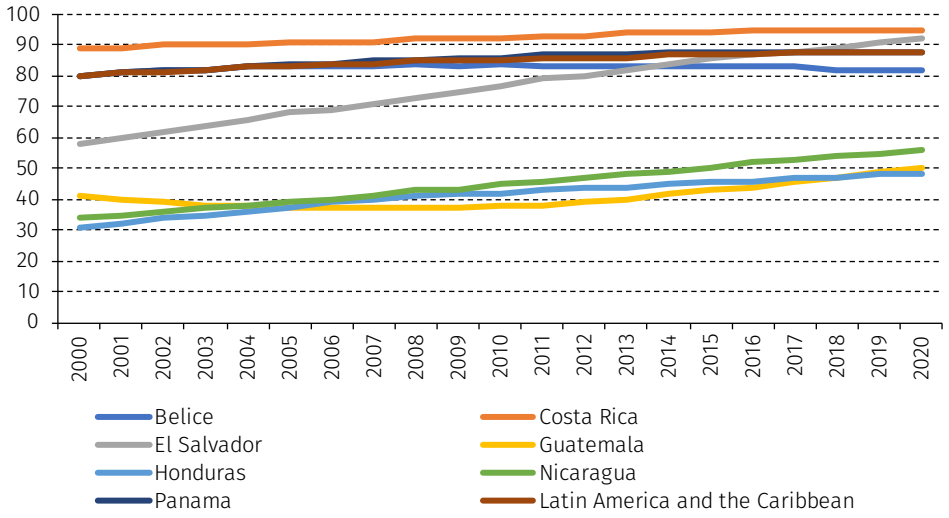
Having analysed the access to and use of clean cooking fuels and technologies in Guatemala and Honduras, the conditions limiting their use in these countries will be examined next. In both countries, around 50% of households use fuelwood as their main cooking fuel, and, generally speaking, the following barriers hinder the adoption of clean fuels and technologies:

- The conditions of poverty and extreme poverty that afflict the populations of both countries, which restrict the amount of income that can be used to pay for energy and purchase the appliances required for modern energy services.
- The lack of adequate infrastructure and distribution channels in the case of households located in marginalised areas, difficult to access locations or in communities where geographical dispersion makes the provision of some types of energy unaffordable.
- Sociocultural aspects associated with the use of fuelwood.

Considering the limitation associated with the lack of income due to the poverty conditions of a large part of the population in Guatemala and Honduras, it can be observed that, when comparing the proportion of inhabitants with primary reliance on clean fuels and technologies (see figure XI.9), both countries present percentages below the levels of Latin America and the Caribbean and the rest of the Central American countries. In fact, within the region, only Haiti presents lower levels than Guatemala and Honduras (DESA, 2023). The evolution of the indicator on access to clean fuels and technologies does not come as a surprise if one considers the human development levels of the countries analysed (see figure XI.10). Although several countries in the Central American sub-region are below the level of the human development index (HDI) for Latin America and the Caribbean, Guatemala and Honduras have the lowest HDIs in Central America.

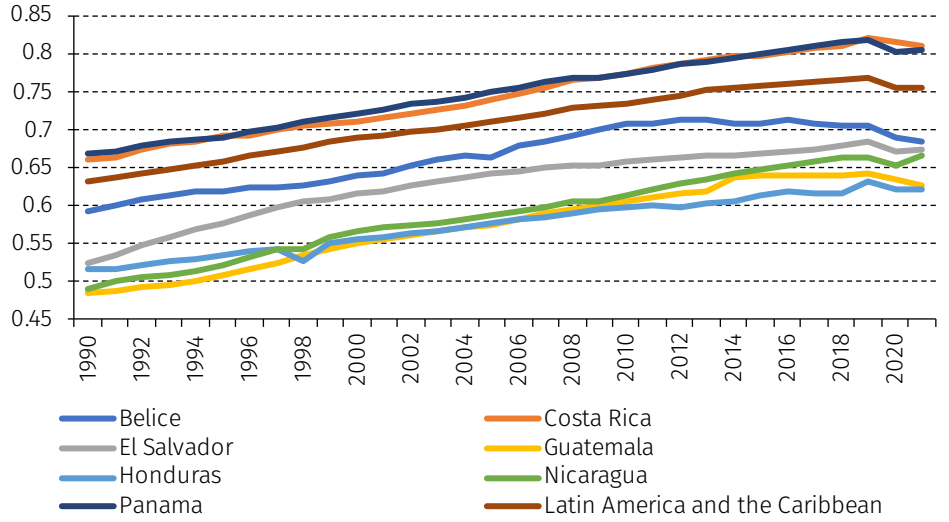
Consequently, the poverty levels in Guatemala and Honduras were above those of Latin America and the other Central American countries for almost the entire 2000-2021 period (see figures XI.11 and XI.12). Honduran population living in poverty remained above 50% throughout the 2001-2019 period, peaking at 64.5% in 2005. The population in extreme poverty peaked at 31.4% in 2005. Between 2009 and 2019, extreme poverty remained, for the most part, at around 20% of the population. In Guatemala, the population living in poverty fell from 53.6% in 2000 to 42.7% in 2006, and in 2014, the latest year recorded, this proportion reached 50.5% of the total population. Extreme poverty went from 16.9% of the population in 2000 to 10.4% in 2006 and 15.4% in 2014.

Figure XI.9
Latin America and the Caribbean and Central American countries: proportion of the population with primary reliance on clean fuels and technologies, 2000-2020
(Percentages)



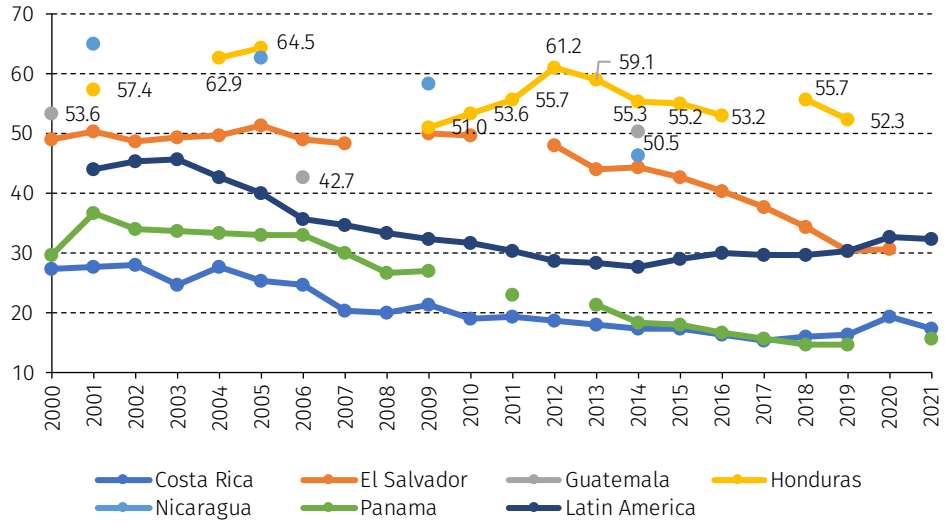
Source: Prepared by the author, on the basis of United Nations Department of Economic and Social Affairs (DESA), Statistics – SDG Indicators Database, 2023 [online database] https://unstats.un.org/sdgs/dataportal/database.

Figure XI.10
Latin America and the Caribbean and Central American countries: human development index (HDI), 1990-2021



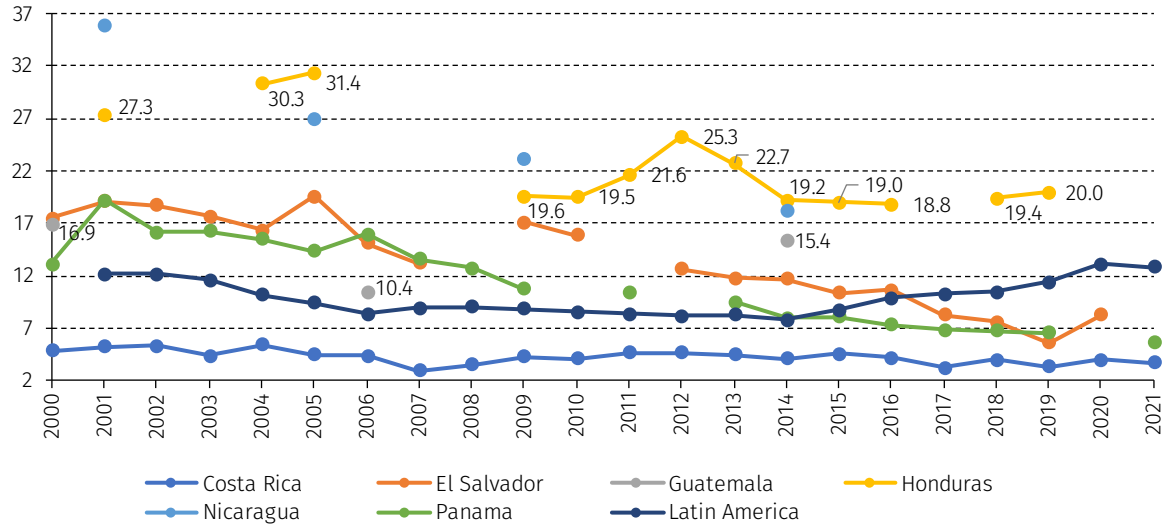
Source: Prepared by the author, on the basis of United Nations Development Programme (UNDP), "All composite indices and components time series (1990-2021)", *Human Development Reports (HDR)*, 2023.

Figure XI.11
Latin America and Central American countries: population living in poverty, 2000-2021
(Percentages)



Source: Prepared by the author, on the basis of Economic Commission for Latin America and the Caribbean (ECLAC), CEPALSTAT [online database] https://statistics.cepal.org/portal/cepalstat/dashboard.html?lang=es.

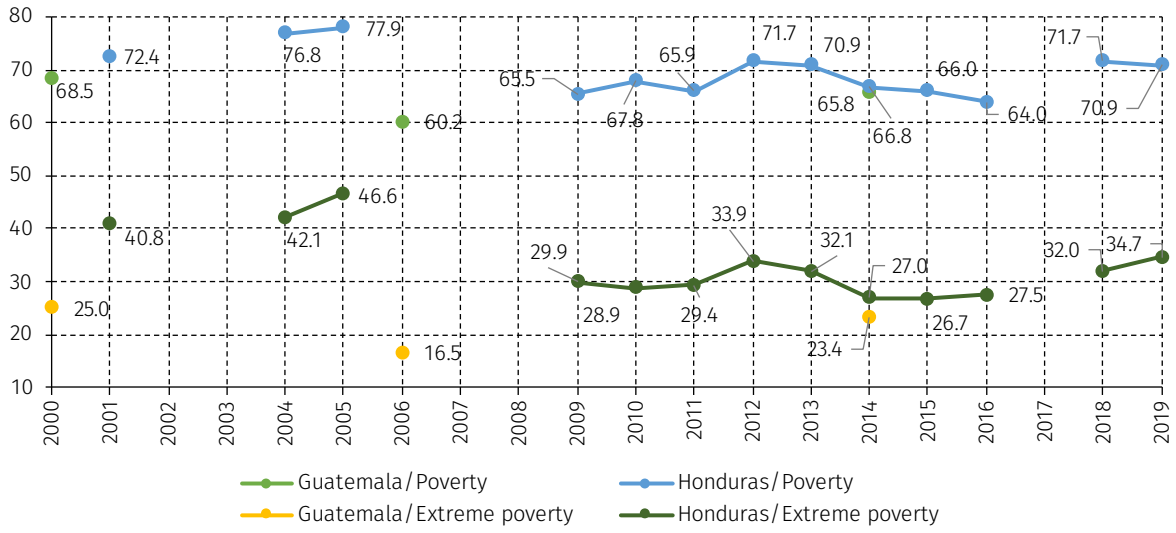
Figure XI.12
Latin America and Central American countries: population living in extreme poverty, 2000-2021
(Percentages)



Source: Prepared by the author, on the basis of Economic Commission for Latin America and the Caribbean (ECLAC), CEPALSTAT [online database] https://statistics.cepal.org/portal/cepalstat/dashboard.html?lang=es.

As noted above, fuelwood consumption at the residential level has not decreased in Guatemala, particularly in rural areas. In the case of Honduras, although fuelwood consumption has fallen, it continues to be used as the main cooking fuel by almost half of the population. The poverty and extreme poverty conditions that many households in Guatemala and Honduras experience contribute to this situation, particularly in rural areas (see figure XI.13), where clean fuels and technologies have shown lower penetration.

Figure XI.13
Latin America and Central American countries: population living in extreme poverty in rural areas, 2000-2021
(Percentages)



Source: Prepared by the author, on the basis of Economic Commission for Latin America and the Caribbean (ECLAC), CEPALSTAT [online database] https://statistics.cepal.org/portal/cepalstat/dashboard.html?lang=es.

Poverty in the rural areas of Honduras reached almost 80% of the population in 2005, averaged 67.3% from 2009 to 2016 and rose to over 70% in 2018 and 2019. Extreme poverty in Honduras' rural areas went from 40.8% of the rural population in 2000 to 46.6% in 2005. Subsequently, between 2009 and 2019, it fell to levels above 20% but below 35% of the rural population. In Guatemala, poverty in rural areas has remained between 60% and 70% of the population. Extreme poverty in rural areas afflicted 25% of the population in 2000, 16.5% in 2006 and 23.4% in 2014.

The lack of income associated with the poverty conditions of a large part of the Guatemalan and Honduran populations constrains the adoption of clean fuels and technologies. It also limits the adoption of solutions considered as transitional, such as improved biomass cookstoves.

The economic barriers that prevent the adoption of electricity as an energy source for cooking include the following:

- The use of electricity for cooking requires constant, reliable and affordable access to the electricity grid or to an isolated power system (e.g. solar photovoltaic cells), as well as electrical wiring at home. This involves, among other expenses, connection and installation costs and purchases of appliances and cooking utensils. Even if electricity is available, the initial costs necessary to start using it may be prohibitive for the poorest families in Guatemala and Honduras.
- Unlike fuelwood, which can be collected at no monetary cost, the use of electricity for cooking implies recurrent service payments, which is not possible for many poor families in Guatemala and Honduras. Also, in the case of non-payment of the service, they may face reconnection costs and fines.
- Repairing electrical installations and appliances may involve unexpected expenditures that many poor families cannot cover. In this respect, traditional cookstoves are often easier and less expensive to repair.

LP gas also faces certain economic barriers that limit its adoption (Wang and others, 2013; Puzzolo and others, 2016; Cabrera-Torres and others, 2020):

- Cooking with LP gas implies expenditures on gas installation, and buying a gas cylinder and a stove. People may prefer not to invest in these items and keep using fuelwood for cooking.

- The price of LP gas —subject to the volatility of its international price— together with the transport costs associated with refilling gas cylinders at the point of purchase (which may be far from rural areas in the cases of Guatemala and Honduras) would be considerable economic obstacles to the adoption of LP gas.
- The repair of a gas cookstove or related installations may be an unexpected expense that many poor families may be unable to pay.

The adoption of improved biomass cookstoves also faces some economic barriers (Wang and others, 2013):

- In the case of improved cookstoves built on site, the training costs for their construction and maintenance may be high, even if local materials and labour make their construction inexpensive.
- With regard to prefabricated improved cookstoves, these may involve higher initial costs, including their purchase and transportation from the point of sale.
- If an improved cookstove needs to be repaired, households face an unexpected expense that they may be unable to cover. In addition, the materials needed to repair the cookstove may not be readily available.

Another obstacle to adopting clean cooking fuels and technologies is the lack of infrastructure (for electricity) and distribution channels (for LP gas and prefabricated improved cookstoves). Providing electricity or LP gas to marginalised, rural, hard-to-reach and geographically dispersed areas can be unfeasible.

With respect to electricity, access may be limited by the lack of infrastructure, that is, by the fact that there is simply no electricity coverage, as was the case for 11% of the population in Guatemala and 13% of the population in Honduras in 2021. In addition to the economic concerns already mentioned, in the case of isolated power systems, it is also necessary to consider the existence and accessibility of the points of sale that distribute equipment and materials and the availability of the technicians specialised in the installation of these systems. In the case of LP gas, adequate distribution channels are required, which distributors may consider financially unsound in geographically dispersed and scarcely populated areas, as is the case, for example, of large parts of the Alta Verapaz department in Guatemala or the department of Gracias a Dios in Honduras. To the above, it should be added that LP gas distribution is carried out by land and in some parts of Guatemala and Honduras there are simply no roads or, in other cases, the state of the roads make it difficult to transport LP gas, which increases its cost for final users.

Unlike improved biomass cookstoves built on site, prefabricated cookstoves must be sold at certain outlets, which may be far away from potential users in rural areas of Guatemala and Honduras, particularly those located at a greater distance from urban areas. Sociocultural barriers to the adoption of clean fuels and technologies must also be taken into consideration. These barriers are particularly visible in Guatemalan and Honduran households that use traditional fuelwood cookstoves. For instance, the type, quantity and taste of food may be factors that determine the use of traditional fuelwood cookstoves (Wang and others, 2013; Puzzolo and others, 2016; Cabrera-Torres and others, 2020), even when electricity, gas stoves and/or improved biomass cookstoves are available.

In this regard, even if it is possible to use other cooking fuels and technologies, due to some characteristics of traditional cookstoves in Guatemala and Honduras, fuelwood is preferred for certain types of food. Traditional cookstoves have a flat griddle (known as *comal*) to prepare *tortillas*, a staple food in both countries (Wang and others, 2013). Furthermore, in Guatemala, cookstoves are used to prepare maize dough (known as *nixtamal*) for *tortillas*, as well as beans and different grains, which are cooked over direct heat for long periods of time (Wang and others, 2013).

In Guatemala, traditional cookstoves are used to prepare *tortillas*, beans, rice, maize, grains, potatoes, plantains, eggs, meat, chicken, coffee and *atole* (a maize-based drink), while in Honduras, people use them to prepare *tortillas*, beans, rice, maize, plantains, eggs, meat, soups, spaghetti and other foods (Wang and others, 2013). In many cases, several of these foods are prepared at the same time and in large quantities, as traditional cookstoves support heavy pots (Wang and others, 2013), which is not always possible with electric and gas stoves, as well as in some models of improved biomass cookstoves.

In addition, traditional fuelwood cookstoves are more practical and versatile than other cooking technologies. Relative to improved biomass cookstoves, traditional cookstoves light more quickly, support the use of larger wood pieces and do not require any particular type of fuelwood (Wang and others, 2013). In Guatemala and Honduras (Wang and others, 2013), traditional cookstoves are used for heating water, heating (in some cases), drying fuelwood and driving away insects (although rarely in Honduras). In Guatemala, they are also used for drying clothes and lighting, while in Honduras coffee is roasted on them. Electric and gas stoves and some improved biomass cookstoves are unsuitable for these uses.

It should be noted that improved cookstoves manufactured on site can replicate some of the features of traditional cookstoves, but often have quality and design issues (Wang and others, 2013), and may be less efficient and produce higher indoor emissions than some models of prefabricated improved cookstoves.

In addition to economic and availability issues, the use of different cooking fuels and technologies[1] may be the result of the perception that some fuel and/or technology is better for certain uses. Thus different fuels and technologies are used in households at the same time. For instance, traditional cookstoves are used to cook large amounts of food, improved biomass cookstoves to prepare daily meals and gas or electric stoves for heating previously cooked food. The use of LP gas is also limited by the perception that it is dangerous, stemming from incidents of explosions that involved this fuel (Puzzolo and others, 2016). Finally, the adoption of clean fuels and technologies may be limited because, in many cases, male heads of households —who usually make the decisions on the use of household income— may refuse to adopt them because they do not perceive any benefits or they think that meals will not taste as good as the meals prepared on a traditional cookstove (Wang and others, 2013).

G. Policies, programmes and projects to promote access to clean cooking fuels and technologies and to reduce the use of fuelwood in Guatemala and Honduras

Although there are differences between Guatemala and Honduras in terms of access to clean cooking fuels and technologies, both countries present a high proportion of households that use fuelwood, mainly in traditional cookstoves, with the environmental and health risks that this entails. With respect to the challenge of achieving greater penetration of clean fuels and technologies, energy policies in both countries have placed more emphasis on increasing electricity coverage and on reducing the use of fuelwood, predominantly through the use of improved biomass cookstoves. The latter are considered a transitional technology, since most models do not meet WHO emissions guidelines, though they are more efficient than traditional cookstoves.

In regard to increasing electricity access, Guatemala's 2013-2027 Energy Policy (MEM, 2013) aims to achieve 95% electricity coverage by strengthening the actions associated with the Rural Electrification Plan of the National Electrification Institute (INDE), and developing rural electrification programmes that promote isolated power systems that use renewable energy sources. While the 2019-2050 Energy Policy (MEM, 2019a) does not set any targets related to increasing electricity coverage, the 2019-2032 National Policy for Rural Electrification (MEM, 2019b) aims for 99% electricity coverage by 2032.

This policy also shows the need for a database with socioeconomic information on households without electricity and of an Indicative Rural Electrification Plan that prioritises the areas where electrification programmes will be carried out. A municipal priority indicator was developed for the 2020-2032 Indicative Rural Electrification Plan (MEM, 2020b), and different weights were given to the following criteria: relative fuelwood consumption index (10%), percentage of people living in poverty (20%), Human Development Index (20%), multidimensional poverty index (20%), number of users without electricity access (15%) and access to electricity transmission and distribution systems (15%).

As for reducing the use of fuelwood, Guatemala's 2013-2027 Energy Policy (MEM, 2013) considered distributing 100,000 improved cookstoves. This would also entail creating regulations for the use and certification of improved cookstoves, microcredit programmes for their purchase and technical assistance

[1] This phenomenon is known as fuel stacking.

for their use. The policy also sets the goal of reducing the use of fuelwood in 25% of households by increasing the use of LP gas and methane, among others. The 2019-2050 Energy Policy (MEM, 2019a) sets the goal of promoting the benefits of improved cookstoves, but without concrete targets.

However, the 2013-2024 National Strategy for Sustainable Production and Efficient Use of Fuelwood (INAB, 2015) sets forth several specific targets and actions to reduce the use of fuelwood in Guatemala. One such is to create, by 2024, a national platform for promoting the production and efficient use of fuelwood through municipal action plans for 142 municipalities —prioritised through geo-referenced and statistical information—, and the evaluation and monitoring of fuelwood through the *Woodfuels Integrated Supply/Demand Overview Mapping* (WISDOM) methodology[2] as a starting point.

The Strategy also considered the satisfaction of the energy needs of the population through the sustainable production of fuelwood in 48,000 hectares of energy plantations and agroforestry systems. This would operate in the 142 prioritised municipalities by 2024 with the support of the Forestry Incentives Programme (PINFOR), the Incentives Programme for Owners of Small Tracts of Land with Forestry or Agroforestry Vocation (PINPEP) and other support programmes. These actions would at the same time contribute to the creation of employment in rural areas. The strategy also included —as a target in line with the 2013-2027 Energy Policy— the adoption of improved cookstoves in 100 thousand households by 2024.

Within the framework of the Nationally Appropriate Mitigation Actions (NAMAs) and as part of the project "Guatemala - Efficient Use of Fuel and Alternative Fuels in Indigenous and Rural Communities (Guatemala - Sustainable Cooking)", a Fuelwood Commission was created to implement the 2013-2024 National Strategy for Sustainable Production and Efficient Use of Fuelwood. The project will be implemented between 2022 and 2027 with a budget of 11 million euros, financed by the Inter-American Development Bank (IDB). The operationalisation will be carried out by an organisation called Alterna, which will establish a trust fund for the operation of a guarantee fund for manufacturers and users of improved cookstoves. Alterna will also design and run the awareness and behavioural change campaign and manage the incentive programmes to promote the adoption of clean cookstoves (IDB, 2022).

It is worth noting that Guatemala has previously developed programmes for the adoption of improved cookstoves. These programmes, promoted by the government and non-governmental organisations (NGOs), date back to 1976 with the introduction of the "Lorena" cookstove and, in general terms, their impact has not been significant, mainly due to the lack of support after installation (Grinnell, 2019). In the case of Honduras, one of the pillars of the 2019-2021 Energy Agenda (SEN, 2020) is the goal of universal access to modern energy. Despite referring to "modern energy" in general, the goal is to reach 100% electricity coverage by 2034; therefore, the targets and actions are focused on electricity access. To achieve this goal, a universal electricity access policy and specific strategic plans and programmes were deemed as necessary.

In turn, one of the strategic goals of the 2050 Roadmap of the Energy Policy of Honduras (SEN/OLADE, 2021) is the reduction of energy poverty. Among its targets, the Roadmap includes a 5% decrease in the percentage of income used by vulnerable families to meet their basic electricity needs and the promotion of sustainable and targeted subsidies in electricity tariffs by 2030, in addition to reducing the energy poverty gap by 100%, reaching 100% electrical coverage, meeting 100% of the electricity needs of vulnerable families and a 20% reduction in the percentage of income that vulnerable families use to cover their basic electricity needs by 2050. A measure associated with meeting these targets is the identification of the population below the energy poverty line, the electricity needs of households and productive uses of energy, and the proportion of income spent on basic electricity needs.

As part of the strategic goal on energy efficiency and savings in the residential, commercial, industrial and agricultural sectors of the 2050 Roadmap (SEN/OLADE, 2021), the following is proposed: a strategy to replace fuelwood with energy sources such as LP gas, and a policy for the manufacturing and adoption of clean cookstoves in rural areas where the provision of other alternatives is difficult and costly by 2030, in addition to eliminating the use of traditional fuelwood cookstoves, developing a strategy for the adoption of cleaner energy sources throughout the country and achieving greater penetration of

[2] It basically consists of mapping the supply and demand of biomass for energy purposes and then integrating them into a module that presents the balance between available and accessible biomass and total demand for biomass (INAB and others, 2012).

clean energy for cooking by 2050. Among the actions considered to meet these targets are the development of a strategy for LP gas infrastructure, studies to characterise fuelwood consumption, campaigns against the inadequate use of fuelwood, the development and monitoring of improved cookstoves programmes and the development of a strategy for the transition to energy sources such as LP gas.

Regarding the reduction of fuelwood use and improved cookstoves programmes, the National Inclusive Strategy for the Adoption of Improved Cookstoves (ENAEM) in Honduras (SNV, 2022) considers six strategic lines:

(i) *Inter-Institutional Coordination* to form a committee to implement measures that address the multidimensional nature of the problem of fuelwood use in Honduras. The committee would be composed of the Ministry of Natural Resources and Environment (*MiAmbiente*), the Presidential Office of Green Economy (OPEV) through the National Directorate of Climate Change (DNCC), the Ministry of Energy (SEN), the Ministry of Health (SESAL), the Institute of Forest Conservation and Development, Protected Areas and Wildlife (ICF) and the Ministry of Development and Social Inclusion (SEDIS). In addition, the participation of the Ministry of Education (SEDUCA), the National Women's Institute (INAM), the Honduran Standards Organization (OHN), the National Autonomous University of Honduras (UNAH) and the Inter-Institutional Platform for Strengthening the Value Chain of Improved Cookstoves (composed of NGOs and the private sector) was also suggested.

(ii) *Financial mechanisms* for the development of the ENAEM initiatives. These may include a government fund, microfinance, differentiated financial products to address the needs of vulnerable groups, carbon finance, tax incentives and partnerships and agreements with the private sector (including inclusive businesses and Corporate Social Responsibility).

(iii) *Strengthening the value chain*, which includes actions such as supporting R&D along the value chain, technical and social assessments, development of technical standards and certification for improved cookstoves, encouraging the participation of women in all stages of the value chain, capacity-building at the local level, participation of Micro, Small and Medium Enterprises (MSME) and local community networks as intermediaries, the standardisation of after-sales services and certification of services.

(iv) *Household access to fuelwood* through the promotion of communal agroforestry production systems and energy plantations, the development of enterprises for the production of fuelwood derived from forest management plans, the creation of a certification system for fuelwood commerce, training programmes for the use of forest residues for cooking and raising awareness of the conservation of forest resources.

(v) *Cultural awareness and adaptation*, since the Strategy's actions must seek to replace traditional cooking technologies in an inclusive manner and are adapted to the cultural needs of users.

(vi) *Monitoring and evaluation*, as it has been identified that the low impact of past improved cookstoves programmes and projects was due to the absence of both aspects. In addition to defining procedures for verification, evaluation and continuous improvement, the development of indicators of the impact of the ENAEM on the population was proposed.

ENAEM is not the only initiative to promote the use of improved cookstoves in Honduras, though it is the most recent one. Previous government administrations in Honduras distributed improved cookstoves free of charge (for instance, 276,015 cookstoves between 2003 and 2009) with little monitoring and oversight, and many were not installed or were abandoned (Grinnell, 2019). Profogones is another project developed in Honduras. Executed by Fundación Vida with funds provided by international organisations, the project sold different models of improved cookstoves in stores or authorised outlets with after-sales services. The project did not have the desired success because it could not compete against improved cookstoves that were distributed for free (Grinnell, 2019).

The EnDev Honduras project (EnDev-HN, 2019) was carried out in collaboration with private sector manufacturers, government agencies and NGOs and installed 40,285 "Justa" cookstoves. Through the NGO called Proyecto Mirador, more than 240 thousand "Justa 2 X 3" model cookstoves have been installed since 2004 with carbon credit financing. This has meant the reduction of 15 tonnes of carbon dioxide (CO_2) over the six-year life of an improved cookstove (Proyecto Mirador, 2023). Proyecto Mirador pays a technician to build the cookstove on site, provides the parts needed for its installation and the cleaning tool, and carries out the monitoring and maintenance of the cookstoves, while the beneficiaries provide some materials and participate in the construction of the cookstove (Proyecto Mirador, 2023). Given the comprehensiveness of its model, Proyecto Mirador is one of the most successful experiences in implementing improved biomass cookstoves.

Regarding policies to foster the use of LP gas for cooking, well-articulated and specific strategies are needed in Guatemala and Honduras. For instance, LP gas subsidies have only been implemented as a response to temporary issues, such as price increases caused by the conflict between the Russian Federation and Ukraine that began in February 2022.

H. Some policy considerations and recommendations to increase access to clean cooking fuels and technologies and to reduce the use of fuelwood in Guatemala and Honduras

Along with the reduction of fuelwood use through improved cookstoves, Guatemala and Honduras have favoured electrification as a strategy towards universalising clean fuels and technologies. However, despite the fact that most Guatemalan and Honduran households have access to electricity, fuelwood is still the most widely used cooking fuel, which is evidence of electricity underconsumption, despite relatively high electricity coverage in both countries.

In Guatemala, it is necessary to provide incentives (in the form of competitive prices for the final consumers) to encourage increased use of electricity as a cooking technology, considering the emphasis on electrification in its energy policy. However, some considerations must be made regarding Guatemala's electricity subsector, which is made up of a small group of domestic and foreign companies and was previously monopolised by the National Electrification Institute (INDE), which carried out the electricity generation, transmission and distribution functions in the country. The electricity generated is distributed by Energuate due to contractual issues.[3] Moreover, distributors in rural areas make monopoly profits because they are the only companies that supply electricity to these areas, and the cost-of-service pricing model allows distributors to transfer losses to consumer prices (Moreira and Naveda, 2021).

Municipalities in Guatemala have few local revenue sources, one of which is the Single Property Tax (IUSI). Therefore, many municipalities seek other financing sources in order to be less dependent on revenue from central government sources, for example, road tolls and public lighting charges. In this regard, municipalities add an additional cost to distributors with the municipal public lighting fee, which is arbitrarily defined by municipalities (Navarro, 2021). These dynamics can lend themselves to excessive charges by municipalities that do not take into account technical considerations in their agreements with distributors.[4] All these factors may negatively affect the final consumer price of electricity. Although distributors offer a social tariff for users consuming less than 300 kWh per month, which is subsidised by INDE, the amount of the subsidy varies according to household electricity consumption[5] and may not be enough to encourage the use of electricity in the case of the poorest households.

Subsidies will be more effective and less costly for the government if the distribution of energy to consumers is reformed and regional distribution monopolies are broken. In this regard, the privatisation process in Guatemala favoured the creation of oligopolies in the electricity subsector, because it did not occur under optimal conditions of competition (Bertelsmann Stiftung, 2022). For this reason, priority

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[3] In other cases, distribution quotas are allocated to each generator.

[4] See [online] https://www.prensalibre.com/economia/cobran-lo-justo-las-municipalidades-por-alumbrado-publico-la-discusion-esta-en-punto-muerto/.

[5] See [online] https://eegsa.com/factura-eegsa-2/calculadora-de-facturas/informacion-de-tarifas/#:~:text=hasta%202%20kWh.-,Se%20reconoce%20como%20Usuario%20de%20Tarifa%20Social%20a%20todo%20usuario,diario%20de%20hasta%202.93%20kWh.

should be given to the approval of a competition law[6] and the creation of a regulatory authority to tackle market concentration and monopolistic practices (in the private and the public[7] sectors), in order to ensure better prices and quality for consumers (Gándara, 2021).

Consequently, the design of end-user price schemes in the electricity subsector should be reviewed, since the cost-of-service pricing lets distributors transfer energy losses to final consumers. Therefore, the governance model of the institutions of the electricity subsector and the participation of the private sector should be reviewed. The same should be done with the municipal public lighting fee, as the current pricing model transfers this cost to final users. To this end, it is necessary to establish technical standards for the definition of the fee, as the municipal public lighting fee, in addition to the service-based tariffs, could be detrimental to the most vulnerable population of some municipalities.[8]

In the case of Honduras, a country with high poverty rates and whose state power company operates at a huge loss, technical studies are needed to review electricity tariffs and its subsidy policies, including a recent proposal to provide electricity free of charge to 1.3 million households that consume less than 150 kWh per month, which was approved by Congress in February 2022. The subsidy is intended to reach those who really need it and without causing further damage to the finances of the National Electric Power Company (ENEE).

Expanded electricity coverage, increased household income and a strategy of targeted and cross-subsidisation of electricity may lead to the substitution of energy sources such as fuelwood used for cooking on traditional cookstoves. Although electricity is not the main energy source for cooking in Honduras, its penetration is among the highest in Central America. Thus, in addition to competitive prices, in order to favour and further increase the use of electricity, it is necessary to ensure a reliable and continuous supply, so households with access to electricity but without access to other fuels (such as LP gas), do not revert to the use of fuelwood.

Since both countries have emphasised increasing electricity coverage as a strategy for universal access to modern energy, it is necessary to favour electricity generation through renewable energy, particularly from non-conventional sources (solar, wind, geothermal, micro-hydropower and biomass, among others), thus reducing the bill associated to hydrocarbons imports for electricity generation. With respect to this, improved administrative processes, tax incentives and other economic incentives such as feed-in-tariffs[9] are necessary.

LP gas is not a renewable energy source, it is not cleaner than electricity generated from renewable sources and, in the cases of Guatemala and Honduras, it is an imported product. However, it is a better option than fuelwood burned in traditional cookstoves. As with electricity markets, LP gas markets should be competitive, offering better prices to final consumers. Targeted subsidies aimed at the most vulnerable households should also be considered, with the intention of increasing the penetration of LP gas where the provision of this fuel has a higher cost-benefit ratio than other options.

The importance of an adequately applied subsidy policy to increase LP gas penetration is illustrated by El Salvador, which has managed to reduce its poverty and extreme poverty until reaching levels below the average for Latin America. This happened at the same time household fuelwood consumption was declining and primary reliance on clean fuels and technologies was increasing, as shown in figure XI.9. The increased use of clean fuels is partly due to the greater penetration of LP gas resulting from the subsidy policy that El Salvador has implemented since 1974 (OLADE, 2012). Also, in early 2011, the Salvadoran government launched a targeted subsidy policy (OLADE, 2012) that led to higher penetration of LP gas, which has coincided with falling poverty levels (shown in figures XI.11 and XI.12).

Considering the large number of households in Guatemala and Honduras that do not use clean cooking fuels and technologies (around 50%), it seems difficult to get all households to adopt them in

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6 Guatemala is the only Latin American country without such a law.

7 Guatemala has no significant state-owned companies, except for two ports and the National Electrification Institute (INDE) (Bertelsmann Stiftung, 2022). INDE is the country's largest power generation, transmission and distribution company.

8 It is also necessary to consider further fiscal decentralisation to enable local governments to increase their sources of revenue, as one of the reasons why municipalities charge the public lighting fee is the lack of options for raising their own revenues.

9 Feed-in-tariffs are a policy tool that guarantees above-market prices and long-term contracts. They are usually targeted at small producers of renewable energy and are meant to promote investments in renewable energy sources (Kenton, 2021).

the short and medium terms. Therefore, it is necessary to establish programmes for the adoption of improved biomass cookstoves, a technology that allows for the reduction of fuelwood use and is considered a transitional bridge towards more modern technologies.

Both countries have a national strategy to promote sustainable fuelwood production, reduce its use and foster improved biomass cookstoves. They also have experience in implementing improved cookstoves programmes and plans. However, it is necessary to set up financing and after-sales services, as well as long-term evaluation and monitoring that contribute to the sustainability of improved cookstoves programmes and projects. The absence of evaluation and monitoring has been one of the main problems after a cookstove has been delivered and/or installed. It is also important to take into consideration that improved cookstoves models must be adapted to the sociocultural conditions of potential users. Cookstove models that have succeeded in other parts of the world may not be suitable for the contexts of Guatemala and Honduras.

Improved cookstoves programmes and projects have many lessons to learn from the success of Proyecto Mirador and its comprehensive approach, which features financial sustainability (carbon credits for the reduction of emissions through improved cookstoves), job creation (training and hiring of local technicians for cookstove installation), participation and empowerment of beneficiaries (who provide materials and labour for the installation of the cookstove) and follow-up, monitoring and after-sales services that promote the continued use of improved cookstoves. The development of improved biomass cookstoves standards and certifications to meet certain levels of energy efficiency and comply with WHO emissions guidelines may attract funding for the manufacturing of this type of cookstoves, as most current models do not meet these guidelines.

As a general recommendation, energy policy formulation must come together with actions associated to specific, measurable, achievable, realistic and time-bound indicators that contribute to monitoring progress and assessing the impact of policies. To this end, it is essential to be able to link policies to concrete expenditures and/or activities. It is recommended that future iterations of the population and housing censuses and of the household surveys should inquire about other secondary fuels used (for any purpose), in addition to the primary fuel used for cooking, thus reaching a better understanding of fuel stacking and fuel use decisions.

In addition, household income and expenditure surveys should continue inquiring about energy expenditures, detailing, as much as possible, the costs for each fuel and technology. It is imperative to strengthen and systematise the production of national and subnational statistics related to poverty, living conditions, income and expenditures, household energy use and fuelwood consumption to improve assessments and policy recommendations to increase access to modern and clean energy services.

Although the lack of infrastructure and adequate distribution channels together with certain sociocultural aspects may limit the use of and access to clean fuels and technologies, the main obstacle to their adoption is the poverty afflicting many families in Guatemala and Honduras. Therefore, it is essential to improve the income of the most vulnerable families. Considering the positive externalities of clean fuels and technologies on public health, education and productivity, the possibility of targeted and cross-subsidies on electricity tariffs and LP gas prices and/or cash transfers that favour the poorest and most vulnerable families in Guatemala and Honduras should be analysed in detail.

I. Conclusions

In Latin America and the Caribbean, Guatemala and Honduras are among the countries with the highest poverty levels, the lowest proportion of population with primary reliance on clean fuels and technologies and the highest use of fuelwood. Although both countries have reached a relatively high electricity coverage (close to 90%), this is in stark contrast to statistics and estimates showing that around 50% of Guatemalan and Honduran households use fuelwood as their main cooking fuel, which poses a challenge to achieve the universalisation of modern energy in the short and medium terms as set by SDG 7 of the 2030 Agenda for Sustainable Development. The high consumption of fuelwood at the residential level, despite relatively high electricity coverage, may explain the underconsumption of electricity in households and fuel stacking, i.e. the use of different fuels and technologies, including traditional cookstoves.

Both countries face significant challenges related to the construction of infrastructure to increase electricity coverage in rural areas and in marginalised, geographically isolated and sparsely populated places, some of which may be addressed through off-grid systems with non-conventional renewable energy sources. Thus, electricity generation through renewable sources for the power grid, off-grid systems and distributed generation must be favoured over the production of electricity with fossil fuels. Since LP gas is an imported non-renewable resource, it should not be given much prominence. However, where the cost-benefit ratio and the acceptance of the population - based on sociocultural preferences -, allows for the substitution of traditional cookstoves, a competitive price must be guaranteed. The possibility of targeted subsidies should be considered to further increase the penetration and consumption of LP gas, particularly among the most vulnerable households.

Since getting 50% of Guatemalan and Honduran households to adopt clean fuels and technologies in the short and medium terms is a very complex task, measures beyond electricity and LP gas adoption must be considered. In particular, efforts should be made to increase adoption of improved cookstoves. In this respect, the goals and actions proposed by the "Guatemala – Sustainable Cooking" project within the framework of the NAMAs and the ENAEM in Honduras are heading in the right direction. If adequately implemented, they could provide sustainability to improved cookstoves programmes. Experiences such as those of Honduras' Proyecto Mirador indicate that the success and sustainability of improved cookstoves programmes depend on factors such as financing mechanisms, adaptation to the needs of families, the cost of the cookstoves, job creation, adequate distribution channels, after-sales services and long-term follow-up and monitoring of the cookstoves.

Increasing the incomes of the poorest and most vulnerable families of Guatemala and Honduras is necessary to reduce fuelwood consumption and to strengthen the adoption of clean fuels and technologies. Further consideration should also be given to introducing electricity and LP gas subsidies, as well as the possibility of cash transfers. Other options not presented in this study should also be analysed, as they may adapt to certain local physical conditions and household needs. Fuels and technologies to be considered are biofuels, biogas, biomass residues and solar cookstoves.

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Chapter XII
Structural gaps in Haiti's economy: an input-output table analysis[1]

Randolph Gilbert
Roberto Orozco Morales
Jesús Santamaría González

Introduction

This study summarises two papers[2] prepared for a project on structural gaps in Central America and the Caribbean region. The research consisted of two stages: an input-output table (IOT) was first prepared for Haiti, and then a regional IOT was constructed. The regional table included the Haitian economy to analyse national and regional structural gaps. Two overall goals lay behind constructing an input-output matrix for Haiti (HIOT)[3] and a structural gaps analysis. The first was to describe Haiti's productive structure at the sectoral level and to analyse the final demand in that country.

The second goal was to produce a sectoral analysis based on the regional input-output table, used to prepare backwards, and forward-production linkages and to itemize the gross output value and the value added by final demand components, using Leontief and Ghosh's inverse matrices.[4] Finally, the table was incorporated into the structural analysis of trade between Haiti, Central America, the Dominican Republic and Mexico, considering the value added by intra-regional trade and trade with the rest of the world.

Recently, the Economic Development Unit of the Economic Commission for Latin America and the Caribbean (ECLAC), located in Mexico City, began constructing national and regional input-output tables to analyse intersectoral production structures. ECLAC worked together with central banks and statistics agencies of Central America and the Dominican Republic in this endeavour. As part of the analytical repository being assembled, this chapter, in particular, contains the construction of an IOT for Haiti and explores its results.

The statistical information for Haiti is scarce and dispersed, so its collection and processing called for additional effort. Since only 23 sectors of the Haitian economy (compared to 40 sectors in the subregion's countries) had disaggregated data, some assumptions and hypotheses had to be made to enable the comparison of Haiti with other Central American countries; however, this lowered the precision of the analysis (Romero Ramírez and others, 2023). These limitations make it necessary to view the interpretations of the data with caution due to possible nuances.

The analysis started from a 23-by-23-sector matrix providing an overview of Haiti's productive structure in the 2011-2012 fiscal year. Next, a nine-country regional input-output matrix was created using matrix analyses already produced by the ECLAC Subregional Office. This matrix was unlike the one made for Haiti because it included a new sectoral aggregation on which several Haitian productive sectors lack disaggregated information that is available for the other analysed countries.

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[1] This chapter was written using two reports prepared by consultants Víctor Antonio Romero Ramírez and Luis Daniel Torres. Thanks for their comments are due to Pablo Yanes, Ramón Padilla Pérez and Juan Carlos Rivas, respectively Research coordinator, Chief and Officer of the Economic Development Unit of ECLAC Subregional Headquarters in Mexico.

[2] See Romero Ramírez and others (2023), y Gilbert and others (2023).

[3] According to the available information, such an instrument for Haiti did not exist then.

[4] A full review of the formulation, assumptions and applications of Leontief's model can be found in Miller and Blair (2009).

Section 1 of this chapter analyses productive gaps (vertical gaps) and backward and forward linkages. Section 2 uses a regional input-output table to render the structural analysis of trade between Haiti and the region formed by Central America, the Dominican Republic and Mexico, and the rest of the world (horizontal gaps). It highlights Haiti's intra-regional and extra-regional trade and the induced value added (IVA) of its exports and imports. Section 3 presents results and conclusions from the statistical and matrix analysis made in the study and recommendations for public policies that Haiti could implement. This study has a methodological annex containing a synthetic description of Haiti's IOT. The description considers the basic theoretical concepts of Leontief's and Ghosh's models. The annex also presents Rasmussen-Hirschmann indexes[5] that identify productive linkages.

A. Structural analysis of Haiti's economy: Identification and analysis of productive gaps (vertical gaps)

1. Stylized facts of the Haitian economy based on the national IOT, 2011-2012

This section describes some economic variables in the input-output table for Haiti (HIOT) in fiscal years 2011-2012.[6] Relevant results. Two characteristics were identified from macroeconomic aggregates on the supply and demand sides.

- The economy's value added (VA) distribution is strongly biased towards gross operating surplus (GOS). The ratio of GOS in VA is 76%, compensation to employees is 23%, and indirect net taxes for subsidies are 1%. GOS includes income for capital property and mixed income.
- Residents' expenditures on final goods and services of domestic or imported origin concentrate on household consumption (74%). Only 15% goes to gross fixed capital formation.

Production value. Two macroeconomic indicators are relevant to measure the value of an economy's production over time: gross production value (GPV) and gross domestic product (GDP). Both figures contain different accounting items and can be read by how production is used (horizontal reading of HIOT) or costs (vertical reading of HIOT). Haiti's GPV for 2011-2012 was 905 billion gourdes (bg) (21,609 million dollars), 61% of which corresponded to GDP and the other 39% to intermediate goods and services. Intermediate consumption was 354 bg, of which 70% was domestic and 30% imported. Compared with countries in Central America, the Dominican Republic and Mexico, Haiti has the lowest ratio of GDP as part of GPV, making it the country with the least GPV by intermediate consumption. Except for Panama, Haiti has the largest participation of expenditures in intermediate consumption of domestic origin. Comparing functional income distribution in the region's countries, compensation share in income is 22.6% in Haiti, which is considerably lower than in Mexico (28.3%) and Panama (28.6%). Costa Rica and Honduras have the highest, with 49.4% and 47.6%, respectively.

Household final consumption (HC) in Haiti represented 69% and is the primary component of the final demand for national production. The next item is the investment demand from enterprises, households and government, represented by gross fixed capital formation (GFCF) plus changes in inventories (CI), corresponding to 14% of the total. The rest of the residents' demand is composed of government expenditures (6%) and non-profit institutions serving households (4%). The final demand of residents is met by domestically-produced goods and services and by the production of non-resident enterprises, that is, final demand imports. Most of the total final demand (91%) is covered by domestic production. The rest of the world provides the remaining 9%.

2. Analysis of backward and forward linkages in production

This study now describes the economic variables on the sectoral level to identify the patterns in their ratios. The most important sectors are identified according to their roles in different variables and indicators. Relative size of sectors measured by production value. The HIOT can be constructed with gross production value (GPV), value added (VA) and the value of the final domestic demand (FDD).

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[5] Rasmussen (1963) and Hirschman (1958).
[6] Details of the input-output table for Haiti can be found in table A.3 of annex.

Another stylized fact is the marked heterogeneity in each factor's relative size, that is, the ratio of each sector as a percentage of the production value, possibly influenced by the construction and aggregation criteria for each sector. When sectors are arranged in decreasing order according to these three variables, five sectors comprise 61% of the production value: wholesale and retail trade (12), agriculture (1), health and educational services (22), followed by food products and beverages (4) and construction (11).

Table XII.1
Sectors with the primary quotas for gross production value (GPV), value added (VA) and final domestic demand (FDD)
(Percentages)

Sector code	Description	GPV_i/ GPV_total	VA_i/ VA_total	FDD_i/ FDD_total	Simple average
12	Wholesale and retail trade, maintenance of motor vehicles	17	22	16	18
1	Agriculture, forestry, hunting and related services	17	19	13	16
22	Educational services, health care and social assistance without accommodation, arts, entertainment, recreation, performing arts, spectator sports, museums and leisure activities	9	10	12	10
4	Food products, beverages and tobacco	9	6	10	9
11	Construction	8	6	9	8
	Subtotal	60	63	60	61
	Other	40	37	40	39

Source: Prepared by the authors.

Income distribution. As already mentioned, the functional income distribution in the Haitian economy showed a bias towards gross operating surplus, followed by compensation of employees. One might ask whether this arises from a functional income distribution at a sectoral level that is effectively GOS-biased or if it is the result of just a few sectors. As mentioned above, there is a bias in the functional income distribution, but the bias now favours *capital owners*[7] and mixed income. As a result, only seven out of 23 sectors have over a 43% share of compensation of employees related to value added, whereas, in the great majority of sectors, it is over 42% for GOS. In addition, at the sector level, the participation of different taxes is considerably low, which is why they will not be considered in the rest of this chapter. Several factors explain this, the most relevant being high informality and reduced industrial capacity, which makes for a very low fiscal burden in Haiti and limits the country's capability to deal with social, economic or environmental challenges.

Table XII.2 displays two horizontal blocks. The first shows sectors with the highest marks for the three indicators. The second shows sectors that do not represent any of them. Each indicator is presented with its percentage share and its position in decreasing order. Arranged by the ratio in which compensations participate in each sector, the uppermost sectors are administrative and support services (21), educational and health services (22) and furniture (9). The trade and agriculture sectors come last, with 3.1% and 5.9%, respectively.

[7] The "capital owner" concept probably refers to the labour market structure (economically active population, EAP). In Haiti, self-employed people outnumber those in a subordinate employee/employer relationship.

Table XII.2
Main sectors, according to diverse indicators
(Percentages share, values and position in decreasing order)

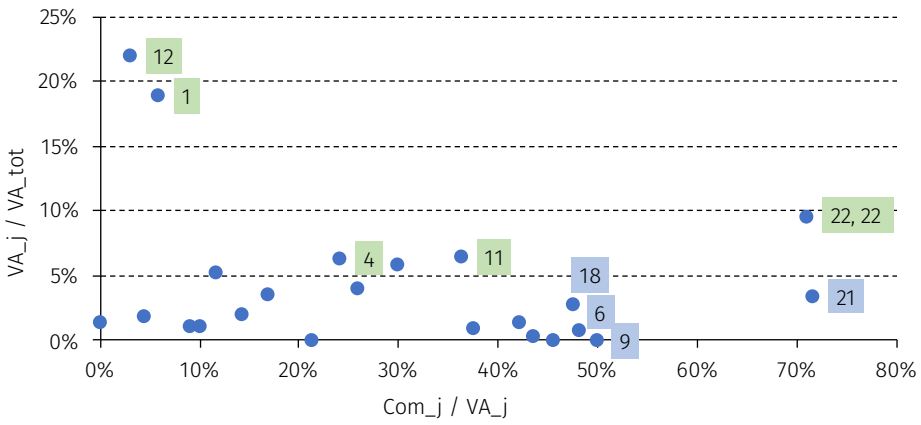
		Production value (average)		Com_j/VA_j		Exports scale X_i/X_tot		Exports intensity X_i/GPV_i	
		%	Pos	%	Pos	%	Pos	%	Pos
Sectors in the first five places according to any variable									
1	Agriculture, forestry, hunting and related services	16.2	2	5.9		6.7		2.0	
4	Food products, beverages and tobacco	8.6	4	24.2		17.0	2	9.2	4-8
5	Apparel and leather and allied products	5.7		30.0		9.7	4	9.2	4-8
6	Wood products (excepting furniture), wicker products, paper products, printing and related support activities	1.3		48.2	4	2.7		9.2	4-8
7	Chemical products	0.2		21.4		0.5		9.2	4-8
8	Non-metallic mineral products, primary metals, fabricated metal products (except machinery and equipment)	3.9		17.0		7.2		9.2	4-8
9	Furniture and related products, miscellaneous manufacturing, installation and maintenance of machinery and equipment	0.0		49.9	3	0.1		6.5	
11	Construction	7.6	5	36.3		0.0		0.0	
12	Wholesale and retail trade, maintenance of motor vehicles	18.3	1	3.1		24.0	1	7.2	
15	Accommodation and food services	3.9		42.2		12.6	3	13.6	1
16	Publishing industries (including software), motion picture and sound recording industries and broadcasting	0.1		45.5		0.3		12.4	2
18	Financial services (except insurance and pension funds), insurance and reinsurance, pension funds (except mandatory social security) and other support activities	2.4		47.5	5	0.0		0.0	
21	Administrative and support services, mandatory social security	3.8		71.7	1	0.1		0.1	
22	Educational services, health care and social assistance without accommodation, arts, entertainment, recreation, performing arts, spectator sports, museums and leisure activities	10.4	3	71.1	2	9.4	5	5.1	
23	Activities of associative organisations, maintenance and repair of computers and electronic devices, personal and domestic services in households	1.5		37.6		3.1		10.4	3
	Subtotal first five	61.0		--		72.6		--	
	Average first five	12.2		57.7		14.5		11.0	
	Median first five	10.4		49.9		12.6		10.4	

		Production value (average)		Com_j/VA_j		Exports scale X_i/X_tot		Exports intensity X_i/GPV_i	
		%	Pos	%	Pos	%	Pos	%	Pos
Sectors not in the first five places according to any variable									
2	Fishing and aquaculture	1.0		0.0		0.1		0.5	
3	Other extractive activities	0.9		10.0		0.1		0.4	
10	Production and distribution of electricity, gas, steam, air conditioning, water collection, treatment and distribution	1.9		14.3		0.1		0.3	
13	Land transportation, duct transportation, water transportation and warehousing and transportation support activities	4.5		26.0		3.2		3.1	
14	Postal and courier services	0.3		43.5		0.2		3.1	
17	Telecommunications, information and data processing services	2.0		4.4		2.2		5.4	
19	Real estate services, legal and accounting services, architecture and engineering services, miscellaneous professional, scientific and technical services	4.9		11.7		0.4		0.4	
20	Travel and tourism services, investigation and security services, building maintenance services, landscaping services	0.8		9.0		0.4		2.4	

Source: Prepared by the authors.

Figure XII.1 shows the relationship between income distribution and the size of each sector measured by production value, considering the percentage share of sectoral VA over the total (VA_j/VA_tot) and the share of compensations as part of that sector's VA (Com_j/VA_j). In general, there is no clear relationship between both variables. However, if limited to the sectors at the upper positions, the relationships can be more clearly appreciated. The five sectors (1, 4, 11, 12 and 22) with the highest VA (already seen in table XI.1) are shown in green. An inverse ratio exists between a sector's size and compensation's share in its VA. In other words, the sectors with the highest value added have the lowest compensation shares related to sectoral VA (except for sector 22).

Figure XII.1
Value added (VA) and share of compensation of employees (Com) in VA



Source: Prepared by the authors.

However, the opposite is observed in sectors where the income distribution is relatively more favourable to compensations: value added and the share of compensations in the sectoral VA are directly related (for sectors 22, 21, 18, 9 and 6). It should be noted that sector 22 is also in this group. Three of these sectors belong to the tertiary industry[8] (21, 22 and 18) and two sectors to the secondary industry (9 and 6). Except for sector 18, all are labour-intensive and target the domestic market.

Production destination. At the aggregate level, the share of intermediate consumption (IC) in gross production value (GPV) is 27%, and the other 73% is final domestic demand (FDD). Most sectors have a percentage share of intermediate consumption under 50% at the sectoral level. The FDD share of a very large group is over 50% on average. As for the domestic intermediate consumption of each sector related to GPVd, the travel and tourism services (78.2%) and electricity production and supply (60.5%) sectors stand out. Exports of lodging services account for 13.6% of GPVd, whereas publishing services make up 12.4%. Gross capital formation is mostly construction (82.5%).

When considering total GPV and exports, five sectors have the highest production value (1, 4, 11, 12 and 22), three of which (12*, 4* and 22*) also report the highest export value. For instance, the sectors with the highest export capacity are wholesale and retail trade (12), with 16.9% of GPV and 24.0% of exports, and food products and beverages (4), with 9.3% and 17.0%, respectively. Agriculture (1) accounts for 16.6% of GPV but merely 6.7% of exports. This reflects that it does not target the external market except for specific products such as cocoa beans, essential oils and mangoes. In the 1960s, sugar and coffee were the principal exports. At the sectoral level, the importance of exports can be measured by two indicators:

- **Export scale** is defined as the exports of the i-nth industry divided by total exports (X_i/X_tot).
- **Export intensity** is defined as the exports of the i-nth industry over the GPV of the i-nth (X_i/VBP_i).

The sectors with the largest exportations in absolute terms (export scale) do not always send a significant portion of their production to the external market (export intensity). One exception is the apparel sector (5), which predominantly manufactures for export.

Exports and income distribution. The sectoral structure of the functional distribution of income and the sectoral GPV-related exports is presented below. The sectors with the highest export intensity (codes 4-8, 15, 16 and 23) clearly show a positive relation between X_i / GPV_i and Com_i / VA_i. Employees working in sectors that send large production quotas to the world market tend to accrue higher incomes regarding VA. However, there seems to be little clear relation between the two variables in the sectors with the highest share of employee compensations in VA (codes 6, 9, 18, 21, 22).

Export intensity (X_i/GPV_i) may be unrelated to the export scale (X_i/X_tot). For example, wholesale and retail trade (12) has the most significant percentage of exports but is not among the first five sectors with the highest export intensity. Inversely, publishing services (16), the second sector by export intensity, is not among the principal export sectors in value.

3. Gross production value and value added induced by final demand components

Haiti's economic structure using HIOT is composed of four stages. First, a general description of the Leontief inverse matrix. Second, an analysis of dispersion power $U_j^{b^L}$ (sum by columns) and dispersion sensitivity indicators $U_i^{c^L}$ (sum by rows) using the Leontief inverse matrix. Third, a general description of the Ghosh inverse matrix. Fourth and last, the indicators for backward b_j^L and forward linkages c_i^G, which respectively correspond to the sum by columns in the Leontief inverse matrix and the sum by rows in the Ghosh inverse matrix.

By definition, the general structure of the Leontief inverse matrix is $(I-A)^{-1} \equiv L \equiv [l_{ij}]$. Table XII.3 shows matrix L with 23×23 multipliers l_{ij}. The rows at the end and the columns on the right have indicators that summarize some aggregate characteristics. Coefficients $l_{i,j}$ may be interpreted as the

[8] The "industry" category means "large activity sector" as per the traditional classification of primary, secondary and tertiary activities.

increase in the production value of the i-nth industry induced by an increase of one monetary unit in the production destined to meet the final demand of the j-nth industry.[9] For example, value $l_{1,3} = 0.02$ shows that if sales of the "other extractive activities" sector (3) increase by one dollar to satisfy final demand, a production (indirect in this case) of two cents will be induced in the agriculture sector (1). These 0.02 dollars are the value of the inputs that the economy requires to produce one dollar's worth of the production of sector 3 for domestic demand.

Elements on the main diagonal, $l_{ii} = l_{jj}$. The elements of this matrix $l_{1,1}, l_{2,2}, \dots, l_{23,23}$ have the coefficients with the highest value. All coefficients are more than or equal to one because each element on the diagonal is: $l_{j,j} = 1 + a_{j,j} + a_{j,j}^{(2)} + \cdots$. The unit in $l_{j,j}$ corresponds to the value of the final demand produced by the j-nth sector. The infinite sum of $l_{j,j} - 1 = a_{j,j} + a_{j,j}^{(2)} + \cdots$ represents the inputs that the j-nth sector must produce, directly (as its own supplier) and indirectly (as a supplier for other suppliers), for the sector to produce one monetary unit destined for final demand. The differences in these coefficients $l_{ii} = l_{jj}$ appear in different shades of red in table XII.3.

The sectors with the highest coefficients $l_{ii} = l_{jj}$ are telecommunication services (17) with 1.22 and agriculture (1) with 1.16. These coefficients mean that when those sectors satisfy one dollar of final demand, they simultaneously fulfil a demand of 22 and 16 cents, respectively, for indirect inputs for the rest of the economy. The average coefficient $l_{ii} = l_{jj}$ is 1.03, which means that, except for sectors 17 and 1, the other sectors do not provide relevant inputs for themselves or their direct or indirect suppliers. In conclusion, Haiti's economy does not require many final or intermediate inputs from its domestic production.[10]

Elements outside the main diagonal $l_{i \neq j}$. Again considering the Leontief inverse matrix (table 3), the elements outside the diagonal are now be examined: $l_{i \neq j}$. These 484 coefficients represent the multiplier effects of one sector's demand j over all the other sectors without considering the production meant to satisfy the final demand of that sector. These coefficients are smaller than the elements in the main diagonal because they $l_{i \neq j} = a_{i \neq j} + a_{i \neq j}^{(2)} + \cdots$ do not reach 1. Most coefficients $l_{i \neq j}$ are near zero, and few values have a significant magnitude.

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[9] Given the linearity of the model, the same indicator tells the value of the production of the i-nth industry induced by the production for the final demand of one monetary unit's worth of the j-nth industry.

[10] Unlike other Latin American economies, the Haitian economy is characterized by a very small level of import substitution. Although some steps in this direction were taken between the 1950s and the 1970s, no further advancement was made because of indiscriminate trade liberalization (in the 1980s), a lack of policies supporting the domestic industry that manufactures intermediate or final goods (instead, that industry is burdened with tariffs and duties) and the transformation process of primary goods (agriculture), among other reasons.

Table XII.3
Data descriptors in the Leontief inverse matrix

		Leontief inverse matrix L	Primary			Secondary								Tertiary												Sum per row	Diagonal	l_{ii}/c_i^L	$c_i^L - l_{ii}$	$\frac{c_i^L - l_{ii}}{c_i^L}$	Dispersion sensitivity
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	c_i^L	l_{ii}				$U_i^{c^L} = \frac{c_i^L}{nc^L}$
Primario	1	Agriculture, livestock and forestry	1.16	0.00	0.02	0.36	0.04	0.25	0.11	0.04	0.08	0.04	0.15	0.01	0.05	0.04	0.13	0.04	0.03	0.02	0.03	0.01	0.04	0.03	0.05	2.73	1.16	43%	1.56	57%	1.964
	2	Fisheries and aquaculture	0.01	1.00	0.00	0.02	0.00	0.02	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.09	1.00	92%	0.09	8%	0.785
	3	Other extractive activities	0.01	0.00	1.00	0.02	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.08	1.00	93%	0.08	7%	0.777
Secundario	4	Food, beverages and tobacco	0.01	0.00	0.00	1.03	0.03	0.04	0.06	0.03	0.10	0.03	0.04	0.01	0.05	0.03	0.09	0.05	0.01	0.01	0.02	0.00	0.03	0.03	0.07	1.76	1.03	58%	0.73	42%	1.267
	5	Clothing, textiles and leather goods	0.01	0.00	0.00	0.02	1.02	0.02	0.04	0.02	0.06	0.02	0.02	0.00	0.03	0.01	0.05	0.03	0.00	0.00	0.01	0.00	0.02	0.02	0.04	1.43	1.02	71%	0.41	29%	1.033
	6	Wood, articles of wood and cork, other products	0.00	0.00	0.00	0.00	0.01	1.01	0.01	0.00	0.02	0.00	0.01	0.00	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	1.12	1.01	90%	0.11	10%	0.808
	7	Chemicals	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.02	1.00	98%	0.02	2%	0.736
	8	Other prod. min.no met., prod. basic metallurgical, metal articles	0.01	0.00	0.00	0.01	0.01	0.02	0.03	1.01	0.04	0.01	0.02	0.00	0.02	0.01	0.04	0.02	0.00	0.00	0.01	0.00	0.01	0.01	0.03	1.32	1.01	77%	0.31	23%	0.953
	9	Furniture, other manufactures, rep. and inst. of maq. and equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.01	1.00	99%	0.01	1%	0.729
	10	Electricity, gas, steam, distrib., capt. and trat. of water	0.01	0.00	0.00	0.01	0.01	0.05	0.03	0.13	0.07	1.02	0.02	0.01	0.01	0.00	0.02	0.04	0.01	0.00	0.02	0.01	0.01	0.03	0.01	1.51	1.02	67%	0.50	33%	1.092
	11	Construction	0.01	0.00	0.00	0.01	0.00	0.02	0.01	0.02	0.00	0.03	1.03	0.01	0.00	0.01	0.01	0.00	0.01	0.01	0.14	0.01	0.00	0.01	0.00	1.36	1.03	76%	0.33	24%	0.977
Terciario	12	Commerce	0.05	0.01	0.02	0.11	0.06	0.11	0.11	0.06	0.15	0.11	0.09	1.04	0.10	0.12	0.15	0.09	0.10	0.06	0.04	0.02	0.07	0.06	0.11	2.83	1.04	37%	1.79	63%	2.043
	13	Transport	0.02	0.00	0.01	0.01	0.01	0.02	0.02	0.02	0.01	0.03	0.01	0.05	1.01	0.01	0.01	0.02	0.02	0.01	0.04	0.01	0.01	0.05	0.01	1.43	1.01	70%	0.42	30%	1.031
	14	Postal services and courier	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.03	1.00	97%	0.03	3%	0.743
	15	Hotels and restaurants	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	1.00	0.01	0.01	0.02	0.00	0.01	0.14	0.01	0.00	1.22	1.00	82%	0.22	18%	0.880
	16	Publishing, cinematographic, radio, television, music recordings	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	1.01	1.00	99%	0.01	1%	0.731
	17	Telecommunications and information services	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	1.22	0.00	0.01	0.02	0.02	0.02	0.00	1.37	1.22	89%	0.15	11%	0.987
	18	Financial services	0.01	0.00	0.12	0.01	0.00	0.01	0.03	0.01	0.02	0.05	0.01	0.01	0.06	0.00	0.01	0.01	0.01	1.04	0.02	0.04	0.01	0.02	0.00	1.50	1.04	69%	0.46	31%	1.081
	19	Act. inmob., legal and accounting, arq. and eng., other professional acts	0.01	0.00	0.03	0.01	0.01	0.06	0.05	0.07	0.01	0.03	0.01	0.03	0.02	0.03	0.01	0.01	0.03	0.09	1.01	0.07	0.02	0.02	0.01	1.66	1.01	61%	0.64	39%	1.195
	20	Travel agency and serv. related, inv. and sec.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.04	0.01	0.02	0.01	0.05	0.00	0.01	0.05	0.03	0.01	1.01	0.01	0.01	0.01	1.29	1.01	78%	0.29	22%	0.932
	21	Business services, admin. public and defence; social security	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.01	1.00	99%	0.01	1%	0.729
	22	Education, health, and others. social services	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	1.01	0.00	1.08	1.01	93%	0.07	7%	0.776
	23	Associations, computer rep. and art. personal, other acts of personal services	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.04	1.00	96%	0.04	4%	0.751
		Sum by columns, b_j^L	1.34	1.02	1.22	1.63	1.22	1.65	1.53	1.44	1.58	1.42	1.42	1.21	1.38	1.34	1.56	1.38	1.51	1.32	1.38	1.21	1.43	1.33	1.37	1.39	1.03	80%	0.36	20%	
		Diagonal, l_{jj}	1.16	1.00	1.00	1.03	1.02	1.01	1.00	1.01	1.00	1.02	1.03	1.04	1.01	1.00	1.00	1.00	1.22	1.04	1.01	1.01	1.00	1.01	1.00	1.03					
		l_{jj}/b_j^L	87%	98%	82%	63%	84%	61%	65%	71%	63%	72%	72%	86%	73%	75%	64%	72%	81%	79%	73%	83%	70%	75%	73%	75%	Averages				
		Add elements outside the diagonal, $b_j^L - l_{jj}$	0.18	0.02	0.22	0.61	0.20	0.65	0.53	0.42	0.58	0.40	0.39	0.17	0.38	0.34	0.56	0.38	0.29	0.28	0.37	0.21	0.43	0.33	0.37	0.36					
		$(b_j^L - l_{jj})/b_j^L$	13%	2%	18%	37%	16%	39%	35%	29%	37%	28%	28%	14%	27%	25%	36%	28%	19%	21%	27%	17%	30%	25%	27%	25%					
		Dispersion power $U_j^{b^L} = \frac{b_j^L}{nb^L}$	0.968	0.738	0.882	1.177	0.877	1.192	1.105	1.035	1.136	1.024	1.021	0.873	0.998	0.964	1.124	0.996	1.089	0.949	0.995	0.875	1.032	0.961	0.989						

Source: Prepared by the authors.

Coefficients of greater magnitude appear in green. Three of the highest coefficients correspond to the agriculture and forestry (1) row: 0.36 for food products, beverages and tobacco, 0.25 for wood products and 0.15 for construction, meaning that sector (1) is a relevant supplier of inputs, particularly for those three sectors, and has the potential to be so for the entire economy.[11]

a) A study of the rows in the Leontief inverse matrix

The Rasmussen dispersion sensitivity indicator $U_i^{c^L}$ is built by summing rows c_i^L. Highlighted in shades of green and red, a clear pattern appears on matrix L: few sectors have relatively high coefficients on the rows, meaning that they are sectors that play a significant role as suppliers for several other sectors of the economy. These are called star suppliers. Focusing on the column to the right of the matrix, the "Sum by rows column c_i^L," it may be observed that $c_i^L = \sum_{j=1}^{n} l_{ij}$. The three sectors with the highest value coefficients are[12] trade (12) at 2.83, agriculture (1) at 2.73 and food products, beverages and tobacco (4) at 1.76. Column l_{ii}/c_i^L indicates that between 37% and 99% of the value of the sum by rows is constituted by an element of the diagonal, the average being 80%. This indicates a low level of intersectoral linkages.

b) A study of the columns in the Leontief inverse matrix

Similar to the sum by rows, the Rasmussen dispersion power indicator $U_j^{b^L}$ is obtained by summing columns b_j^L. Coefficients are near 1 in the columns, unlike the rows (where almost all the coefficients are higher than 1). The sum by columns, shown below the matrix, corresponds to the production multiplier or the sectoral indicator of backward linkages b_j^L. Different shades of blue indicate the sum by columns, which is more dispersed than the sum by rows c_i^L.

With a value of $b_6^L = 1.65$, the wood products (6) sector has the most significant number of backward linkages. This value indicates that when the final demand of this sector increases by 1 dollar, it induces a total production of 1.65 dollars in the economy as a whole. Of these 1.65 dollars, one goes to the final demand of sector 6, and the rest (0.65) goes to the direct and indirect inputs needed to produce that dollar of final demand. By contrast, the fishing and aquaculture sector (2) has the lowest value (1.02). It is followed by the trade sector (12), where b_j^L=1.21. Of the five sectors with the highest values in b_j^L, four belong to the secondary industry and one to the tertiary industry.

c) Rasmussen dispersion power $U_j^{b^L}$ and dispersion sensitivity $U_i^{c^L}$ indicators

Under this method, it was found that ten sectors in the sum by columns and eight in the sum by rows are higher than average. This helps determine the key sectors of Haiti's economy in this taxonomy. The sectors with the highest dispersion power coefficients are wood products (1.19), food products, beverages and tobacco (1.18) and furniture and related products (1.13). In turn, the sectors with a dispersion sensitivity larger than 1 are trade (2.04), agriculture (1.96) and food products, beverages and tobacco (1.27). As observed, the latter and the electricity and gas supply sectors are the only ones with a coefficient over 1. Also, according to the typology, they are the only key sectors. Figure XII.2 reveals a slightly negative correlation. It shows that only two key sectors (food products, beverages and tobacco and electricity and gas) are simultaneously over average $U_j^{b^L}, U_i^{c^L} > 1$.

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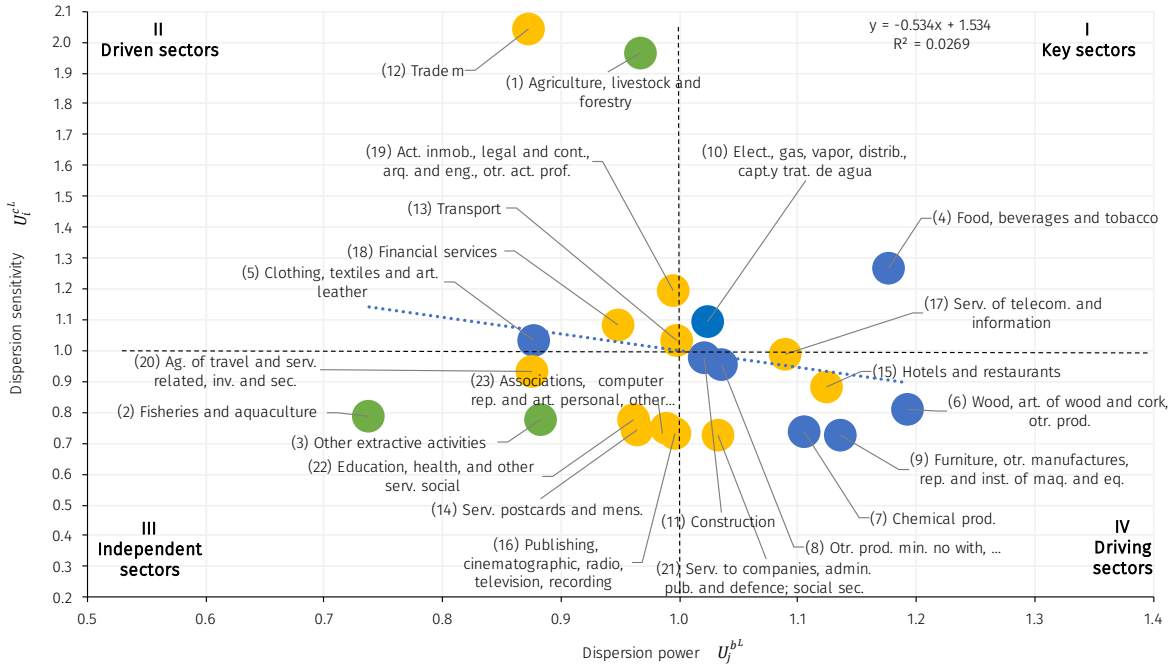
[11] This depends on the characteristics of the Leontief inverse matrix and the interaction between the matrix and the final demand vector.

[12] When the coefficients outside the diagonal were analysed above $l_{i \neq j}$, it was pointed out that sector 1, agriculture, is critical because it has three of the four coefficients with the highest value.

Figure XII.2
Classification of sectors according to Rasmussen sensitivity indicators



Source: Prepared by the authors.

The first sector is among the first three places according to both indicators, and the second is classified as a key sector with values that are almost borderline: $U_j^{b^L} = 1.024$ and $U_i^{c^L} = 1.092$. Also, there are eight driving sectors with high values for $U_j^{b^L}$ and values $U_i^{c^L} < 1$, of which five are manufactures and three are services. There is another set of six driven sectors with high $U_i^{c^L}$ and values $U_j^{b^L} < 1$: one belongs to the primary, four to the tertiary and one to the secondary industries. Finally, the Haitian economy has seven independent sectors with indicators $U_j^{b^L}, U_i^{c^L} < 1$. None of these is a manufacturer: two are primary (sectors 2 and 3), and the other five belong to services (14, 16, 20, 22 and 23). By definition, the general structure of the Ghosh inverse matrix is: $(I - B)^{-1} \equiv G \equiv [g_{ij}]$. The Ghosh inverse matrix $G \equiv [g_{ij}]$ is similar to the Leontief inverse matrix $L \equiv [l_{ij}]$.

The coefficients $g_{i,j}$ may be interpreted as the increase in the production value of the j-nth industry induced by an increase of one monetary unit in the demand for inputs in the i-nth sector.[13] Table XII.4 shows that the value of $g_{20,12} = 0.34$ means that a 1-dollar increase in the tourism and travel-related services sector (20) induces the production (indirect in this case) of 34 cents in the trade sector (12). These 0.34 dollars come from the sales that the whole of the economy has to make to meet the additional production of one dollar in sector 20.

Elements in the main diagonal, $l_{ii} = l_{jj}$. The elements in the main diagonal of the Leontief and Ghosh inverse matrices are the same: $l_{ii} = g_{ii}$. The most important results are the following:

- The elements in the main diagonal are equal to or greater than 1.
- In this case, the sectors with the largest coefficients in g_{ii} are telecommunication and information services (17) with 1.22 and agriculture (1) with 1.16. These coefficients indicate that

[13] Given the linearity of the model, the same indicator is defined as the production value of the j-nth industry induced by the production stemming from one monetary unit's worth of production of the i-nth industry value added.

when these sectors purchase inputs for 1 dollar, they are simultaneously selling 22 and 16 cents, respectively, to cover the intermediate consumption of the entire economy.

- Most coefficients have values under 1.04 and near 1, so the average of the coefficients g_{ii} is 1.03. This means that, except for sectors 17 and 1, the impact made by production is not that relevant for these sectors or the direct and indirect customers.

Elements outside the main diagonal $g_{i\neq j}$ in the Ghosh inverse matrix. These elements provide information on the multiplier effects, that is, on the increase in a sector's supply i caused by an increase in the primary inputs of all the other sectors of the economy.

Outside the main diagonal, g_{ii}, other coefficients are usually lower. In general, most coefficients $g_{i\neq j}$ approach zero, and very few reach a significant value. The intensity of the shades of green shows the coefficients with the greatest magnitudes. As in the Leontief inverse matrix, an explaining factor is that coefficients $g_{i\neq j} = b_{i\neq j} + b_{i\neq j}^{(2)} + \cdots$ do not contain a unit, as elements of the main diagonal do. The three sectors with the highest coefficients in the Ghosh inverse matrix are trade (12) at 0.34, food products, beverages and tobacco (4) at 0.24 and other non-metallic mineral products (8) at 0.22.

d) A study of the rows in the Ghosh inverse matrix

The rows in the Ghosh inverse matrix provide information on the indirect or direct production that different sectors require to satisfy the demand for primary inputs. This indicator gives information on forward linkages, albeit non-normalised. When analysing the Ghosh inverse matrix by rows, a pattern of relatively high coefficients emerges.

In table 4, the sum by rows column $c_i^G = \sum_{i=1}^{n} g_{ij}$ identifies (in different shades of blue) the coefficients of greater magnitude; a wide range of tones can be observed. On the other hand, the administrative and support services (21) and education and health (22) sectors show the lowest values at 1.01 and 1.04, respectively. Finally, when studying the composition of the forward linkages, or sum by rows of Ghosh inverse matrix, c_i^G, the ratio of g_{ii} in c_i^G is 74% on average, which indicates a low linkage level outside the sector.

e) A study of the columns in the Ghosh inverse matrix

Matrix G also has shades of green that play a different pattern along the columns. While a few sectors systematically show high coefficients, other sectors display coefficients that approach zero. Unlike the analysis by rows, the columns reveal a higher concentration of sectors with low coefficients and fewer sectors with high coefficients.

The row below the matrix G, sum by columns b_j^G, confirms the abovementioned pattern, as most sectors show low levels and a few have high magnitudes. For instance, the sum by columns b_j^G in three sectors ranges from 2.06 to 2.28, followed by two sectors with values between 1.64 and 2.06. The five sectors with the highest values in indicator b_j^G are14 trade (12), 2.26; agriculture (1), 2.22; food products, beverages and tobacco (4), 2.12; education and health (22), 1.96; and construction (11), 1.65.

Finally, the analysis of the composition of the sum by columns b_j^G gives results very similar to the sum by rows c_i^G. For the sum by columns b_j^G, the ratio of the elements on the diagonal g_{jj} is, on average, 77% (compared to $g_{ii}/c_i^G = 74\%$). In conclusion, the analysis with the Ghosh method confirms that there are very few sectors with forward linkages or that are capable of driving a greater productive linkage of the Haitian economy by supplying inputs for other sectors.

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[14] The importance of the trade (12) and the agriculture and forestry (4) sectors were already pointed out when describing coefficients outside the diagonal, $g_{i\neq j}$. The two principal coefficients are in their columns.

Table XII.4
Data descriptors in the Ghosh inverse matrix

		Ghosh inverse matrix *G*	Primary			Secondary								Tertiary												Sum per row	Diagonal			
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	c_i^G	g_{ii}	$\frac{g_{ii}}{c_i^G}$	$c_i^L - g_{ii}$	$\frac{c_i^G - g_{ii}}{c_i^G}$
Primario	1	Agriculture, livestock and forestry	1.16	0.00	0.00	0.20	0.01	0.02	0.00	0.01	0.00	0.01	0.07	0.01	0.01	0.00	0.04	0.00	0.00	0.00	0.01	0.00	0.01	0.02	0.00	1.59	1.16	73%	0.43	27%
	2	Fisheries and aquaculture	0.20	1.00	0.00	0.24	0.01	0.03	0.00	0.01	0.00	0.00	0.08	0.01	0.01	0.00	0.03	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00	1.64	1.00	61%	0.64	39%
	3	Other extractive activities	0.18	0.00	1.00	0.22	0.01	0.02	0.00	0.01	0.00	0.00	0.07	0.01	0.01	0.00	0.03	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	1.59	1.00	63%	0.59	37%
Secundario	4	Food, beverages and tobacco	0.02	0.00	0.00	1.03	0.02	0.01	0.00	0.01	0.00	0.01	0.03	0.01	0.03	0.00	0.04	0.00	0.00	0.00	0.01	0.00	0.01	0.03	0.01	1.28	1.03	80%	0.25	20%
	5	Clothing, textiles and leather goods	0.02	0.00	0.00	0.03	1.02	0.01	0.00	0.01	0.00	0.01	0.03	0.01	0.03	0.00	0.04	0.00	0.00	0.00	0.01	0.00	0.01	0.03	0.01	1.28	1.02	80%	0.26	20%
	6	Wood, articles of wood and cork, other products	0.02	0.00	0.00	0.03	0.02	1.01	0.00	0.01	0.00	0.01	0.03	0.01	0.03	0.00	0.04	0.00	0.00	0.00	0.01	0.00	0.01	0.03	0.01	1.28	1.01	79%	0.27	21%
	7	Chemicals	0.02	0.00	0.00	0.03	0.02	0.01	1.00	0.01	0.00	0.01	0.03	0.01	0.03	0.00	0.04	0.00	0.00	0.00	0.01	0.00	0.01	0.03	0.01	1.28	1.00	78%	0.28	22%
	8	Other prod. min.no met., prod. Basic metallurgical, metal articles	0.02	0.00	0.00	0.03	0.02	0.01	0.00	1.01	0.00	0.01	0.03	0.01	0.03	0.00	0.04	0.00	0.00	0.00	0.01	0.00	0.01	0.03	0.01	1.28	1.01	79%	0.27	21%
	9	Furniture, other manufactures, rep. and inst. of maq. and equipment	0.03	0.00	0.00	0.03	0.02	0.01	0.00	0.02	1.00	0.05	0.04	0.15	0.04	0.01	0.03	0.00	0.05	0.03	0.02	0.00	0.03	0.05	0.01	1.63	1.00	61%	0.63	39%
	10	Electricity, gas, steam, distrib., capt. and trat. of water	0.06	0.00	0.00	0.05	0.03	0.03	0.00	0.22	0.00	1.02	0.05	0.06	0.02	0.00	0.05	0.00	0.01	0.00	0.03	0.00	0.02	0.11	0.00	1.78	1.02	57%	0.76	43%
	11	Construction	0.02	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.01	1.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.02	0.00	1.23	1.03	83%	0.20	17%
Terciario	12	Commerce	0.05	0.00	0.00	0.06	0.02	0.01	0.00	0.01	0.00	0.02	0.04	1.04	0.03	0.00	0.04	0.00	0.01	0.01	0.01	0.00	0.01	0.03	0.01	1.42	1.04	73%	0.38	27%
	13	Transport	0.08	0.00	0.00	0.02	0.01	0.01	0.00	0.02	0.00	0.01	0.01	0.16	1.01	0.00	0.01	0.00	0.01	0.01	0.04	0.00	0.01	0.09	0.00	1.49	1.01	67%	0.49	33%
	14	Postal services and courier	0.08	0.00	0.00	0.02	0.01	0.01	0.00	0.02	0.00	0.01	0.01	0.16	0.01	1.00	0.01	0.00	0.01	0.01	0.04	0.00	0.01	0.09	0.00	1.49	1.00	67%	0.49	33%
	15	Hotels and restaurants	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.00	1.00	0.00	0.00	0.01	0.00	0.00	0.10	0.02	0.00	1.17	1.00	86%	0.17	14%
	16	Publishing, cinematographic, radio, television, music recordings	0.04	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.01	0.00	0.01	1.00	0.14	0.00	0.02	0.01	0.02	0.06	0.00	1.36	1.00	74%	0.36	26%
	17	Telecommunications and information services	0.03	0.00	0.00	0.02	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.02	0.01	0.00	0.01	0.00	1.22	0.00	0.03	0.01	0.03	0.08	0.00	1.49	1.22	82%	0.27	18%
	18	Financial services	0.05	0.00	0.04	0.03	0.01	0.01	0.00	0.02	0.00	0.04	0.02	0.07	0.12	0.00	0.02	0.00	0.01	1.04	0.05	0.01	0.01	0.08	0.00	1.65	1.04	63%	0.60	37%
	19	Act. inmob., legal and accounting, arq. and eng., other professional acts	0.03	0.00	0.00	0.02	0.01	0.02	0.00	0.06	0.00	0.02	0.01	0.12	0.02	0.00	0.01	0.00	0.01	0.05	1.01	0.01	0.02	0.03	0.00	1.47	1.01	69%	0.46	31%
	20	Travel agency and serv. related, inv. and sec.	0.04	0.00	0.00	0.03	0.01	0.01	0.00	0.03	0.00	0.11	0.05	0.34	0.07	0.02	0.02	0.00	0.12	0.08	0.04	1.01	0.05	0.09	0.01	2.14	1.01	47%	1.13	53%
	21	Business services, admin. public and defence; social security	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.01	1.00	99%	0.01	1%
	22	Education, health, and others. social services	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	1.01	0.00	1.04	1.01	97%	0.03	3%
	23	Associations, computer rep. and art. personal, other acts of personal services	0.03	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.01	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.02	1.00	1.12	1.00	89%	0.12	11%
		Sum by columns, b_j^G	2.22	1.01	1.06	2.12	1.25	1.21	1.03	1.52	1.01	1.34	1.65	2.28	1.53	1.04	1.55	1.01	1.61	1.26	1.47	1.06	1.38	1.96	1.12	1.42	1.03	74%	0.40	26%
		Diagonal, g_{jj}	1.16	1.00	1.00	1.03	1.02	1.01	1.00	1.01	1.00	1.02	1.03	1.04	1.01	1.00	1.00	1.00	1.22	1.04	1.01	1.01	1.00	1.01	1.00	1.03				
		g/b_j^G	52%	99%	94%	48%	81%	83%	97%	67%	99%	76%	62%	46%	66%	96%	65%	99%	76%	82%	69%	94%	72%	51%	89%	77%		Averages		
		Add elements outside the diagonal, $b_j^G - g_{jj}$	1.05	0.01	0.06	1.10	0.23	0.21	0.03	0.50	0.01	0.32	0.63	1.24	0.53	0.04	0.55	0.01	0.39	0.22	0.46	0.06	0.38	0.95	0.12	0.40				
		$(b_j^G - g_{jj})/b_j^G$	48%	1%	6%	52%	19%	17%	3%	33%	1%	24%	38%	54%	34%	4%	35%	1%	24%	18%	31%	6%	28%	49%	11%	23%				

Source: Prepared by the authors.

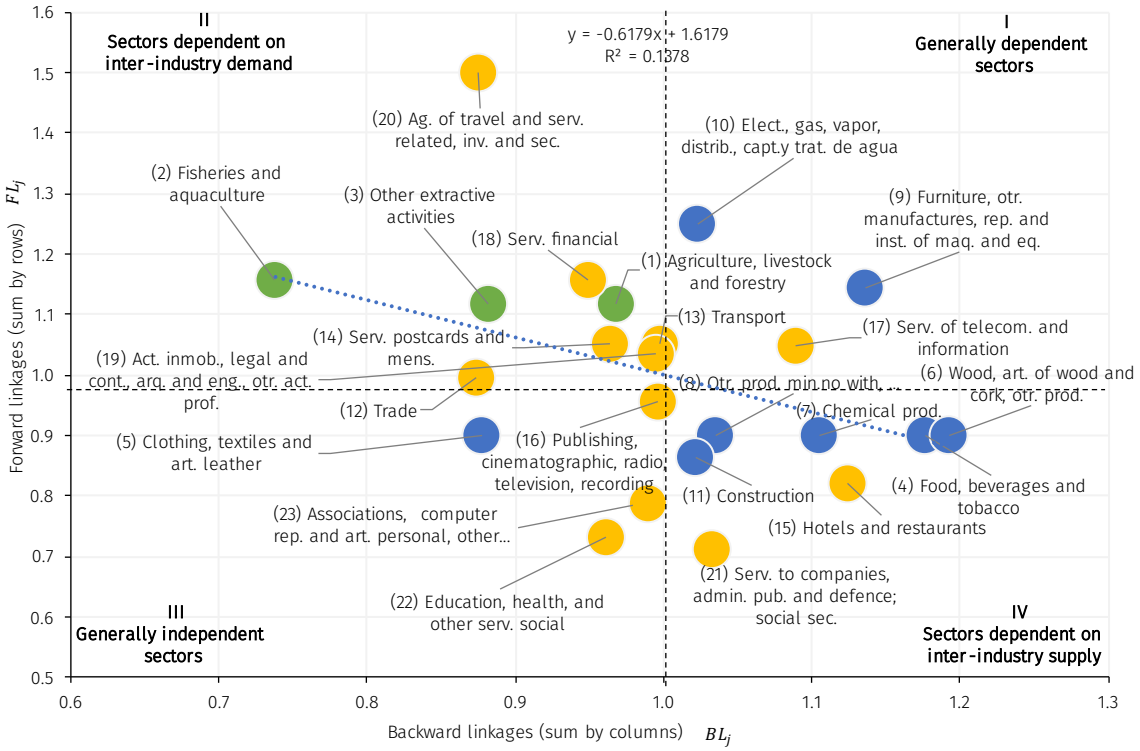
f) Backwards BL_j and forward FL_i linkage indicators

This section ends with a classification of the economic sectors in the Haitian economy to identify key sectors based on the normalised backward $BL_j \equiv \frac{b_j^L}{\bar{b}^L}$ and forward $FL_i \equiv \frac{c_i^G}{\bar{g}_{ij}}$ linkage indicators.

The results reveal the existence of ten to eleven sectors whose sums of rows and columns are above average, thus helping the economy with several key sectors, according to the taxonomy.[15] However, the correlation between both indicators needs to be high for this to occur.[16] Figure XII.3 reveals a slightly negative correlation. There are very few key sectors, that is, sectors in which both the sum by rows and the sum by columns are above average, $BL_j, FL_i > 1$. Such key sectors are mentioned below. Two of them are part of the manufacturing industry (furniture and related products (9) and electricity and gas (10)), and another is in the services industry (telecommunications (17)).

Figure XII.3 also shows that the Haitian economy has five independent sectors, that is, sectors with forward and backward linkages that are below average ($BL_j, FL_i < 1$). One is the manufacturing industry (apparel, textile and leather products (5)) and the other four are services (sectors 12, 16, 22 and 23). Except for the publishing and film production sectors (16), the other sectors are in the last positions for both indicators. Most sectors in the Haitian economy depend on inter-industry demand (eight in total). They have few backward and forward linkages (quadrant II) or depend on inter-industry supply (quadrant IV); they have many backward but few forward linkages.

Figure XII.3
Classification of sectors according to indicators for normalized forward and backward linkages



Source: Prepared by the authors.

[15] See details of the taxonomy in annex.
[16] That is not so: an ad hoc test, not shown here, produced a slightly negative correlation.

B. Structural analysis of trade between Haiti, Central America, the Dominican Republic and Mexico (horizontal gaps)

1. Stylized facts of the economies based on the 2011 regional IOT

Before comparing the productive structures of the region's nine countries, this study first explores the national productive structure of Haiti's economy using the regional table (CAHIOT). CAHIOT differs from HIOT because sectors are aggregated[17] , and some have rows and columns equal to zero. In order to simplify the exposition of the Haitian economy's productive structure and its comparison to other economies, this section does not repeat how to read the coefficients in the Leontief and Ghosh inverse matrices or the indicators for rows and columns (see section A).

The following list of CAHIOT sectors has rows and columns that equal zero in HIOT, namely matrices A^{hh} and B^{hh}, since the country does not report production[18] in the following sectors: mining and energy (3), coal, oil and nuclear fuel (8), pharmaceutical products (10), machinery and equipment (12), motor vehicles (13), aerospace industry (14), other transport equipment (15) and other manufactures (16).The above implies that there will be zeros in the Leontief$(\boldsymbol{I}-\boldsymbol{A})$ and Ghosh $(\boldsymbol{I}-\boldsymbol{B})$ inverse matrices but not on their main diagonal, which will be equal to 1. This also means there is no indicator for linkages or dispersion in either matrix (though the matrices for those sectors have a number 1 (one)) because Haiti has no domestic production of the commodities associated with those sectors.

General characteristics of the Leontief inverse matrices $L^{hh} \equiv [l_{ij}^{hh}]$ for Haiti as per CAHIOT. Table XII.5 shows matrix L^{hh} as estimated for comparison with CAHIOT. The postal services (20) and agriculture and forestry (1) sectors appear on the diagonal with the highest magnitudes, with 1.19 and 1.17, respectively. Despite aggregation, these results are consistent with HIOT.

As in HIOT, the elements outside the main diagonal in CAHIOT feature the other services (23) and agriculture and forestry (1) sectors, whose rows have the highest coefficients. This may be corroborated by the sum by rows c_i^L, where values are 2.52 and 2.44, respectively, which means that these sectors are relevant suppliers for other sectors. Most other sectors in CAHIOT show considerably lower sum by rows, and the concentration pattern repeats with the "star" suppliers.

When analysing the information by columns, the wood products sector has the largest sum (1.67). This result is also consistent with HIOT, where the same sector appeared with the highest sum by columns. The other three sectors have sums that add up very closely: food products and beverages (5), 1.65, other manufacturing industries (16), 1.59; and chemical products (9), 1.55. The interpretation of the sum by columns or production multipliers induced by the final demand is similar to that of the Rasmussen dispersion power indicator.

a) General characteristics of Ghosh inverse matrices $G^{hh} \equiv [g_{ij}^{hh}]$ for Haiti as per CAHIOT

Table XII.6 shows the results of matrix G^{hh} based on CAHIOT. In this case, the Leontief L^{hh} and Ghosh G^{hh} inverse matrices share the same elements on the main diagonal.

[17] Although aggregated in 23 sectors, these do not necessarily coincide with HIOT descriptors.

[18] Eventually, these sectors may be subsumed into others for confidentiality reasons, and it may be impossible to disaggregate information when referring to a small number of enterprises or productive entities.

Table XII.5
Haiti: statistical descriptors in Leontief inverse matrix-CAHIOT

		Leontief inverse matrix L $L \equiv (I - A^h)^{-1}$	Primary				Secondary												Tertiary					Sum by rows c_i^L	Diagonal l_{ii}	l_{ii}/c_i^L	$c_i^L - l_{ii}$	$\frac{c_i^L - l_{ii}}{c_i^L}$	Dispersion sensitivity $U_i^{c^L} = \frac{c_i^L}{n\bar{c}^L}$
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23						
Primary	1	Agriculture, livestock and forestry	1.17	0.00	0	0.02	0.36	0.04	0.25	0	0.12	0	0.04	0	0	0	0	0.08	0.04	0.15	0.05	0.03	0.02	0.03	0.04	2.44	1.17	48%	1.28	52%	1.735
	2	Fisheries and aquaculture	0.01	1.00	0	0.00	0.02	0.00	0.02	0	0.01	0	0.00	0	0	0	0	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	1.08	1.00	93%	0.08	7%	0.767
	3	Other extractive activities	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
	4	Food, beverages and tobacco	0.01	0.00	0	1.00	0.02	0.00	0.01	0	0.01	0	0.00	0	0	0	0	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	1.07	1.00	94%	0.07	6%	0.759
Secondary	5	Clothing, textiles and leather goods	0.01	0.00	0	0.00	1.03	0.04	0.04	0	0.07	0	0.03	0	0	0	0	0.10	0.03	0.04	0.05	0.01	0.01	0.02	0.03	1.52	1.03	68%	0.49	32%	1.079
	6	Wood, articles of wood and cork, other products	0.01	0.00	0	0.00	0.02	1.02	0.02	0	0.04	0	0.02	0	0	0	0	0.06	0.02	0.02	0.03	0.01	0.00	0.01	0.02	1.30	1.02	79%	0.28	21%	0.921
	7	Chemicals	0.00	0.00	0	0.00	0.00	0.01	1.01	0	0.01	0	0.00	0	0	0	0	0.02	0.00	0.01	0.01	0.00	0.00	0.00	0.00	1.08	1.01	93%	0.08	7%	0.769
	8	Other prod. min.no met., prod. basic metallurgical, metal articles	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
	9	Furniture, other manufactures, rep. and inst. of maq. and equipment	0.00	0.00	0	0.00	0.00	0.00	0.00	0	1.00	0	0.00	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.01	1.00	99%	0.01	1%	0.721
	10	Electricity, gas, steam, distrib., capt. and trat. of water	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0						
	11	Construction	0.01	0.00	0	0.00	0.01	0.02	0.02	0	0.03	0	1.01	0	0	0	0	0.04	0.01	0.02	0.02	0.00	0.00	0.01	0.01	1.22	1.01	83%	0.21	17%	0.867
	12	Commerce	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0						
	13	Transport	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0						
	14	Postal services and courier	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0						
	15	Hotels and restaurants	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0						
	16	Publishing, cinematographic, radio, television, music recordings	0.00	0.00	0	0.00	0.00	0.00	0.00	0	0.00	0	0.00	0	0	0	0	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.01	1.00	99%	0.01	1%	0.716
	17	Telecommunications and information services	0.01	0.00	0	0.00	0.01	0.01	0.05	0	0.03	0	0.13	0	0	0	0	0.07	1.02	0.02	0.01	0.01	0.00	0.02	0.02	1.41	1.02	72%	0.39	28%	1.001
	18	Financial services	0.01	0.00	0	0.00	0.01	0.00	0.01	0	0.01	0	0.02	0	0	0	0	0.00	0.03	1.03	0.00	0.01	0.01	0.08	0.01	1.23	1.03	83%	0.21	17%	0.875
Tertiary	19	Act. inmob., legal and accounting, arq. and eng., other professional acts	0.02	0.00	0	0.01	0.01	0.01	0.02	0	0.02	0	0.02	0	0	0	0	0.01	0.03	0.01	1.01	0.02	0.01	0.03	0.04	1.28	1.01	79%	0.27	21%	0.907
	20	Travel agency and serv. related, inv. and sec.	0.01	0.00	0	0.00	0.01	0.00	0.01	0	0.01	0	0.01	0	0	0	0	0.00	0.01	0.00	0.01	1.19	0.00	0.02	0.01	1.28	1.19	93%	0.09	7%	0.909
	21	Business services, admin. public and defence; social security	0.01	0.00	0	0.12	0.01	0.00	0.01	0	0.03	0	0.01	0	0	0	0	0.02	0.05	0.01	0.06	0.01	1.04	0.02	0.01	1.40	1.04	74%	0.36	26%	0.994
	22	Education, health, and others. social services	0.01	0.01	0	0.03	0.01	0.01	0.07	0	0.05	0	0.08	0	0	0	0	0.02	0.07	0.01	0.03	0.08	0.12	1.03	0.04	1.67	1.03	62%	0.63	38%	1.186
	23	Associations, computer rep. and art. personal, other acts of personal services	0.07	0.01	0	0.02	0.12	0.06	0.13	0	0.12	0	0.07	0	0	0	0	0.16	0.13	0.10	0.12	0.13	0.09	0.12	1.08	2.52	1.08	43%	1.44	57%	1.792
		Sum by columns, b_j^L	1.35	1.03		1.23	1.65	1.22	1.67		1.55		1.45					1.59	1.44	1.43	1.39	1.51	1.32	1.38	1.32	1.41	1.04	79%	0.37	21%	1
		Diagonal, l_{jj}	1.17	1.00		1.00	1.03	1.02	1.01		1.00		1.01					1.00	1.02	1.03	1.01	1.19	1.04	1.03	1.08	1.04					
		l_{jj}/b_j^L	86%	98%		82%	63%	83%	60%		65%		70%					63%	71%	72%	72%	79%	79%	75%	82%	75%					
		Add elements outside the diagonal, $b_j^L - l_{jj}$	0.19	0.02		0.23	0.62	0.20	0.66		0.55		0.43					0.59	0.42	0.40	0.39	0.32	0.28	0.35	0.24	0.37			Averages		
		$(b_j^L - l_{jj})/b_j^L$ $U_j^{b^L} = \frac{b_j^L}{n\bar{b}^L}$	14%	2%		18%	37%	17%	40%		35%		30%					37%	29%	28%	28%	21%	21%	25%	18%	25%					
		Dispersion power	0.960	0.729		0.872	1.170	0.869	1.185		1.100		1.027					1.132	1.024	1.014	0.991	1.071	0.940	0.980	0.935	1					

Source: Prepared by the authors.

Table XII.6
Haiti: statistical descriptors in Ghosh inverse matrix-CAHIOT

		Ghosh inverse matrix G $G \equiv (I - B^h)^{-1}$	Primary				Secondary														Tertiary					Sum by rows c_i^G	Diagonal g_{ii}	$\frac{g_{ii}}{c_i^G}$	$c_i^L - g_{ii}$	$\frac{c_i^G - g_{ii}}{c_i^G}$
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23					
Primary	1	Agriculture, livestock and forestry	1.17	0.00	0	0.00	0.20	0.01	0.02	0	0.00	0	0.01	0	0	0	0	0.00	0.01	0.07	0.01	0.00	0.00	0.01	0.07	1.60	1.17	73%	0.44	27%
	2	Fisheries and aquaculture	0.20	1.00	0	0.00	0.24	0.01	0.03	0	0.00	0	0.01	0	0	0	0	0.00	0.00	0.08	0.01	0.00	0.00	0.01	0.06	1.65	1.00	61%	0.65	39%
	3	Other extractive activities	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
	4	Food, beverages and tobacco	0.18	0.00	0	1.00	0.22	0.01	0.02	0	0.00	0	0.01	0	0	0	0	0.00	0.00	0.07	0.01	0.00	0.00	0.01	0.05	1.60	1.00	63%	0.60	37%
Secondary	5	Clothing, textiles and leather goods	0.03	0.00	0	0.00	1.03	0.02	0.01	0	0.00	0	0.01	0	0	0	0	0.00	0.01	0.03	0.03	0.00	0.00	0.02	0.10	1.29	1.03	80%	0.26	20%
	6	Wood, articles of wood and cork, other products	0.03	0.00	0	0.00	0.03	1.02	0.01	0	0.00	0	0.01	0	0	0	0	0.00	0.01	0.03	0.03	0.00	0.00	0.02	0.10	1.29	1.02	79%	0.27	21%
	7	Chemicals	0.03	0.00	0	0.00	0.03	0.02	1.01	0	0.00	0	0.01	0	0	0	0	0.00	0.01	0.03	0.03	0.00	0.00	0.02	0.10	1.29	1.01	78%	0.29	22%
	8	Other prod. min.no met., prod. Basic metallurgical, metal articles	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
	9	Furniture, other manufactures, rep. and inst. of maq. and equipment	0.03	0.00	0	0.00	0.03	0.02	0.01	0	1.00	0	0.01	0	0	0	0	0.00	0.01	0.03	0.03	0.00	0.00	0.02	0.10	1.29	1.00	77%	0.29	23%
	10	Electricity, gas, steam, distrib., capt. and trat. of water	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0					
	11	Construction	0.03	0.00	0	0.00	0.03	0.02	0.01	0	0.00	0	1.01	0	0	0	0	0.00	0.01	0.03	0.03	0.00	0.00	0.02	0.10	1.29	1.01	78%	0.28	22%
	12	Commerce	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0					
	13	Transport	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0					
	14	Postal services and courier	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0					
	15	Hotels and restaurants	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0					
	16	Publishing, cinematographic, radio, television, music recordings	0.03	0.00	0	0.00	0.03	0.02	0.01	0	0.00	0	0.02	0	0	0	0	1.00	0.05	0.04	0.04	0.06	0.03	0.05	0.25	1.63	1.00	61%	0.63	39%
	17	Telecommunications and information services	0.06	0.00	0	0.00	0.06	0.03	0.03	0	0.00	0	0.22	0	0	0	0	0.00	1.02	0.05	0.02	0.01	0.01	0.06	0.23	1.81	1.02	56%	0.79	44%
	18	Financial services	0.02	0.00	0	0.00	0.01	0.00	0.00	0	0.00	0	0.01	0	0	0	0	0.00	0.01	1.03	0.00	0.00	0.00	0.09	0.04	1.22	1.03	84%	0.20	16%
Tertiary	19	Act. inmob., legal and accounting, arq. and eng., other professional acts	0.08	0.00	0	0.00	0.02	0.01	0.00	0	0.00	0	0.02	0	0	0	0	0.00	0.01	0.01	1.01	0.01	0.01	0.05	0.26	1.49	1.01	68%	0.48	32%
	20	Travel agency and serv. related, inv. and sec.	0.04	0.00	0	0.00	0.02	0.01	0.01	0	0.00	0	0.01	0	0	0	0	0.00	0.01	0.01	0.01	1.19	0.00	0.06	0.14	1.52	1.19	78%	0.33	22%
	21	Business services, admin. public and defence; social security	0.05	0.00	0	0.04	0.04	0.01	0.01	0	0.00	0	0.02	0	0	0	0	0.00	0.04	0.02	0.12	0.01	1.04	0.07	0.18	1.65	1.04	63%	0.61	37%
	22	Education, health, and others. social services	0.02	0.00	0	0.00	0.01	0.01	0.01	0	0.00	0	0.03	0	0	0	0	0.00	0.02	0.01	0.02	0.02	0.03	1.03	0.14	1.36	1.03	76%	0.33	24%
	23	Associations, computer rep. and art. personal, other acts of personal services	0.03	0.00	0	0.00	0.03	0.01	0.01	0	0.00	0	0.01	0	0	0	0	0.00	0.01	0.02	0.02	0.01	0.01	0.03	1.08	1.28	1.08	85%	0.20	15%
		Sum by columns, b_j^G	2.02	1.00		1.06	2.03	1.22	1.18		1.03		1.43					1.01	1.21	1.58	1.42	1.33	1.15	1.58	3.01	1.45	1.04	72%	0.41	28%
		Diagonal, g_{jj}	1.17	1.00		1.00	1.03	1.02	1.01		1.00		1.01					1.00	1.02	1.03	1.01	1.19	1.04	1.03	1.08	1.04				
		g/b_j^G	58%	100%		95%	51%	83%	85%		98%		71%					99%	84%	65%	71%	89%	91%	65%	36%	78%				
		Add elements outside the diagonal, $b_j^G - g_{jj}$	0.85	0.00		0.06	1.00	0.20	0.18		0.03		0.42					0.01	0.20	0.55	0.42	0.14	0.11	0.55	1.93	0.41				
		$(b_j^G - g_{jj})/b_j^G$	42%	0%		5%	49%	17%	15%		2%		29%					1%	16%	35%	29%	11%	9%	35%	64%	22%				

Averages

Source: Prepared by the authors.

The elements outside the main diagonal, shown in green in matrix G^{hh}, clearly show that the highest-magnitude indicators are in the columns associated with agriculture (1), food products and beverages (5) and other services (23) sectors: 2.02, 2.03 and 3.01, respectively. The results for the rows do not show a very consistent pattern. This conjecture is proven by the column with the sum by rows, where six sectors (1, 2, 4, 16, 17 and 21) appear with values between 1.60 and 1.81. The rest have values between 1.52 and 1.22. The three sectors with the greatest sum by rows are electricity and gas at 1.81 and fishing and aquaculture and financial services, both at 1.65.[19] The interpretation of the sum by rows is similar to that of forward linkages.

Generally speaking, when newly aggregated, Haiti's indicators for linkages and dispersion corroborated that HIOT and CAHIOT share some characteristics with the Leontief and Ghosh inverse matrices. There are very few key sectors. Likewise, considering the Rasmussen indicators, only two out of sixteen sectors of Haiti's economy[20] are key sectors: food products and beverages (5) at 1.17 and 1.08, and electricity and gas (17) at 1.02 and 1.001. As for the linkage indicators, there are three key sectors: other manufactures (16) at 1.13 and 1.12; electricity and gas (17) at 1.02 and 1.24; and postal and courier services (20) at 1.07 and 1.04. Out of this list, only sector 17 corresponds to a key sector under both criteria, that is, with dispersion and linkage indicators.

Figures XII.4 and XII.5 show that the productive structures of HIOT and CAHIOT are of a similar sectoral typology. Figure XII.4 shows the Rasmussen indicators for dispersion power and dispersion sensitivity in four quadrants: key sectors (I), independent sectors (II), driving sectors (III) and driven sectors (IV). HIOT sectors are shown in blue and CAHIOT sectors in yellow.

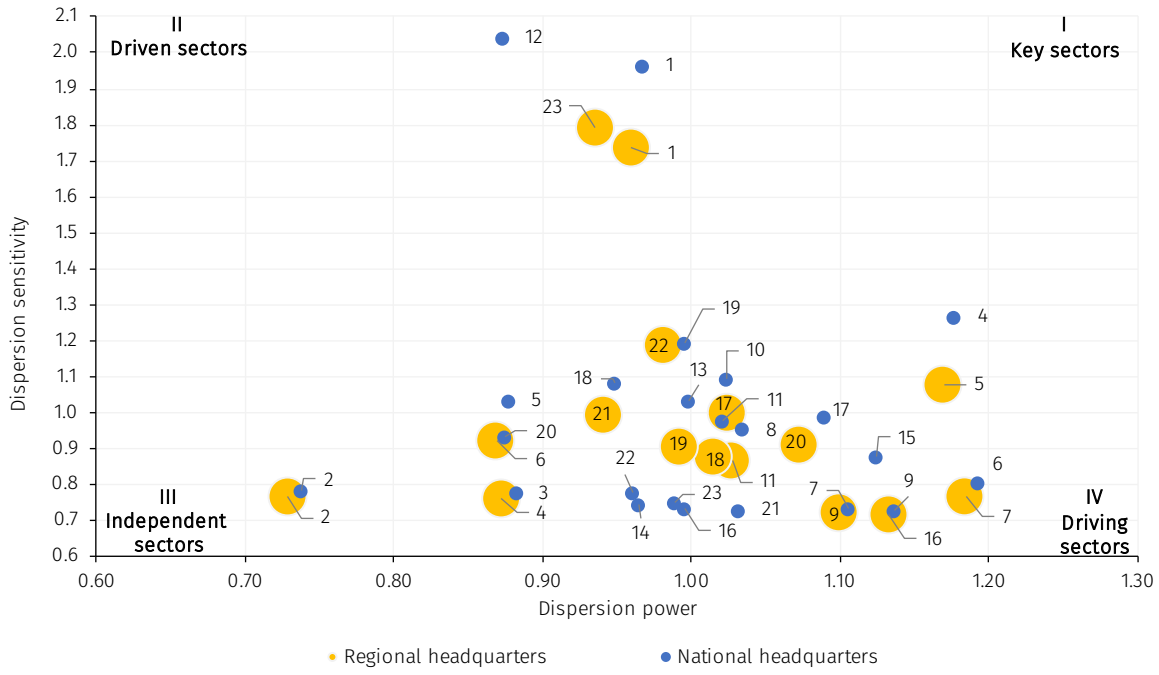
The dispersion diagram in figure XII.5 shows the indicators for backward and forward linkages, also in four quadrants: key or dependent sectors (I), independent sectors (II), sectors depending on inter-industry demand (III) and sectors depending on inter-industry supply (IV). Both figures display a strong correlation between the value of the indicators and their sectoral typology, even though HIOT has 23 sectors and CAHIOT just 16. For instance, the fishing and aquaculture sector in figure XII.4 has very similar indicators (in the independent sectors quadrant), but in figure XII.5, it appears as a sector depending on inter-industry demand. In quadrant IV in both matrices, the indicators for dispersion and linkages for the chemical products sector (CAHIOT sector 9 and HIOT sector 7) are also very much alike.

Due to sector aggregation, CAHIOT contains cases with complex analysis. For instance, the trade sector (12) is part of HIOT, but CAHIOT places it in the other services sector (23). However, both sectors are near each other in quadrant II, with dispersion sensitivity indicators of 2.04 and 1.79, respectively. Both appear in quadrant III (generally independent sectors) in figure XII.5. Generally speaking, the aggregations made when passing from HIOT to CAHIOT do not alter the characterization or validity of the intrinsic productive structure of Haiti's economy.

[19] The full name of the sector is "Financial services (except insurance and pension funds) insurance and reinsurance, pension funds (except mandatory social security) and other support activities".

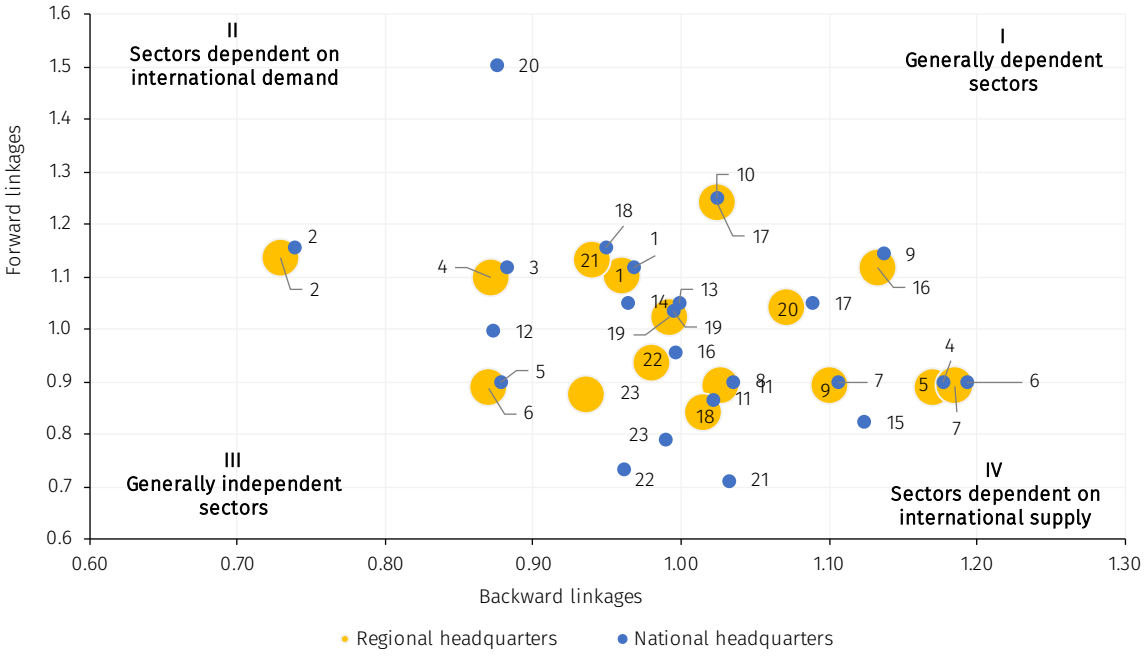
[20] Sectors that correspond to the CAHIOT matrix.

Figure XII.4
Haiti: classification of sectors according to Rasmussen sensitivity indicators – HIOT and CAHIOT



Source: Prepared by the authors.

Figure XII.5
Haiti: classification of sectors according to indicators for normalized forward and backward linkages – HIOT and CAHIOT



Source: Prepared by the authors.

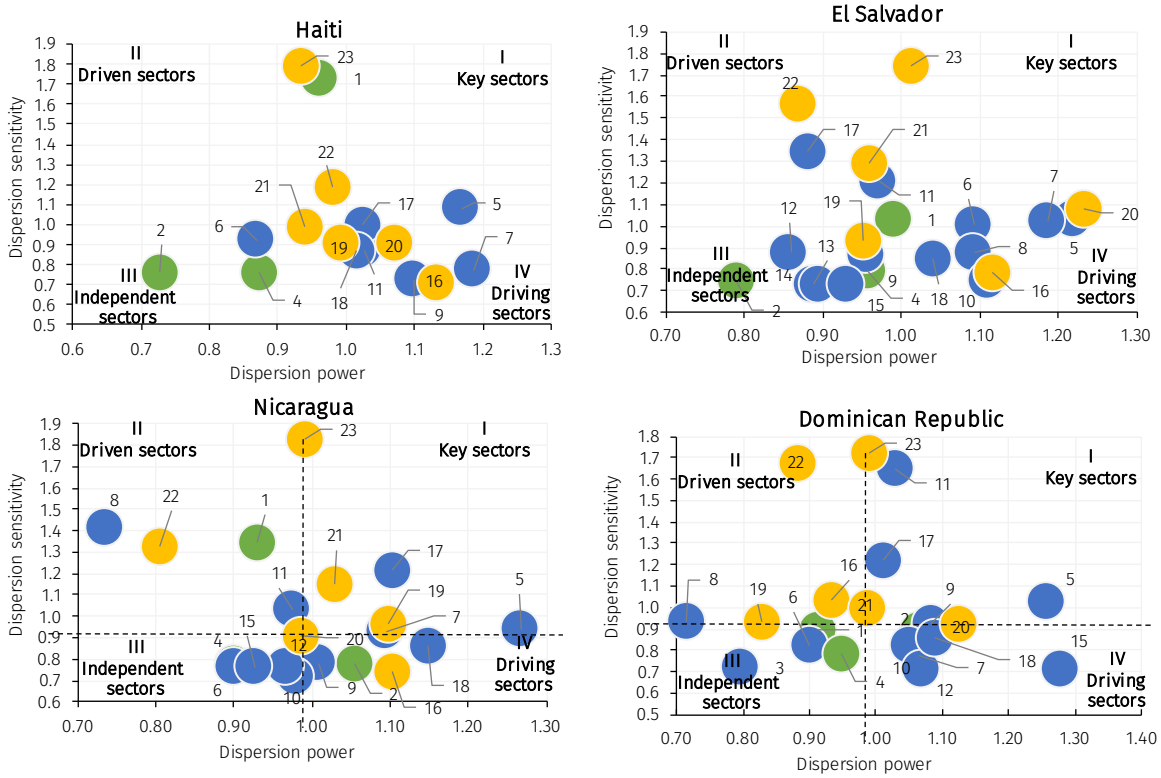
b) Comparison between the structure of Haiti and the rest of the region's countries

Having described Haiti's productive structure using HIOT and CAHIOT, this study now compares that structure with the other eight CAHIOT economies. The nine countries' productive structures are compared using the Rasmussen sensitivity indicators and backward and forward linkages indicators. This section presents two different exercises. The first identifies general patterns in the nine economies to explore whether the Haitian economy follows them. The second compares the productive structures using the Haitian economy as a *swivel* (reference point).

According to the sectoral classification, four of the eight countries in the region have at most two key sectors. El Salvador stands out with five. Costa Rica, the country with the least, has only one. As in Haiti, the electricity and gas sector is also key in Nicaragua, but it is not borderline. The food products and beverages (5) sector is key in five economies: El Salvador, the Dominican Republic, Honduras, Panama and Mexico. This sector is in the same position in El Salvador, the Dominican Republic and Haiti; even though the dispersion power indicator is well above average, the dispersion sensitivity indicator is nearly average.

Haiti, Honduras and Panama have the least number of independent sectors, counting five each. For Haiti, the independent sectors are fishing and aquaculture (2), extractive activities (4), apparel (6), land transportation (19) and financial services (21). As for driving sectors, Haiti has six, as do Honduras, Panama and Mexico. Finally, there are three driven sectors in Haiti and two in Guatemala. These sectors have high dispersion sensitivity and low dispersion power. Figure XII.6 presents sensitivity indicators by sector for a subgroup of four countries (Haiti, the Dominican Republic, El Salvador and Nicaragua). They are indicated both by code and colour: green, blue or yellow circles, depending on whether they belong, respectively, to primary, secondary (manufactures) or tertiary (services) industries.

Figure XII.6
Haiti, El Salvador, Nicaragua and the Dominican Republic: classification of sectors according to Rasmussen sensitivity indicators as per CAHIOT, by country

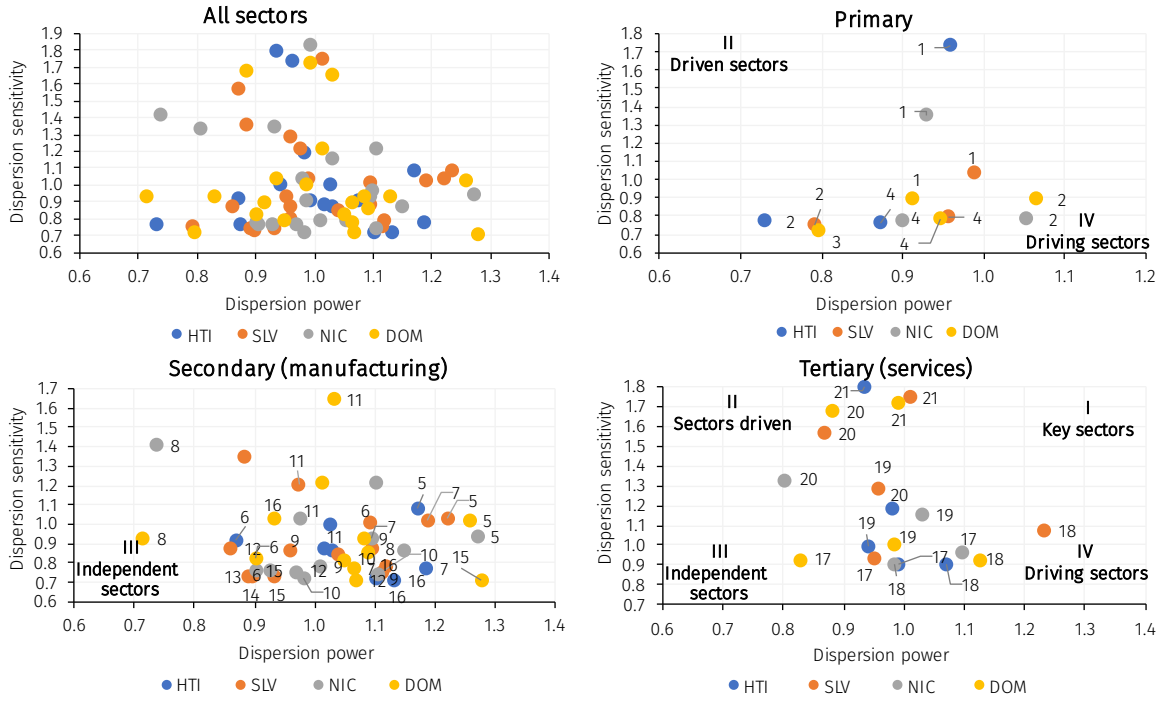


Source: Prepared by the authors.

Figures XII.6 and XII.7 compare Haiti, El Salvador and Nicaragua (economies with similar GDP)[21] with the Dominican Republic, which shares a border with and has strong historical, trade and labour ties to Haiti.[22] Figure XII.7 presents the Rasmussen indicators for dispersion power and sensitivity divided by groups of sectors: (i) all sectors, (ii) primary, (iii) manufactures and (iv) services. The colour code indicates the country to which each sector belongs. Three patterns emerge in the "All sectors" group: (i) there are few key sectors, (ii) most sectors have under-average dispersion sensitivity and (iii) most points lay in quadrants III and IV. According to this typology, countries have two to four key sectors. Regarding dispersion sensitivity, which stems from the sum by rows of the Leontief inverse matrix, most values are quite small, and only a few are "star" suppliers.

The figure for the "Primary" group **does not contain any key sectors** because most of the points are located in the third quadrant due to the very low values of the dispersion indicators. The principal trait is that, for both countries, the agriculture and forestry sector (1) falls in the driven sectors. In Haiti, the dispersion sensitivity indicator is higher; in the Dominican Republic, it is below average. The figure for the "Manufactures" group identifies **four key sectors**, three of which belong to El Salvador. As in the primary industry, most sectors have low values for dispersion sensitivity, though several of those are above average. Thus, many lay in quadrants III and IV. Finally, the sectors in the "Services" group, unlike those in the Primary and Manufactures groups, have above-average dispersion sensitivity values.

Figure XII.7
Haiti, El Salvador, Nicaragua and the Dominican Republic: classification of sectors according to Rasmussen sensitivity indicators as per CAHIOT, by industry



Source: Prepared by the authors.

[21] In 2019, before the pandemic, GDP (in 2015 million dollars) of Haiti, El Salvador and Nicaragua was, respectively, 15, 26 and 13 billion (World Bank, World development indicators).

[22] If labour indicators for Haiti are produced, it would be highly relevant to analyse the interrelation between labour markets. The flow of workers in different sectors from Haiti to the Dominican Republic is a topic for future analysis.

2. Trade composition

a) Haiti's domestic input-output table

HIOT presents information on total intermediate demand exports and imports by sector. The total refers to the origin of imports and the destination of exports. HIOT also contains aggregate information on imports for final demand. However, CAHIOT only shows information by sector on final demand imports of intra-regional origin.

b) Export and import scales

The three main sectors in the export scale (X_i/X_{tot}) are food products and beverages (4), wholesale and retail trade (12) and accommodation and food services (15). Together, they represent 54% of total exports, suggesting that exportations concentrate in a few sectors. By export intensity, the most relevant sectors are lodging and food services (15), publishing (16) and repair and maintenance services (23). Four sectors stand out in the imports scale (M_i/M_{tot}): lodging and food services (15), construction (16), education and health (22) and transportation (13).

3. Regional input-output tables for Haiti, Central America, Mexico and the Dominican Republic

Next follows the analysis of the value of total exports for the nine economies under study, the imports of intermediate inputs and the final demand of intra-regional origin (CAHIOT does not include aggregated data or sectoral information on the imports of final goods of extra-regional origin). According to the results, Mexico stands out for the volume of exports and imports in the entire region, with 85% of total exports and 84% of total imports for intermediate inputs and final demand. Costa Rica and Panama are major exporters, while Guatemala and the Dominican Republic prevail as importers.

Haiti has the smallest volume of total exports and imports in the region. The size of its economy may explain this. Although Nicaragua's GDP is smaller than Haiti's, the value of its exports and imports is higher. As a ratio of GDP, Haiti has the lowest exports of 8% (whereas Nicaragua exports 37% and the Dominican Republic 17%) and imports of 16% (compared to 38% in Nicaragua and 21% in the Dominican Republic). Nicaragua's exports are 3.5 times Haiti's, and its intermediate input imports are 1.8 times larger. While the Dominican Republic's exports are 9.1 times greater than Haiti's, it imports only 5.3 times as much. Based on CAHIOT, this study presents the intra-regional and extra-regional structure of exports and imports.

The exports of Central American countries mostly exit the region. However, intra-regional trade relations are robust. The intra-regional market constitutes a high ratio of exports; 53% of El Salvador's total exports are intra-regional, and that of other Central American countries ranges from 44% (Honduras) to 15% (Panama). Some countries trade little within the region. The Dominican Republic (4%), Haiti (2%) and Mexico (2%) lean heavily towards extra-regional markets.

As for intermediate input imports, though participation in extra-regional markets is generally higher, Central American countries maintain solid commercial relations. Except for Panama (8%), other Central American countries range from 42% (Nicaragua) to 15% (Costa Rica). Haiti and the Dominican Republic are the least integrated countries in intermediate input imports, with very similar percentages (6% and 6.3%). Mexico's share is the lowest (0.8%). Summing up, the countries of Central America are firmly integrated, but Haiti, Mexico and the Dominican Republic are less closely attached to the subregion.

4. Composition of intra-regional trade

This subsection focuses on intra-regional trade and highlights each country's origin of imports and destination of exports. Table XII.7 shows intra-regional trade flows. The table consists of a square 9x9 foreign trade matrix. The columns show every country's imports from the eight others. The rows display the exports each country sends out to the other countries in the region. For instance, Haiti exports 12 million dollars (md) to the Dominican Republic, so the latter imports the same amount from the former. On the other hand, Haiti imports 36 million dollars from its neighbour, which are the Dominican Republic's exports. As there are only trade flows in the matrix, the main diagonal is zero, and both the sums by rows and by columns are equal to 23,645 million dollars in exports and imports.

Table XII.7
Total intra-regional exports and imports by country: origin and destination of trade flow
(Million dollars at basic prices)

	HTI	CRI	SLV	GTM	HND	NIC	PAN	MEX	DOM	Tot. exp.
					Values					
HTI		1	0	0	0	0	2	4	12	19
CRI	16		405	498	511	566	573	1 405	231	4 205
SLV	1	244		744	821	349	166	264	45	2 634
GTM	11	363	1 006		1 035	411	166	765	90	3 846
HND	5	380	791	649		816	82	441	75	3 238
NIC	16	280	270	126	157		48	344	25	1 267
PAN	59	345	141	234	185	92		174	394	1 624
MEX	35	1 069	700	2 143	936	191	763		591	6 428
DOM	36	42	8	77	40	8	31	141		383
Tot imp	179	2 725	3 321	4 471	3 684	2 434	1 831	3 537	1 464	23 645

Source: Prepared by the authors.

Haiti has the smallest total exports (19 md) and imports (179 md), followed by the Dominican Republic, with intra-regional exports of 383 md and imports of 1,464 md. This pattern is the same for intra-regional exports and imports for intermediate consumption and final demand. Regarding the ratio of intra-regional imports from each country, 33% of Haiti's imports come from Panama,[23] 20% from the Dominican Republic and 19% from Mexico.

5. Composition of Haiti's extra-regional trade

The study now complements the analysis by examining extra-regional trade, highlighting Haiti's extra-regional total exports and imports for intermediate consumption and examining them by economic sectors. This study considers Haiti's sectors and industries that export to markets in South America, the United States, Canada, Europe (UE27),[24] China, CARICOM, the rest of Asia (RA) and the rest of the world (ROW). Exports are considered total because it is unknown whether they are for intermediate consumption, final consumption or FBKF-VE, (gross fixed capital formation and stock variation).

The United States (48.7%) and EU27 (32%) are the main destination markets for Haiti's total extra-regional exports. Disaggregation of exports by type of industry (primary, manufactures and services) shows that the United States and EU27, once more, are the first and second markets for each of the three industries. The manufacturing sector, for which Canada is second after the United States, is the exception. In short, the United States and EU27 concentrate 94.6% of Haiti's extra-regional exports in the primary sector, 54.2% in manufactures and 98.2% in the tertiary sector.

6. Analysis of value added induced by intra-regional trade between Haiti, Central America and the Dominican Republic

This study presents some results on induced value added (IVA) created by intra-regional exports, which are also intra-regional imports. The methodological annex describes how IVA was obtained.

a) Detailed results for Haiti's exports and imports

Intra-regional value added induced by Haiti's intra-regional exports:

[23] The origin of imports is not necessarily the same as the "productive" origin of the traded good or service. Panama is a fine example (at least regarding Haiti) because it is a trading platform for the region and the world. This is not the case for the Dominican Republic or Mexico.

[24] Constituted by Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland (Eire), Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and the United Kingdom.

- Intermediate demand: Almost 100% (15.5 md out of 15.7 md) of IVA from Haiti's intra-regional exports is generated within the country. Also, two-thirds of IVA 15.5md (10.1 md) come from Haitian exports to the Dominican Republic. The exports that induce the most value added in Haiti are those made to Mexico and Panama.
- Final demand: The final demand exports significantly shape the pattern followed by Haiti's total exports.

Value added induced in Haiti by its imports from the other eight countries, particularly from the Dominican Republic. Next, this study summarizes findings on value added induced by the demand for total, intermediate and final imports of the most important economies in the region.

- Almost 100% of IVA from imports purchased by Haiti from the Dominican Republic is generated in the latter country (exporter).
- Most of the Dominican Republic's IVA comes from its exports to Haiti. Out of 25.5 md of IVA induced in the Dominican Republic by Haiti's intra-regional imports, a mere 0.04 md are generated by imports that Haiti purchases from other countries. Exports follow this same pattern (but not imports). Most of the value added generated in a country by the exports flow between any two countries is induced by that country's exports.
- Haiti's intra-regional imports mostly induce value added in Panama (41.6 md), the Dominican Republic (25.5 md) and Mexico (21.2).

b) Detailed results by industry/activity

IVA generated by intra-regional trade may be examined by exports and imports made by the primary, secondary or tertiary industries. The following are the study's main findings:

- For the region and most countries, exports of manufactures generate the most value added induced by intra-regional trade.
- Exports of final demand services are especially important for Haiti, followed by exports for intermediate demand of manufactures.
- The activities that generate IVA are the same that make the exports. In other words, value added induced by exports of final demand services are mostly generated by service activities in Haiti. Likewise, Haiti's manufacturing activities generate value added induced by the intermediate demand of manufactures.

There are some variations in the analysis by country. For instance, 78% of IVA in Panama comes from regional exports of services. In Mexico, a similar ratio is generated by manufactures. These two countries have the highest ratios for services and manufactures, respectively.

Regarding Haiti's IVA, 54% of the 15.7 md is induced by exports of services. Exports of manufactures account for 44%, and only 2% comes from primary exports. However, the structure is entirely different when exports are considered by type of demand. Manufactures account for 81% of the 2.8 md from intermediate demand exports. Only 11% comes from services, followed closely by primary industry with 9%. The structure of value added induced by final demand exports is very similar to that of total exports.

7. Estimation of value added induced in Haiti by its exports to the rest of the world

Finally, utilising extra-regional exports, this study analyses the region's IVA, focusing on Haiti. This exercise shows the value added induced by intra-regional and extra-regional exports in each country in the region. Though IVA may vary widely, the results tell that even though most IVA originates in extra-regional exports, intra-regional and extra-regional market shares fluctuate. In the less integrated countries of the region, IVA from extra-regional exports ranges between 96% and 98%. For example, in Haiti, it is 98%. In Central American countries, IVA from intra-regional exports is much higher, ranging from 31% to 50%.

C. Results and conclusions

The first result from the HIOT analysis is that total value added (on the cost side), at 76.4%, is strongly biased towards gross operating surplus (GOS). Compensation of employees, with 22.6%, comes next, followed by net indirect taxes of subsidies (1%). At 71.2%, Mexico's GOS is the second largest after Haiti's. Regarding compensations, Costa Rica presents the highest ratio, 49.4%. Considering HIOT final domestic demand (uses), 69.1% goes to household consumption (HC), followed by gross capital formation at 13.8%. A mere 7% goes to exports, indicating that a small part of Haiti's national products enters the world markets. Government and NPISH participate with 6.4% and 3.7%, respectively.

HIOT was used to calculate Leontief and Ghosh inverse matrices and to estimate Rasmussen indices indicating each sector's backward (purchase power) and forward (sale power) linkages. Three key sectors were identified: furniture, electricity and gas distribution, and telecommunication and information services.

From the Leontief inverse matrix, the trade structure revealed by CAHIOT (the regional table for Haiti, Central America, Mexico and the Dominican Republic) shows that, out of 23 sectors, only the postal and courier service and the telecommunication and information service sectors, together with the agriculture, hunting and forestry sector, have significant magnitudes; this is consistent with HIOT. Rasmussen indicators show that the Haitian economy has only two key sectors: food products and beverages and electricity and gas. However, linkage indicators show three key sectors: other manufactures, electricity and gas and postal and courier services. The export scale revealed by HIOT, which aggregates 23 sectors, shows three outstanding sectors: food products and beverages, wholesale and retail trade and accommodation services. Accommodation, publishing and repair and maintenance services stand out for their export intensity.

1. Structural gaps (in HIOT and CAHIOT)

The analysis identified the following structural gaps:

- Vertical sectoral gaps.[25] In this case, Haiti's IOT reveals vertical sectoral gaps. One notable instance is trade (18.3% of total GPV), where compensations rise to a mere 3.1% of VA. Only 7 out of 23 sectors report compensations greater than 43% as a ratio of VA. In the great majority of sectors, GOS participation is above 42%; this happens because informal work and self-employment are standard in Haiti's economy. Mixed income not mediated through a subordinate employer/employee relationship explains, at least partially,[26] the overestimation of GOS.
- *Sectoral investment gaps*. Gross fixed capital formation (GFCF) is just 14% of final demand in the Haitian economy. Construction is the most relevant sector, with 62% of total investments and 82.5% contribution to GPV. These two sectors are followed by another four (5, 7, 4 and 8) with similar contributions to GPV (10.4%), comprising 21% of total investments. HIOT shows not merely the heterogeneity of investment and the investment gaps but also the minor role that Haiti's financial and credit systems play. According to the Central Bank of Haiti (BRH), in the 2011-2012 fiscal year, only 15% of bank credits27 went into industry and 26% to trade. Historically, "public goods" in the form of basic services (education and health) have been in short supply and highly volatile, in addition to low investment levels (12% on average), the dependence of households on remittances and sociopolitical instability, widening previously existent gaps.
- *Fiscal gaps*. Fiscal pressure in Haiti has been very low for the past two decades (7% to 10%), partly due to high informality and partly because of reduced industrial capacity. HIOT shows net indirect taxes of just 1% of VA due to this reason.

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[25] "Vertical gaps consider heterogeneity and measure the size of structural disparities within a region or a country" (see Gaudin and Pareyón Noguez (2020) and Lupano (2021) for further details).

[26] Notwithstanding the large ratio of profits for formal enterprises, which generates considerable inequality and poverty gaps.

[27] In 2011-2012, net bank credits represented 6% of GPV, while total banking system assets represented 19% of GPV.

- *Sectoral production gaps*. Though these gaps constitute the body of this study, some analytical derivations were not analysed due to a lack of vectors, such as employment statistics. Three variables are used to evaluate performance: gross production value (GPV), value added (VA) and the value of final domestic demand (FDD). Generally, each sector's relative size (ratio relative to the production value) varies widely. Five sectors account for 61% of production value, but this figure is possibly affected by the aggregation of sectors. When arranged in decreasing order according to the variables mentioned above, the three most important sectors are wholesale and retail trade (12), agriculture (1) and educational services (22), followed by food products and beverages (4) and construction (11).
- *Horizontal gaps*[28] Horizontal gaps were detected by analysing the comparative indicators of Haiti's IOT and the regional table (CAHIOT), which integrates HIOT with the other countries of the region utilising, for example, the indicators for induced value added (IVA) generated by trade.

D. In brief

Haiti's IOT and its integration into the regional IOT for Central America, Mexico and the Dominican Republic corroborate and dimension the Haitian economy's low productive linkages, poor diversification and scant regional integration. Besides, the indicators for backward linkages (dispersion power) and forward linkages (dispersion sensitivity) reveal a small number of key sectors capable of moving the economy. The Haitian economy has very low absolute GPV, GDP and foreign trade figures. Also, its insertion into the regional (Central America, Mexico and the Dominican Republic) and world markets has few linkages and strongly depends on imported inputs. Its trade flows only marginally come into play in the dynamics of domestic production.

As can be seen in CAHIOT, which integrates Haiti's IOT with the regional table, the induced value added (IVA) in Haiti by intra-regional trade with the rest of the region also presents very few linkages. The indiscriminate economic liberalization in the 1980s and the few, if any, initiatives of the State regarding industrial policy are possible explanations for the results and characteristics of HIOT. In particular, local producers were negatively affected. The weak production linkages favoured the importation of consumer goods, a consequence of the few incentives to strengthen domestic production through better-integrated production processes and greater value added.

The objectives set at the beginning of this study were met. However, future research may replicate this exercise when better national statistics become available, not just on production (which is fundamental) but also on employment, the inescapable link that binds economic and social issues together. Finally, the abovementioned findings result from the input-output tables produced by ECLAC with data provided by government sources. It is important to explain the set of relations presented in this study in further detail. Thus, progress in collecting and processing more precise and timely statistical data constitutes a fundamental task to reach a greater intelligence of Haiti's productive system. }

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[28] Gaps in horizontal dimensions account for and measure the breadth of inequalities between countries or groups of countries" (see Gaudin and Pareyón Noguez (2020) and Lupano (2021) for further details.

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Annex
Conceptual framework, general methodological considerations and sources of information

This section summarises the conceptual framework, general methodological considerations and sources of information behind Haiti's IOT and the regional table (CAHIOT). An input-output table (IOT) is a synthetic representation of an economy (a country or a region) that registers the following variables:

- Sectoral consumption of domestic intermediate inputs (**Z**);
- Sectoral consumption of imported intermediate inputs ($\boldsymbol{m}$);
- Sectoral payments to productive factors (or value added, $\boldsymbol{va}$), divided into compensation of employees ($\boldsymbol{rem}$), net taxes ($\boldsymbol{t}$), gross operating surplus ($\boldsymbol{ebe}$) and mixed gross income ($\boldsymbol{imb}$);
- Final demand of domestically produced goods ($\boldsymbol{f}$) by economic sector and demand factors: household consumption ($\boldsymbol{ch}$), government expenditures ($\boldsymbol{gg}$), gross fixed capital formation ($\boldsymbol{fbkf}$) and exports ($\boldsymbol{e}$).
- Gross production value generated by each sector ($\boldsymbol{x}$)

Table A.1 shows a simplified schematic of an IOT constituted by three sectors.

Table A.1
Simplified scheme of the domestic input-output table

		Intermediate consumption (Z)			Final demand (f)				GPV (x)
		Sec1	Sec2	Sec3	ch	gg	fbkf	e	
Sec1		Z_{11}	Z_{12}	Z_{13}	ch_1	gg_1	$fbkf_1$	e_1	x_1
Sec2		Z_{21}	Z_{22}	Z_{23}	ch_2	gg_2	$fbkf_2$	e_2	x_2
Sec3		Z_{31}	Z_{32}	Z_{33}	ch_3	gg_3	$fbkf_3$	e_3	x_3
Intermediate imports (m)		m_1	m_2	m_3					
Value added (va)	Compensation of employees (rem)	rem_1	rem_2	rem_3					
	Net taxes (t)	t_1	t_2	t_3					
	Gross operating surplus (ebe)	ebe_1	ebe_2	ebe_3					
	Gross mixed income (imb)	imb_1	imb_2	imb_3					
GPV (x)		x_1	x_2	x_3					

Source: Prepared by the authors.

IOT is a balanced economic system that consumes everything that it produces. In other words, supply is mathematically equal to demand.

$$\boldsymbol{Z + m + va = x = Z + f} \ (\mathbf{1})$$

1. Leontief model

From the demand standpoint, intermediate consumption ($\boldsymbol{Z}$) plus final demand ($\boldsymbol{f}$) is equal to gross production value ($\boldsymbol{x}$).

$$\boldsymbol{Z + f = x} \ (\mathbf{2})$$

In the above equation, the ratio of intermediate goods consumption ($\boldsymbol{Z}$) respective to gross production value ($\boldsymbol{x}$) is given by the following identity:

$$\boldsymbol{Z = Ax} \ (\mathbf{3})$$

$\boldsymbol{A}$ is defined as the technical coefficient matrix obtained by dividing each input by the sectoral gross production value. The coefficient represents a percentage of the intermediate products a sector needs to produce one unit of gross production value.

By substituting equation 3 in equation 2 and solving $\boldsymbol{x}$, the result is:

$$\boldsymbol{x} = (\boldsymbol{I} - \boldsymbol{A})^{-1}\boldsymbol{f} \quad (4)$$

Where $\boldsymbol{I}$ is an identity matrix of equal order as matrix $\boldsymbol{A}$.

Equation 4 is the canonical equation of the Leontief or demand-driven production model, where the gross value of production ($\boldsymbol{x}$) depends on the final demand value ($\boldsymbol{f}$). The matrix of that expression, $(\boldsymbol{I} - \boldsymbol{A})^{-1}$, is known as the multiplier production matrix (or Leontief inverse matrix). It represents the direct and indirect inputs an economic sector requires to generate a product unit.[29]

2. Ghosh model

From the supply standpoint, intermediate consumption ($\boldsymbol{Z}$) plus payment to the production factors ($\boldsymbol{w} = \boldsymbol{va} + \boldsymbol{m}$)[30] equals gross production value ($\boldsymbol{x}$).

$$\boldsymbol{x}'\boldsymbol{Z} + \boldsymbol{w} = \boldsymbol{x}' \ (\mathbf{5})$$

In the last equation, the ratio of intermediate goods sales ($\boldsymbol{Z}$) respective to gross production value ($\boldsymbol{x}$) is given by the following identity:

$$\boldsymbol{B} = \widehat{\boldsymbol{x}^{-1}}\boldsymbol{Z} \ (\mathbf{6})$$

Where $\boldsymbol{B}$ is defined as the matrix of distribution coefficients. These coefficients are found by running the IOT rows and are defined by dividing each input by the gross production value of each sector. In monetary terms, they tell the percentage value of the production a sector sells to itself and the other sectors of the economy.

By substituting equation 6 in equation 5 and solving x', the result is:

$$\boldsymbol{x}' = \boldsymbol{w}(\boldsymbol{I} - \boldsymbol{B})^{-1} \ (\mathbf{7})$$

Where $\boldsymbol{I}$ is an identity matrix of equal order as matrix $\boldsymbol{B}$.

Equation 7 is the canonical expression of the Ghosh model or the supply-driven production model. The primary inputs vector $\boldsymbol{w}$ (which for a domestic IOT equals intermediate imports plus payment to factors)[31] is an exogenous variable. In consequence, changes in production levels can be measured when inputs change. The matrix of that expression, $(\boldsymbol{I} - \boldsymbol{B})^{-1}$, is known as the multiplier supply matrix (or Ghosh inverse matrix). It represents the direct and indirect distribution of production that an economic sector performs to increase primary inputs in one unit.

3. Productive linkages: Rasmussen-Hirschmann indices

In the input-output context, it is very important to quantify the exchange relations (circular) between sectors, whether they demand or supply intermediate inputs. Thus, two kinds of linkages are analysed: Backward linkages measure the pulling effect of an activity on others from which it employs inputs. Forward linkages occur when an activity provides a certain input that is an input for another sector. This study analysed linkages by estimating Rasmussen-Hirschmann indices (or dispersion measurements), defined as follows:

Dispersion power (PD) is a normalized sector's backward linkages, that is, the average capacity of a sector to stimulate the rest of an economy's sectors when it increases its demand by one unit.

$$U_j^{b^L} = \frac{n\sum_{i=1}^{n} l_{ij}}{\sum_{j=1}^{n}\sum_{j=1}^{n} l_{ij}} = \frac{n\sum_{i=1}^{n} l_{ij}}{\sum_{j=1}^{n}\sum_{j=1}^{n} l_{ij}} \quad for\ j\ of\ 1\ up\ to\ n\ (8)$$

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29 The mathematical and economic assumptions underlying the Leontief model can be seen in Miller and Blair (2009).

30 In this expression, the variable $\boldsymbol{w}$ subsumes payment to the production factors ($\boldsymbol{v}$to$\boldsymbol{a}$) and payment of intermediate imports ($\boldsymbol{m}$).

31 In a regional IOT, the primary inputs vector $\boldsymbol{w}$ includes extra-regional intermediate imports, taxes, transportation, insurance and payment to factors.

In the above expression, n corresponds to the number of sectors included in the input-output table, and $\sum_{j=1}^{n} l_{ij}$ is the sum of all elements in the j-nth column of the multiplier production matrix $(\boldsymbol{I}-\boldsymbol{A})^{-1}$. Finally, $\sum_{j=1}^{n}\sum_{j=1}^{n} l_{ij}$ is the sum of all elements in a multiplier production matrix.

Dispersion sensitivity (SD) is a normalized forward linkages, that is, the average capacity of a sector to stimulate other sectors when the final demand of each sector in the economy grows by one unit.

$$U_i^{cG} = \frac{n\sum_{i=1}^{n} g_{ij}}{\sum_{i=1}^{n}\sum_{i=1}^{n} g_{\ ij}} \ for\ j\ of\ 1\ up\ to\ n \quad (9)$$

In the above expression, n corresponds to the number of sectors in an input-output table, where $\sum_{j=1}^{n} g_{ij}$ is the sum of all elements in the j-nth column of the multiplier supply matrix $(\boldsymbol{I}-\boldsymbol{G})^{-1}$. Finally, $\sum_{j=1}^{n}\sum_{j=1}^{n} g_{ij}$ is the sum of all elements in a multiplier supply matrix.

4. Typology of sectors according to dispersion indices

Four kinds of sectors may be identified from the indicators for backward and forward linkages:

(i) Key sectors ($PD > 1\ and\ SD > 1$): sectors that stimulate production with their purchases and sales.

(ii) Driving sectors ($PD > 1\ and\ SD < 1$): demand sectors that stimulate the economy through purchases.

(iii) Independent sectors ($PD < 1, SD < 1$): sectors with a low capacity to drive the economy through its purchases and sales.

(iv) Base or strategic sectors ($PD < 1\ and\ SD > 1$): Supply sectors that stimulate the economy through sales.

Table A.2 shows a simplified typology of sectors according to backward (PD) and forward (SD) dispersion indices.

Table A.2
Typology of sectors according to dispersion indices

		Dispersion sensitivity (SD)	
		$U_j^{bL} < 1$	$U_j^{bL} > 1$
Dispersion power (PD)	$U_i^{cG} > 1$	II. Base sectors	I. Key sectors
	$U_i^{cG} < 1$	III. Independent sectors	IV. Driving sectors

Source: Prepared by the authors.

5. Value added induced by exports

The IOT framework makes it possible to mathematically estimate the value added induced by a country's exports.

$$\boldsymbol{VAE} = \hat{\boldsymbol{v}} \cdot (\boldsymbol{I}-\boldsymbol{A})^{-1} \cdot \hat{\boldsymbol{e}} \quad (10)$$

In the equation above, matrix $(I-A)^{-1}$ represents the matrix of production multipliers, while element $\hat{\boldsymbol{v}}$ contains, along its main diagonal, value added coefficients for each product unit from a sector. The elements on the main diagonal of matrix $\hat{\boldsymbol{e}}$ correspond to elements from the exports vector.

The matrix for the value added induced by exports $\boldsymbol{VAE}$ may be estimated for a domestic or a regional IOT. Equation 11 shows the elements of matrix $\boldsymbol{VAE}$ when the estimation is made with a regional IOT for three countries (r, s, q) with two sectors (1, 2). The elements of submatrices on the main diagonal (in red) account for the domestic value added incorporated into exports. The elements of those submatrices that lay outside the main diagonal correspond to foreign value added incorporated into exports.

$$VAE = \begin{bmatrix} v_1^r l_{11}^{rr} e_1^r & v_1^r l_{12}^{rr} e_2^r & v_1^r l_{11}^{rs} e_1^s & v_1^r l_{12}^{rs} e_2^s & v_1^r l_{11}^{rq} e_1^q & v_1^r l_{12}^{rq} e_2^q \\ v_2^r l_{21}^{rr} e_1^r & v_2^r l_{22}^{rr} e_2^r & v_2^r l_{21}^{rs} e_1^s & v_2^r l_{22}^{rs} e_2^s & v_2^r l_{21}^{rq} e_1^q & v_2^r l_{22}^{rq} e_2^q \\ v_1^s l_{11}^{sr} e_1^r & v_1^s l_{12}^{sr} e_2^r & v_1^s l_{11}^{ss} e_1^s & v_1^s l_{12}^{ss} e_2^s & v_1^s l_{11}^{sq} e_1^q & v_1^s l_{12}^{sq} e_2^q \\ v_2^s l_{21}^{sr} e_1^r & v_2^s l_{22}^{sr} e_2^r & v_2^s l_{21}^{ss} e_1^s & v_2^s l_{22}^{ss} e_2^s & v_2^s l_{21}^{sq} e_1^q & v_2^s l_{22}^{sq} e_2^q \\ v_1^q l_{11}^{qr} e_1^r & v_1^q l_{12}^{qr} e_2^r & v_1^q l_{11}^{qs} e_1^s & v_1^q l_{12}^{qs} e_2^s & v_1^q l_{11}^{qq} e_1^q & v_1^q l_{12}^{qq} e_2^q \\ v_2^q l_{21}^{qr} e_1^r & v_2^q l_{22}^{qr} e_2^r & v_2^q l_{21}^{qs} e_1^s & v_2^q l_{22}^{qs} e_2^s & v_2^q l_{21}^{qq} e_1^q & v_2^q l_{22}^{qq} e_2^q \end{bmatrix} \quad (11)$$

Once the domestic portion of the matrix for value added incorporated into intra-regional intermediate exports (VAE) is subtracted, the result is a new matrix representing the intra-regional foreign value added incorporated into the intra-regional intermediate exports of each country (VAFE). This new matrix is expressed thus:

$$VAFE = \begin{bmatrix} 0 & 0 & v_1^r l_{11}^{rs} e_1^s & v_1^r l_{12}^{rs} e_2^s & v_1^r l_{11}^{rq} e_1^q & v_1^r l_{12}^{rq} e_2^q \\ 0 & 0 & v_2^r l_{21}^{rs} e_1^s & v_2^r l_{22}^{rs} e_2^s & v_2^r l_{21}^{rq} e_1^q & v_2^r l_{22}^{rq} e_2^q \\ v_1^s l_{11}^{sr} e_1^r & v_1^s l_{12}^{sr} e_2^r & 0 & 0 & v_1^s l_{11}^{sq} e_1^q & v_1^s l_{12}^{sq} e_2^q \\ v_2^s l_{21}^{sr} e_1^r & v_2^s l_{22}^{sr} e_2^r & 0 & 0 & v_2^s l_{21}^{sq} e_1^q & v_2^s l_{22}^{sq} e_2^q \\ v_1^q l_{11}^{qr} e_1^r & v_1^q l_{12}^{qr} e_2^r & v_1^q l_{11}^{qs} e_1^s & v_1^q l_{12}^{qs} e_2^s & 0 & 0 \\ v_2^q l_{21}^{qr} e_1^r & v_2^q l_{22}^{qr} e_2^r & v_2^q l_{21}^{qs} e_1^s & v_2^q l_{22}^{qs} e_2^s & 0 & 0 \end{bmatrix} \quad (12)$$

The sum by columns of the new VAFE matrix is equal to backward vertical specialisation (BVS) and represents the intra-regional foreign value added incorporated into the intra-regional intermediate exports of each country.

$$BVS_1^r = v_1^s l_{11}^{sr} e_1^r + v_2^s l_{21}^{sr} e_1^r + v_1^q l_{11}^{qr} e_1^r + v_2^q l_{21}^{qr} e_1^r$$

The sum by rows corresponds to forward vertical specialisation (FVS), that is, the domestic value added that a sector of a given country incorporates into the intra-regional intermediate exports of that same sector but in other countries in the region.

$$FVS_1^r = v_1^r l_{11}^{rs} e_1^s + v_1^r l_{12}^{rs} e_2^s + v_1^r l_{11}^{rq} e_1^q + v_1^r l_{12}^{rq} e_2^q$$

6. Methodology for estimating value added induced by trade

Value added induced by trade is calculated by determining the value added generated by the imports and exports of a given country, the so-called anchor country. Traditional specialisation indicators (domestic and foreign value added contained in exports and imports) are estimated with respect to the anchor. The value added contained in the anchor country's imports is also determined. This value added incorporates three elements: bilateral value added, multilateral value added and reimported value added. Stehrer, Foster and de Vries (2012) and Stehrer (2013) calculate value added induced by commerce using the following equation:

$$\boldsymbol{Tv = \hat{v} \cdot (I - A)^{-1} \cdot \hat{t}} \quad \mathbf{(13)}$$

Where $\hat{\boldsymbol{v}}$ is the diagonalised vector of value added coefficients, that is, the participation in value added respective to gross production. The multiplier production matrix, or Leontief inverse matrix, is given by $\boldsymbol{(I - A)^{-1}}$. Equation $\hat{\boldsymbol{t}}$ is a diagonalised vector whose elements contain the anchor country's exports to and imports from other countries in the regional table. The matrix derived from equation **13** is defined as the matrix of value added induced by bilateral trade between r, the anchor country, and trade partners s and q. That matrix is expressed thus:

$$Tv = \begin{bmatrix} v_1^r l_{11}^{rr} e_1^{r*} & v_1^r l_{12}^{rr} e_2^{r*} & v_1^r l_{11}^{rs} m_1^{sr} & v_1^r l_{12}^{rs} m_2^{sr} & v_1^r l_{11}^{rq} m_1^{qr} & v_1^r l_{12}^{rq} m_2^{qr} \\ v_2^r l_{21}^{rr} e_1^{r*} & v_2^r l_{22}^{rr} e_2^{r*} & v_2^r l_{21}^{rs} m_1^{sr} & v_2^r l_{22}^{rs} m_2^{sr} & v_2^r l_{21}^{rq} m_1^{qr} & v_2^r l_{22}^{rq} m_2^{qr} \\ v_1^s l_{11}^{sr} e_1^{r*} & v_1^s l_{12}^{sr} e_2^{r*} & v_1^s l_{11}^{ss} m_1^{sr} & v_1^s l_{12}^{ss} m_2^{sr} & v_1^s l_{11}^{sq} m_1^{qr} & v_1^s l_{12}^{sq} m_2^{qr} \\ v_2^s l_{21}^{sr} e_1^{r*} & v_2^s l_{22}^{sr} e_2^{r*} & v_2^s l_{21}^{ss} m_1^{sr} & v_2^s l_{22}^{ss} m_2^{sr} & v_2^s l_{21}^{sq} m_1^{qr} & v_2^s l_{22}^{sq} m_2^{qr} \\ v_1^q l_{11}^{qr} e_1^{r*} & v_1^q l_{12}^{qr} e_2^{r*} & v_1^q l_{11}^{qs} m_1^{sr} & v_1^q l_{12}^{qs} m_2^{sr} & v_1^q l_{11}^{qq} m_1^{qr} & v_1^q l_{12}^{qq} m_2^{qr} \\ v_2^q l_{21}^{qr} e_1^{r*} & v_2^q l_{22}^{qr} e_2^{r*} & v_2^q l_{21}^{qs} m_1^{sr} & v_2^q l_{22}^{qs} m_2^{sr} & v_2^q l_{21}^{qq} m_1^{qr} & v_2^q l_{22}^{qq} m_2^{qr} \end{bmatrix} \quad (14)$$

The following indicators may be identified in the above matrix:

- Domestic value added contained in the anchor country's exports to its partners. Elements in red represent the total domestic value added contained in the total exports of the anchor country to partners s and q.
- Foreign value added contained in the anchor country's exports to its partners. Elements in blue represent the total foreign value added contained in the total exports of the anchor country to partners s and q.
- Domestic value added contained in the anchor country's imports from its partners. Elements in green represent the total reimported value added contained in the total imports of the anchor country from partners s and q.
- Bilateral value added contained in the anchor country's imports from its partners. Elements in purple represent the total bilateral value added contained in the total imports of country r from partners s and q.
- Multilateral value added contained in the anchor country's imports from its partners. The sum of all elements in black represents the total multilateral value added contained in the total imports of country r from partners *s* and *q*.

7. Sources of information

To produce this study, the Economic Development Unit (EDU) of ECLAC Subregional Headquarters in Mexico City developed two IOTs: a domestic one for Haiti and a regional one linking the Haitian economy to the Central American, Mexican and Dominican Republic economies.

8. Input-output table for Haiti, 2011-2012 (HIOT)

HIOT was based on information from Haiti's supply and use tables (SUTH) for the 2011-2012 fiscal year, published by the Haitian Institute of Statistics and Information (French acronym IHSI). SUTH are an accounting tool that registers levels of supply (supply table, ST) and use (use table, UT) in different economic sectors. SUTH disaggregate 20 products across 23 sectors, as defined in, respectively, version 2 of Central Product Classification (CPC) and review 4 of International Standard Industrial Classification (ISIC). No information on employment or occupation was available to prepare this table, so it does not contain a labour vector. This may be observed in table A.3.

9. Regional input-output table for Central America, Mexico, the Dominican Republic and Haiti, 2011 (CAHIOT)

The 2011 CAHIOT was built using the 2011 regional input-output table for Central America, Mexico and the Dominican Republic (CAIOT). The table shows an ensemble of intersectoral flows of intermediate goods and services between those countries. Like a domestic input-output table, CAIOT integrates intra-regional and extra-regional final demand information. It also contains data on value added and its functional distribution. CAHIOT is part of this accounting framework to study the sectoral relations of the Haitian economy with the other regions' sectors and countries. CAHIOT was created along three fundamental steps:

- Sectoral normalisation. HIOT was integrated with CAIOT by equalising the 23 sectors of the former with the 40 sectors of the latter.
- Verification and consolidation of trade information on Haiti. Trade information on Haiti was made compatible with data on CAIOT by harmonising three databases: WITS, TRADEMAP and the trade bases of Haiti's General Customs Administration.
- Since sectors were aggregated, the domestic production structure of Haiti, as per CAHIOT, is widely different from HIOT.

Table A.3
Input-output table for Haiti 2011-2012
(Million gourdes at basic prices)

No.	Sector	1 Agriculture, livestock and forestry	2 Fisheries and aquaculture	3 Other extractive activities	4 Food, beverages and tobacco	5 Clothing, textiles and leather goods	6 Wood, articles of wood and cork, other products	7 Chemicals	8 Other prod. min.no met., prod. basic metallurgical, metal articles	9 Furniture, other manufactures, rep. and inst. of maq. and equipment	10 Electricity, gas, steam, distrib., capt. and trat. of water	11 Construction	12 Commerce	13 Transport	14 Postal services and courier	15 Hotels and restaurants	16 Publishing, cinematographic, radio, television, music recordings	17 Telecommunications and information services	18 Financial services	19 Act. inmob., legal and accounting, arq. and eng., other professional acts	20 Travel agency and serv. related, inv. and sec.	21 Business services, admin. public and defence; social security	22 Education, health, and others. social services	23 Associations, computer rep. and art. personal, other acts of personal services	24 Imports	25 Import taxes (MTxM)	26 Net indirect taxes (taxes/subsidies on products)	27 Indirect taxes net of subsidies on production (II-S)	28 Compensation of employees (RDS)	29 Gross operating surplus (gross operating surplus)
1	Agriculture, livestock and forestry	20 102	27	116	25 095	903	2 614	167	621	16	442	7 526	1 033	849	81	3 189	16	295	234	165	12	248	772	300	3 085	79 470	0	269	3 147	150 794
2	Fisheries and aquaculture	1 288	1	7	1 610	27	162	8	24	0	0	440	0	0	0	138	0	0	0	0	0	0	1	0	36	4 162	0	0	24	7 929
3	Other extractive activities	1 121	1	6	1 401	24	141	7	21	0	0	383	0	0	0	121	0	0	0	0	0	0	1	0	32	4 269	0	0	21	7 549
4	Food, beverages and tobacco	1 385	7	15	1 684	1 528	433	128	787	49	438	2 317	266	2 221	74	3 418	48	24	31	268	4	413	1 936	852	7 760	49 314	0	0	8 779	84 178
5	Clothing, textiles and leather goods	792	4	8	964	874	248	73	450	28	250	1 325	152	1 270	42	1 955	27	14	18	153	2	236	1 107	487	4 439	28 208	0	0	5 021	48 151
6	Wood, articles of wood and cork, other products	220	1	2	268	243	69	20	125	8	70	369	42	353	12	544	8	4	5	43	1	66	308	136	1 235	7 848	0	0	1 397	13 396
7	Chemicals	38	0	0	46	42	12	4	22	1	12	64	7	61	2	94	1	1	1	7	0	11	53	23	214	1 358	0	0	242	2 317
8	Other prod. min.no met., prod. basic metallurgical, metal articles	589	3	6	717	650	184	54	335	21	186	986	113	945	32	1 454	20	10	13	114	2	176	823	362	3 301	20 976	0	0	3 734	35 806
9	Furniture, other manufactures, rep. and inst. of maq. and equipment	6	1	0	6	6	2	0	3	0	23	15	68	19	4	13	0	20	16	7	1	10	18	5	35	213	0	19	34	544
10	Electricity, gas, steam, distrib., capt. and trat. of	833	0	9	672	461	598	52	4 408	32	242	691	1 041	88	0	613	35	76	32	553	59	257	1 930	0	54	8 226	0	0	0	20 964
11	Construction	1 209	0	0	10	5	65	12	282	0	392	1 547	727	0	0	60	0	0	0	5 910	0	0	894	0	0	796	0	0	56 224	68 136
12	Commerce	5 916	60	42	7 239	2 154	1 086	199	1 141	67	2 004	4 875	4 374	3 679	368	5 055	71	1 370	1 086	736	56	1 103	3 320	1 294	10 974	81 244	0	1 252	11 963	152 729
13	Transport	2 648	0	59	45	80	51	31	558	0	446	0	6 704	17	0	79	15	244	139	1 671	74	215	3 590	37	1 443	28 259	0	0	0	46 404
14	Postal services and courier	187	0	4	3	6	4	2	39	0	32	0	474	1	0	6	1	17	10	118	5	15	254	3	102	1 999	0	0	0	3 282
15	Hotels and restaurants	3	0	0	0	0	0	0	0	0	4	0	689	137	0	0	12	77	365	88	61	4 053	822	23	5 738	30 135	0	0	0	42 208
16	Publishing, cinematographic, radio, television, music recordings	30	0	0	7	3	3	0	4	0	1	4	4	10	0	5	1	122	1	19	5	13	50	0	134	664	0	0	0	1 080
17	Telecommunications and information services	326	1	2	173	61	50	8	98	0	20	122	121	121	8	122	22	3 379	20	419	127	353	1 157	4	1 020	11 150	0	0	0	18 883
18	Financial services	540	0	895	219	76	24	45	64	5	808	119	837	2 373	0	296	10	110	764	824	254	135	1 264	3	0	8 446	3 809	0	0	21 921
19	Act. inmob., legal and accounting, arq. and eng., other professional acts	519	12	102	283	437	714	89	2 179	0	431	93	4 659	269	65	83	3	326	1 814	311	539	536	837	69	169	28 482	0	305	0	43 324
20	Travel agency and serv. related, inv. and sec.	41	26	0	0	0	0	0	0	0	769	208	2 408	365	146	0	3	728	568	204	27	297	380	76	192	867	0	682	0	7 988
21	Business services, admin. public and defence; social security	7	1	0	0	0	0	0	0	0	28	7	87	15	5	0	0	26	20	8	1	11	16	3	36	110	29 743	25	0	30 150
22	Education, health, and others. social services	797	0	0	12	16	44	3	27	0	0	0	15	250	0	11	2	1	14	150	6	837	483	44	4 275	51 118	8 684	17 177	0	83 966
23	Associations, computer rep. and art. personal, other acts of personal services	276	3	0	4	6	15	1	9	0	74	20	232	120	14	4	0	70	55	71	3	29	162	7	1 432	6 279	0	4 854	0	13 740
24	Imports	8 219	52	94	8 507	7 531	2 628	681	5 554	230	2 854	11 121	8 270	10 770	456	16 160	234	1 069	1 287	2 120	476	2 348	10 862	4 076	7 109	54 227	71	622	6 808	174 434
25	Import taxes (MTxM)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	Net indirect taxes (taxes/subsidies on products)	451	2	25	462	334	15	28	-417	7	106	687	419	672	24	857	10	329	34	44	9	106	305	233	2 221	14 152	97	12	2 407	23 630
27	Indirect taxes net of subsidies on production (II-S)	626	0	0	77	1	11	4	26	0	250	24	512	405	3	5	1	394	280	809	7	218	970	722						
28	Compensation of employees (RDS)	6 138	0	615	8 398	9 793	2 039	150	3 301	40	1 626	12 793	3 693	5 659	848	3 348	245	465	7 309	3 435	566	13 390	37 417	2 141						
29	Gross operating surplus (gross operating surplus)	96 486	7 728	5 541	26 275	22 888	2 183	550	16 144	40	9 457	22 399	115 781	15 735	1 097	4 578	293	9 711	7 804	25 081	5 693	5 076	14 232	2 836						
30	Gross value of production (GVP)	150 794	7 929	7 549	84 178	48 151	13 396	2 317	35 806	544	20 964	68 136	152 729	46 403	3 282	42 208	1 080	18 883	21 921	43 324	7 988	30 150	83 966	13 740						

Source: Prepared by the authors, on the basis of supply and use tables (IHSI, 2020).
Note: Import taxes are incorporated into indirect production taxes (value added taxes), given how the supply and use tables are built. Information not available in supply and use tables.

Chapter XIII
Financial inclusion in the Dominican Republic: territorial and gender perspectives

Indira Romero Márquez
Jesús Antonio López Cabrera
Sara Hess

Introduction

Financial inclusion is a core issue in reducing poverty. In recent years, extensive research has been conducted on the relationship between having a bank account and diminishing poverty. Several studies prove that financial inclusion improves the socioeconomic situation of individuals and households (Omar and Inaba, 2020; Nsiah and others, 2021; Tran and Le, 2021; Chibba, 2009; Park and Mercado, 2015). Therefore, financial inclusion is essential in achieving Sustainable Development Goals (SDGs), notably Goals 1, 2, 3, 5, 8, 9, 10 and 17.

Financial inclusion has improved globally and in Latin America in the past two decades. More people use financial products now than 20 years ago. In developing economies, the population with a bank account increased from 54% to 63% in this period (World Bank, 2017). However, gaps still exist in some population segments, including women and people living in rural areas.

According to World Bank data, most adults without a bank account are women (56%), many of whom live in rural areas in low-income households (World Bank, 2018). Around the world, 72% of men and 65% of women have a bank account. According to Global Findex 2017, in developing economies, the gender gap remains unchanged at 9 percentage points (World Bank, 2017, p. 4). In Latin America, that gap is 6.6 percentage points (World Bank, 2017). Given its persistence and roots in a sociocultural structure that fosters the exclusion of women, the financial inclusion gap by gender may be defined as a structural gap.

This study aims to help include women in financial systems, particularly those living in rural areas in the Dominican Republic. To that end, the study looks to understand better the existing gap and the factors that make it so persistent. Statistics already shed light on the gap from the quantitative viewpoint. The authors of this study expect that fieldwork and interviews with female entrepreneurs will further illuminate the scene.

Here, women's financial inclusion is analysed under the structural gaps approach by territory units of the Dominican Republic (urban and rural). A deeper look is taken at social gender norms, defined as the implicit, informal rules that a social group or society applies to its treatment of gender (Harper and others, 2020) and their role in access to financial services. Also, this study uses the gender approach to compare the different experiences of women in rural and urban areas.

The study was performed in two stages. The first stage consisted of an exhaustive statistical analysis based on the 2019 National Survey on Financial Inclusion (ENIF). Data were analysed from gender and territorial standpoints. The social gender norms perspective was also included. The second stage included in-depth interviews to discover whether some characteristics, such as gender, marital status, age and income, are related to greater or lesser financial inclusion.

Interviews with women of Dominican rural and urban areas gave information about their use of and access to financial products and the possible influence of social gender norms on the use of banking and financial instruments. The fieldwork included a smaller sample of men to explore the social norms topic from both perspectives.[1] Considering female entrepreneurs in fieldwork is important because Latin America and the Caribbean is the region with the widest gender gap regarding access to financing for formal small and medium-sized enterprises (IFC, 2014; Azar, Lara and Mejía, 2018).

This chapter starts with a definition of structural gaps and a discussion of their territorial aspects. The following sections analyse the financial inclusion of entrepreneurial women and the gender barriers and social norms that affect it, particularly in the Dominican Republic. The last two sections present a statistical analysis of women's financial inclusion in the Dominican Republic and an analysis of the fieldwork results. Finally, the chapter ends with a summary of the results and public policy recommendations.

A. Structural gaps

A structural gap is a disparity that impacts national and/or territorial development. It is not circumstantial but instead has historical and cultural roots. A patriarchal sociocultural system that privileges men over women in most aspects is a historical and cultural phenomenon that affects Latin America and the world.[2]

Latin America evinced progress in financial inclusion during the last decade. Table XIII.1 shows that the percentage of women with a bank account increased by 14% between 2011 and 2017 (from 35% to 49%) and 18% between 2017 and 2021. For men, this percentage grew by 14.5% and 18%, respectively. However, the gender gap for bank accounts stood at 7% in 2021. Caballero and Trivelli (2020) gave evidence that, despite the progress made by Latin American women between 2011 and 2014, many left the financial system in the following years (2014-2017) because the products offered were unsuitable.

Table XIII.1
Latin America and the Caribbean: persons with an account at a financial institution according to sex, 2011, 2014, 2017 and 2021[a]
(Percentages)

Sex	2011	2014	2017	2021
Female[a]	35.1	49.2	52.1	70.1
Male[a]	44.2	55.0	58.7	77.0

Source: Prepared by the authors, on the basis of World Bank, Global Findex, several years.
[a] Percentage of interviewees (over 15 y.o.) who declared having an account (personal or joint) in a bank or other financial institution or who declared having used a mobile financial service in the past 12 months.

The Dominican Republic shows a similar trend (see table XII.2). Although financial inclusion has grown in the total population, its rate differs for women. In 2014, women had better access to financial institutions. However, the trend reverted slightly in 2017 when the gap was 4.3% compared to men and wider than in 2011 (1.8%). The difference rose to almost 5% in 2021, where it has remained.

1 Interviewees were 75% women and 25% men.
2 A good summary of this topic can be found in Marçal (2022).

Table XIII.2
Dominican Republic: persons with an account in a financial institution according to sex, 2011, 2014, 2017 and 2021[a]
(Percentages)

Sex	2011	2014	2017	2021
Female[a]	37.4	56.0	54.1	49.0
Male[a]	39.2	52.2	58.4	53.7
Total[a]	38.2	54.1	56.2	51.3

Source: Prepared by the authors, on the basis of World Bank, Global Findex, several years.
[a] Proportion of interviewees (over 15 y.o.) who declared having an account (personal or joint) in a bank or other financial institution or who declared having used a mobile financial service in the past 12 months.

According to Cavallero and Trivelly, opening a bank account is not enough to ensure long-term financial inclusion for women. In the Dominican Republic, the percentage of women with inactive bank accounts was higher than that of men in 2014 and 2017 (no disaggregated information for 2011). Recent information from Global Findex tells that the gap widened in 2021 (Demirgüç-Kunt and others, 2022) (see table XIII.3).

Table XIII.3
Dominican Republic: persons with an inactive account at a financial institution according to sex, 2014, 2017 and 2021
(Percentages)

Sex	2014	2017	2021
Female	5.5	5.9	8.0
Male	2.4	4.2	4.9

Source: Prepared by the authors, on the basis of World Bank, *Breaking Barriers: Female Entrepreneurs Who Can Cross Over to Male-Dominated Sectors*, 2021.

Besides being persistent, structural gaps tend to be wider in medium-income than high-income countries (Gaudin and Pareyón Noguez, 2020). For example, according to 2017 information from Global Findex, 93.1% of adults have a bank account in the United States, whereas 56.2% have one in the Dominican Republic. Furthermore, there is no significant gender gap in financial inclusion in the United States, but the gap was 4.3 percentage points in 2017 in the Dominican Republic (World Bank, 2017).

Not only does the Dominican Republic face a horizontal gap[3] compared to high-income countries like the United States, but there is also evidence of vertical gaps[4] within the country, namely gender and territory gaps. According to the 2017 Global Findex, 51.6% of Dominican adults in rural areas have access to a bank account, which makes for a 4.6 percentage points gap compared to the national average (56.2%). In Latin America and the Caribbean, 53% of adult persons in rural areas had a bank account in 2017, indicating that the Dominican Republic lags behind other countries in the region.

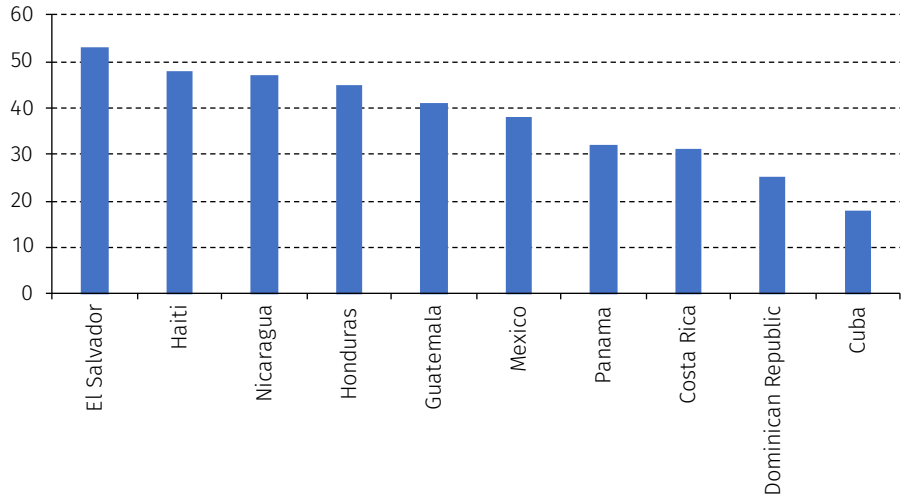
1. Financial inclusion of female entrepreneurs[5]

There are several reasons to focus on female entrepreneurs. One is that their participation in the financial system is influenced by their economic empowerment and participation in the labour market. Global Findex 2017 showed that, globally, among unbanked people, women had lower participation in the labour market than men with the same level of education (41% and 68%, respectively) (Demirguc-Kunt and others, 2018). The survey shows that persons without a bank account are most commonly self-employed (28%).

[3] Gaps in socioeconomic development between countries or regions.
[4] Gaps within the same country, that is, between territories, groups or genders.
[5] Entrepreneurs are those (business owners) who endeavour to generate value by creating or expanding economic activity by identifying and exploiting new products or markets (OECD, 2012).

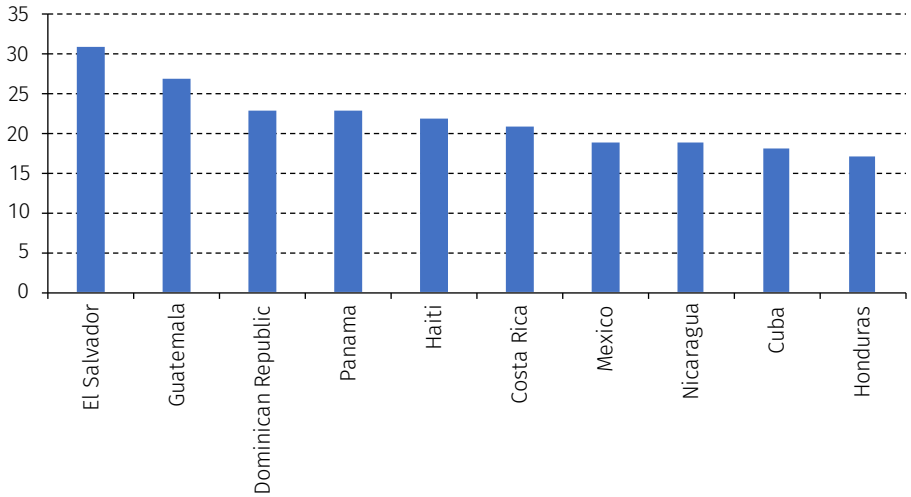
In Mexico (Fareed and others, 2017), women's financial inclusion is directly related to entrepreneurship, thus creating economic opportunities for them. This result coincides with previous studies showing that access to credit positively impacts female entrepreneurs' businesses (FMO Entrepreneurial Development Bank, 2020; Khaleque, 2018). According to the International Labour Organization (ILO), the Dominican Republic has fewer female entrepreneurs than other countries in the subregion. Between 2010 and 2019, an average of 25% of all entrepreneurs were women, whereas the median for the subregion[6] was 39.7% (see figure XIII.1). In this country, there is a slightly higher participation of women among employers (on average 23% between 2010 and 2019), compared to the median for the countries in the subregion, which is 21.4% (see figure XIII.2).

Figure XIII.1
Subregion (10 countries): average female entrepreneurs of total entrepreneurs, 2010-2019
(Percentages)



Source: Prepared by the authors, on the basis of International Labour Organization (ILO), ILOSTAT [online database] https://ilostat.ilo.org/es/.

Figure XIII.2
Subregion (10 countries): average number of women in the total number of employers, 2010-2019
(Percentages)



Source: Prepared by the authors, on the basis of International Labour Organization (ILO), ILOSTAT [online database] https://ilostat.ilo.org/es/.

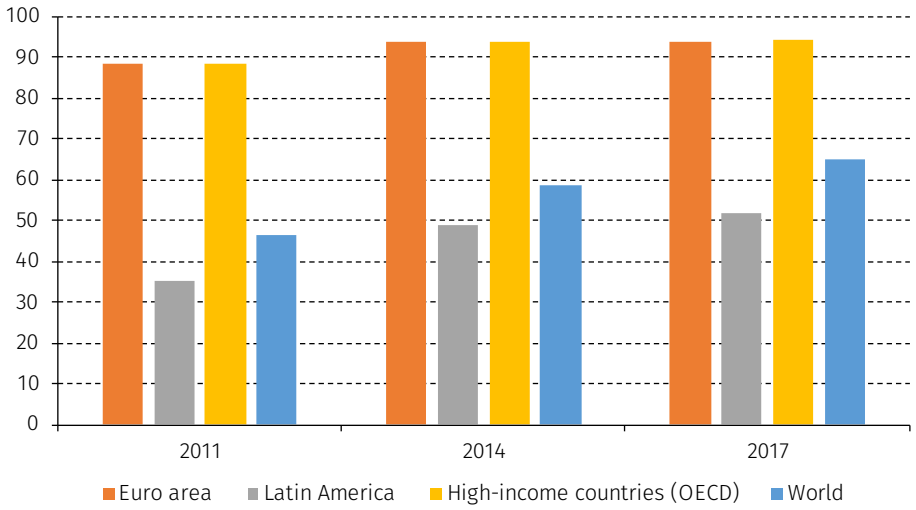
[6] The ten Latin America and the Caribbean countries listed in figure XIII.1 comprise the subregion.

2. Invisible barriers[7] and social gender norms

In Latin America, 56% of unbanked people are women (Demirgüç-Kunt and others, 2017), and 52% of women in general have a bank account (see figure XIII.3). In the Dominican Republic, 53.4% of women have access to an account in a financial or banking institution, whereas just 4.8% may be characterized as female entrepreneurs.[8]

Given this situation, several countries in the region have formulated national strategies to remediate the lack of inclusion of women in the financial system (OCDE/CAF, 2020). However, assessment studies show that the results of these strategies are still modest (Holloway and others, 2017; Banerjee and others, 2015). Recent research poses that social gender norms may be accountable for the lack of progress (Hendriks, 2019; Field and others, 2021). Next, this study defines social gender norms as related to financial inclusion and explores how these norms affect inclusion. It also discusses the need to delve deeper into this issue, especially in Latin America and the Caribbean, where literature is scarce.

Figure XIII.3
Several regions: women over 15 y.o. with accounts in banks and financial institutions, 2011, 2014 and 2017
(Percentages)



Source: Prepared by the authors, on the basis of World Bank, Global Findex, 2017 [online] https://globalfindex.worldbank.org/#about_focus.

a) Social gender norms: a definition

In a review of the literature on social gender norms and their relationship with financial inclusion, Roa (2021) finds three characteristics relevant to the definition. First, social norms are learned from an early age, but they may also be dynamic over time. Second, these norms persist because of the sanctions they imply. And third, they are different from personal beliefs, attitudes or interests. This study uses the definition proposed by Roa (2021), according to which, in financial inclusion, the gender norm is an implicit, non-formal rule that most people accept and follow. This norm dictates how women are expected

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[7] The phrase "invisible barriers" was coined in the United States in the 1970s. It refers to the artificial, implicit obstacles that spring from psychological and organizational prejudice and prevent women from occupying, for instance, leading positions in business. The "invisible" barrier that stops women from reaching high positions, whether political, economic, commercial, financial or another, is known as the "glass ceiling". "Glass ceiling" is a phrase used in psychology to refer to the invisible barriers that are hard for women to pass to advance their carriers. These barriers have nothing to do with women's education and skills but are created by institutional structures. The phrase is useful when designing and planning actions meant to eliminate inequality and discrimination in the workspace to identify all norms, practices and relationships, visible or invisible, that keep women from paid work and affect their career development (https://campusgenero.inmujeres.gob.mx/glosario/terminos/techo-de-cristal).

[8] Figures from the most recent SME Finance Forum (MSME) [online] https://www.smefinanceforum.org/data-sites/msme-finance-gap.

to participate in the household's financial decisions, acquire and use financial products and services, and have access to formal financial channels or intermediaries.

b) Social gender norms as a barrier to financial inclusion

Financial inclusion must be understood considering product access, use and quality (Roa, 2013). Their availability characterizes access to financial products. Claessens and Perotti (2007) point out that the cost of financial products and services is part of their availability, as the public should be able to afford them. Generally speaking, access to financial products within a zone is set by access to branch offices, ATMs, banking correspondents and so on (Beck, Demirgüc-Kunt and Martínez, 2008). More recently, the discussion on access has evolved to include access to financial services from digital and mobile phones.

According to Claessens (2006), the use of financial products is defined by the consumption and usage of products and services that individuals acquire in the formal financial system. Usage may include a bank account for payments and savings. However, it may also mean using a loan for consumption or a mortgage to finance expenses and getting insurance or investing in a fund. The quality of a financial product or service depends on the information it gives the users so they can make decisions regarding their investment portfolio. It also includes the possibility of the product adapting to users' needs. According to Roa (2013), quality is related to the effectiveness of access and the use of financial products and services.

In this study, financial inclusion is defined as the process of enabling the access of all the different segments of society to a range of regulated financial products and services tailored for consumers, thus promoting their economic and financial well-being (SHCP/CNBV/INEGI, 2012; OCDE/INFE, 2012; Atkinson and Messy, 2013). Barriers constraining financial inclusion are usually classified by supply and demand (Roa and Carvallo, 2018; Di Giannatale and Roa, 2019). Regulatory and legal barriers may also be considered (Holloway, Niazi and Rouse, 2017). Supply barriers include the lack of adequate financial products for consumers, women in this specific case. These barriers do not consider the particular challenges women face, such as restrictions on their mobility or social interactions outside the household. It may be that financial intermediation opposes barriers to economic accessibility and eligibility. Also, the scarce marketing for such products may erect a supply barrier (Hess, 2020).

Due to social gender norms, women are often caught in circumstances limiting their ability to overcome supply barriers. For instance, they have few work opportunities and tend to work in informal markets or perform unpaid housework (Roa, 2020). When considering territories, the supply barriers in rural areas become stronger with geographical dispersion and less physical access to financial services. Several studies show that rural women face difficulties in obtaining a government ID, suffer discrimination from financial institutions, do not own or cannot provide collateral and, in some cases, need a husband's permission or signature to access a financial product (Demirgüç-Kunt and others, 2013).

Regarding demand barriers, several factors explain why women demand fewer financial products and services. Previous studies point out poor confidence and self-esteem, lower financial and general education levels, and other characteristics, such as aversion to risk[9] (Lusardi and Mitchell, 2008; Bustelo and Vezza, 2019; Yakoboski and others, 2020). A study of European countries found that women do not request a loan because they think it will be refused in countries where gender bias weighs heavily against women regarding access to credit, meaning that demand barriers have a psychological side (Ongena and Popov, 2015). Several efforts, such as surveys and papers, have been made to visibilize and address supply barriers. Research by the CAF-Development Bank of Latin America also points out the need for development programmes that consider these challenges (Auricchio and others, 2021).

Legal and regulatory barriers include a lack of legislation prohibiting discrimination in the financial or legal systems, which limits women's chances of owning a plot of land, thus restricting their possibilities of providing a guarantee for a loan. Barriers like these interact with norms of society that may normalize the idea that women do not have the same legal protections as men and that their access to financial products is not the same.[10]

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[9] Scott (2020) states that the greater vulnerability of women makes them risk-averse, something that the financial industry attributes to fear. The industry does not consider that risks are different for women than men and that their ability to recover from adversity is more limited than men's.

[10] More detailed information may be found in the World Bank annual report "Woman, Business and the Law".

c) Lack of previous research in Latin America

Papers analysing gender norms and financial inclusion in Latin America and the Caribbean have yet to be published. However, it is evident that social gender norms exist in the region. Their relationship with financial inclusion must be studied, as it has been in other parts of the world. When preparing this chapter, documentary evidence of the effects of social gender norms on financial inclusion was scarce. The existing literature contains even fewer papers that seek to compare the effects of norms on women while differentiating between those who live in rural areas and those who live in urban settings. Only four studies have been made worldwide on the impact of social gender norms on financial inclusion from a territorial standpoint distinguishing between urban and rural areas (Aterido and others, 2013; Babbitt and others, 2015; Matthews, 2016; Gammage and others, 2017).

Most studies on social gender norms and financial inclusion focus on Asia and Africa. In Latin America, the Economic Commission for Latin America and the Caribbean (ECLAC) has researched social gender norms in the region, differentiating between urban and rural settings. This study complements a similar one made for Mexico (Romero, López and Hess, 2022). An important finding for the region is an overload of unpaid work (care chores) that limits women's chances to undertake income-producing activities (Ortega, 2012; Valenzuela and others, 2020; Vaca, 2019). This touches on social norms, as society clearly expects women to put their homes and families first. Social norms also become evident when women with the same characteristics as their male peers have lower access to financial products (IDB, 2021). Hess (2020) points out that women of La Antigua (Guatemala) have less access to credit from formal financial institutions than men, even when their incomes are higher. Other papers show that when husbands help women request a loan, it is easier for them to obtain the funds (Alibhai and others, 2015).

B. Statistical analysis of the 2019 National Survey on Financial Inclusion (ENIF)

The data used for the analysis of the Dominican Republic come from 2019 ENIF, taken between Dec. 9-23 of the same year. The surveyed population were persons 18 or older residing in private homes of the Dominican Republic (not in collective ones of more than five units). Geographical coverage extends over the entire country, including the adjacent islands. The Survey was conducted by the Under-Directorate for Surveys of the Department for National Accounts and Economic Studies and the Under-Directorate for the Regulation of the Financial System of the Department of Financial Regulation and Stability (Central Bank of the Dominican Republic, 2020).

This section presents relevant information from ENIF. The data is disaggregated by sex, place of residence (urban or local), age groups and, in some cases, marital status. An overview of financial inclusion by territory is presented first, followed by information on women's financial inclusion from a territorial standpoint. Finally, statistics evincing the impact of gender norms on financial inclusion are shown.

1. Overview of financial inclusion by territory

In the Dominican Republic, 18.1% of the population lives in rural areas. The 18-29 y.o. group constitutes a majority in both rural and urban areas. Generally speaking, education levels, particularly for college degrees, are higher in urban areas. In rural areas, the main work categories are self-employed, housewife and full-time employee or worker. The most common category in urban areas is full-time employee or worker, followed by self-employed and housewife. In rural settings, almost 60% of people have incomes lower than average. This situation also exists in urban areas but to a lesser degree.

As for the regularity of income, 36.7% of rural inhabitants receive fixed wages, 34.6% variable but predictable wages and all others (28.7%) variable and unpredictable wages. In urban areas, the proportion of people that receive fixed incomes is considerably higher (52.8%), while those that receive variable but unpredictable wages are much fewer (32.4%). Those who receive variable but predictable wages constitute 32.4% of the population. In urban and rural areas, cash is the most common means of paying salaries or making purchases. This practice is widespread in rural settings (78.4%). Payroll accounts in a financial institution chosen by the employer stand second.

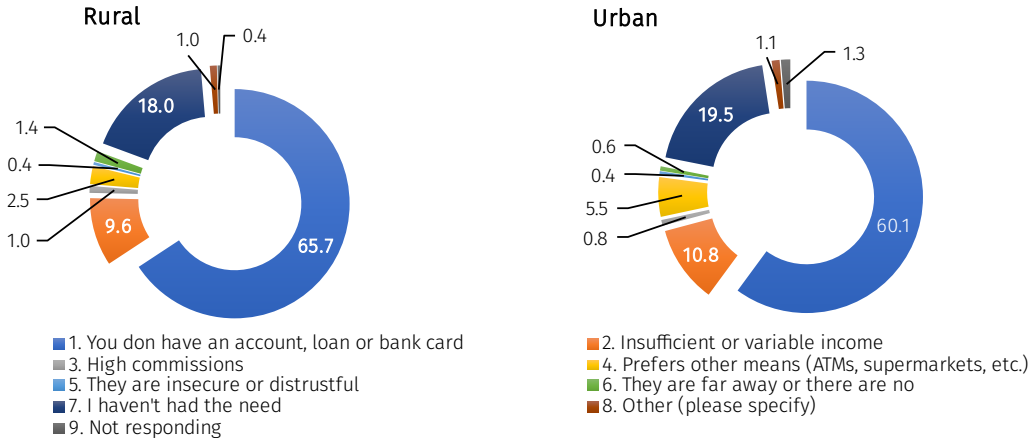
In rural and urban areas, when facing difficulties in covering expenses, people prefer to reduce expenditures (30%) or ask for a loan from friends and family (29.2% in rural areas and 26.6% in urban areas). As for saving and investment habits, 61.7% of persons in rural areas and 56.4% in urban areas declared that they did not save or invest in the past 12 months. In rural areas, 86.5% answered that they do not belong to a loan and savings cooperative; in urban zones, 87.2% gave this answer. Next, this study presents some indicators that evidence financial inclusion, emphasising those related to the access and use of financial products and highlighting differences between rural and urban areas. Marital status is included in some cases to extract additional information.

a) Access to financial products

Information technologies have spread even to remote places and people of limited means. Thus, having a mobile phone and a mobile one with access to the Internet is a key indicator of financial inclusion. According to the Latin American Centre for Innovation and Entrepreneurship (CELIEM, 2022), internet access and social networks on mobile phones are the main technology tools female entrepreneurs use in Central America and the Dominican Republic. According to the Dominican Republic ENIF, 71.5% of people have a mobile phone in rural areas and 82.3% in urban areas. Mobile phones with internet access are also more common in the urban population (83.3%) than among rural inhabitants (75%).

Using the services at the branch office of a bank or financial institution is uncommon in the Dominican Republic. It is practised more in rural settings than in urban areas. When asked whether they had visited a branch office of a financial institution in the past three months, 74.3% of rural inhabitants and 64.2% in urban areas answered “no”. The main reason they gave was that they did not have an “account, loan or bank card” (see figure XIII.4).

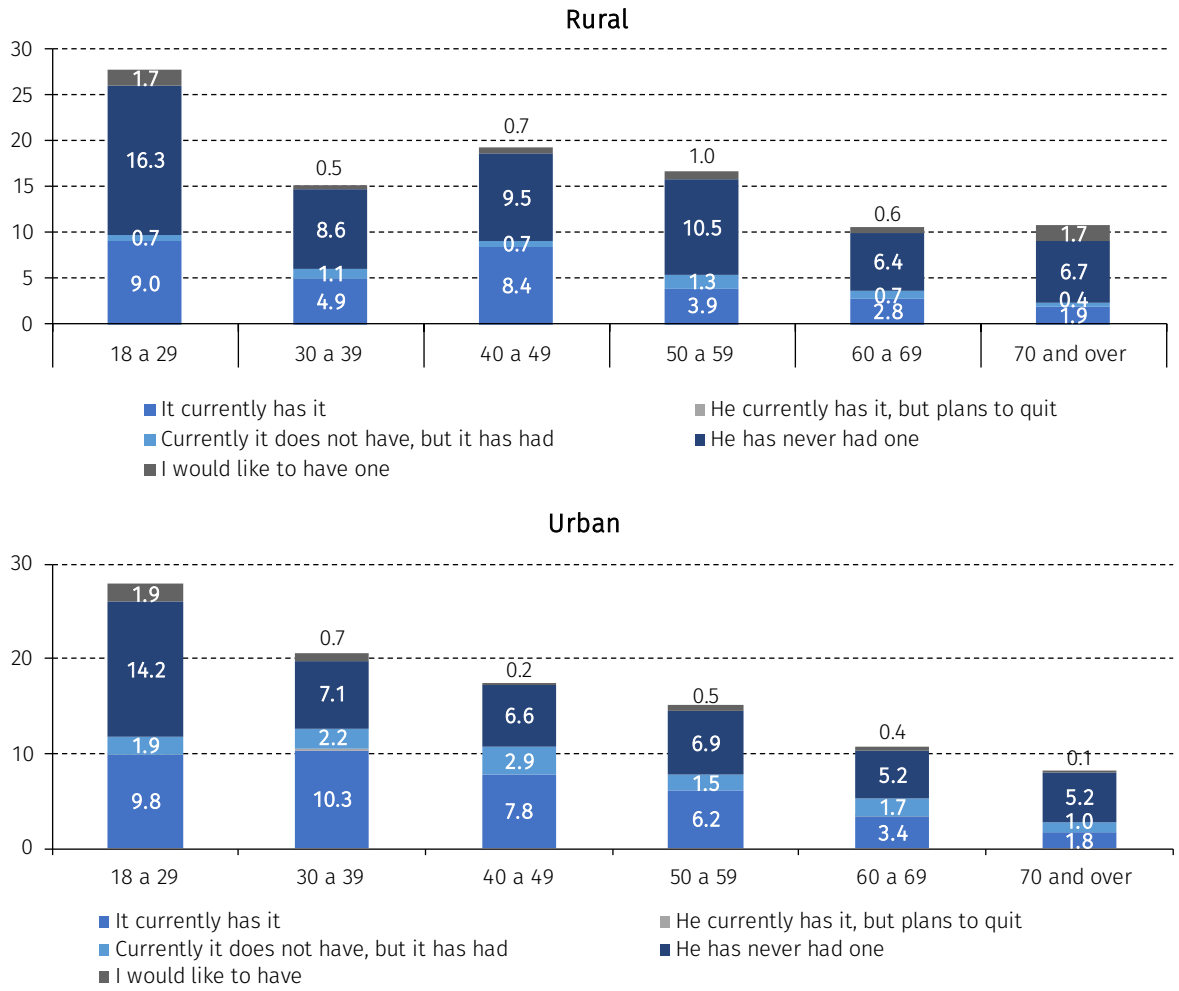
Figure XIII.4
Dominican Republic: persons who do not use the branch offices of financial institutions by place of residence, 2019
(Percentages)



Source: Prepared by the authors, on the basis of Central Bank of the Dominican Republic (BCRD), Encuesta Nacional de Inclusión Financiera (ENIF), 2019.

In the country, 79.7% of people in rural areas and 66.9% in urban areas do not use ATMs. Their use is limited because people do not have an account or a card (85.6% in rural areas and 89.5% in urban areas), and, in far second, because their income is insufficient or variable (6.4% in rural and 6.3% in urban areas). Surprisingly, people with a bank account use the Internet to access it in high numbers: 88.9% in rural areas and 94.6% in urban areas. Finally, savings accounts are more common in both settings, especially among young people. Nevertheless, the total numbers are low, mostly in rural locations (see figure XIII.5).

Figure XIII.5
Dominican Republic: persons with savings accounts by age and place of residence, 2019
(Percentages)



Source: Prepared by the authors, on the basis of Central Bank of the Dominican Republic (BCRD), Encuesta Nacional de Inclusión Financiera (ENIF), 2019.

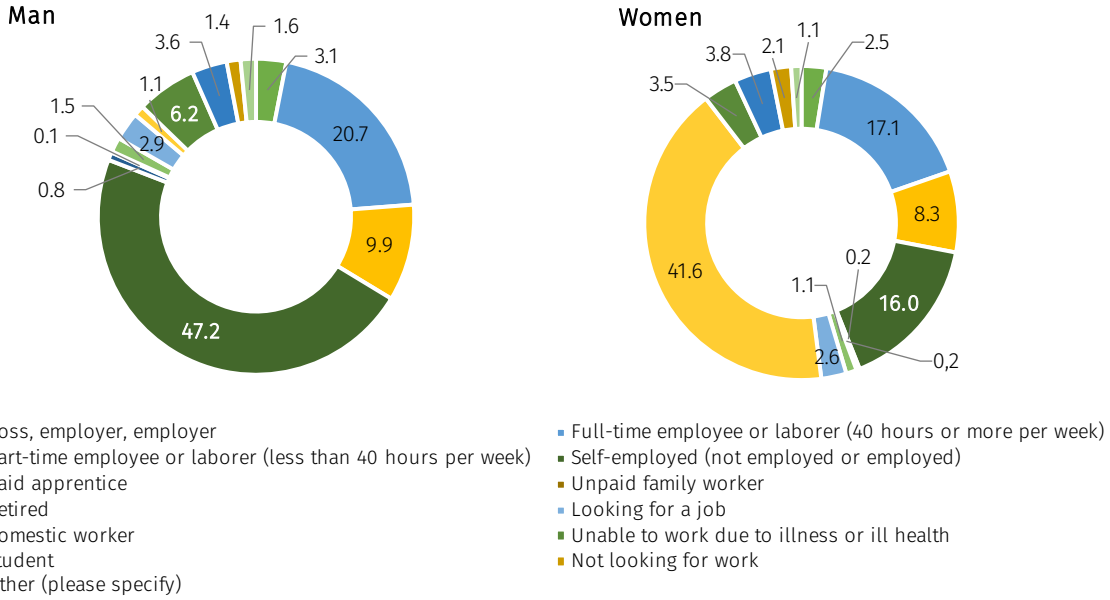
b) Financial inclusion of women by territorial dimension

In 2019, women constituted 57% of the total population of the Dominican Republic, whereas 43% were men. Of these women, 84% lived in urban areas and 16% in the countryside. According to IDB (2021), low education levels may explain the financial exclusion of rural women. Evidence shows that categories like education are important factors for banking discrimination[11] (IDB, 2021) and an obstacle to accessing financial products.

Most of the rural population in the Dominican Republic started elementary school, but many did not finish it. A greater diversity of education levels can be found in the urban population. Unlike men, more women have gone through some education level and even have college studies. This may be a window of opportunity for women to access a financial product. In total, 47% of men are self-employed, and 21% are full-time employees or workers. In contrast, 42% of women are housewives, 17% work full-time, and 16% are self-employed (see figure XIII.6).

[11] Women face unequal work conditions and have fewer opportunities for education and formal employment than men. They also own fewer assets and usually do not own land or other property. All this predisposes them to be discriminated against when they try to access financial services and products.

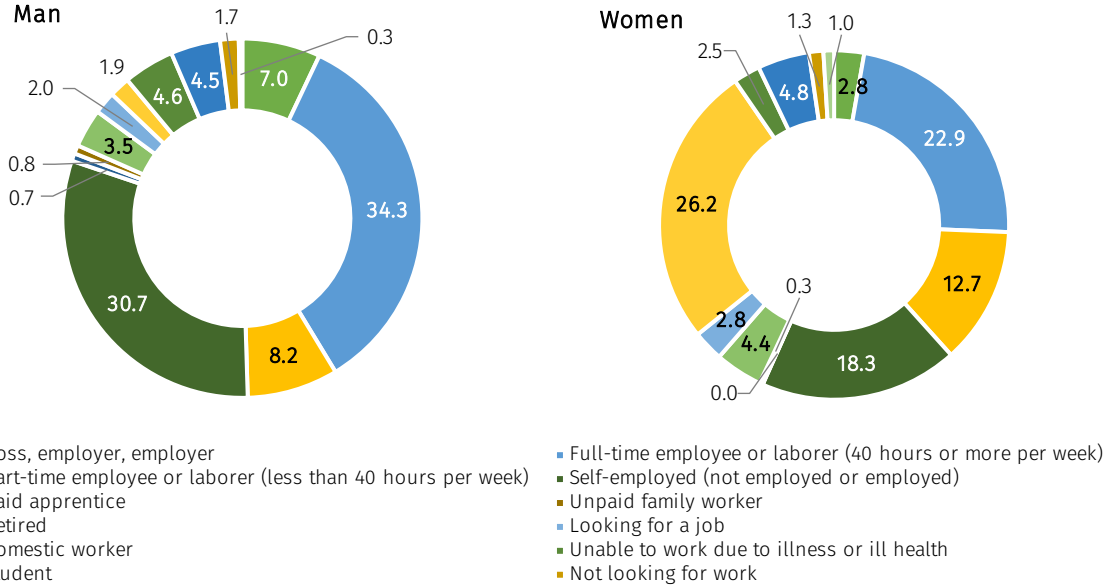
Figure XIII.6
Dominican Republic: rural population by occupation according to sex, 2019
(Percentages)



Source: Prepared by the authors, on the basis of Under-Directorate for Surveys of the Department for National Accounts and Economic Studies and the Under-Directorate for the Regulation of the Financial System of the Department of Financial Regulation and Stability, Encuesta Nacional de Inclusión Financiera (ENIF) 2019.

In urban settings, the proportion of housewives drops considerably to 26%, while the percentage of women with full-time jobs rises to 23%. In cities, 34% of men have full-time jobs, and 31% are self-employed (see figure XIII.7). Work gaps are wider in rural areas than urban ones (ILO, 2016).

Figure XIII.7
Dominican Republic: urban population by occupation according to sex, 2019
(Percentages)



Source: Prepared by the authors, on the basis of Under-Directorate for Surveys of the Department for National Accounts and Economic Studies and the Under-Directorate for the Regulation of the Financial System of the Department of Financial Regulation and Stability, Encuesta Nacional de Inclusión Financiera (ENIF) 2019.

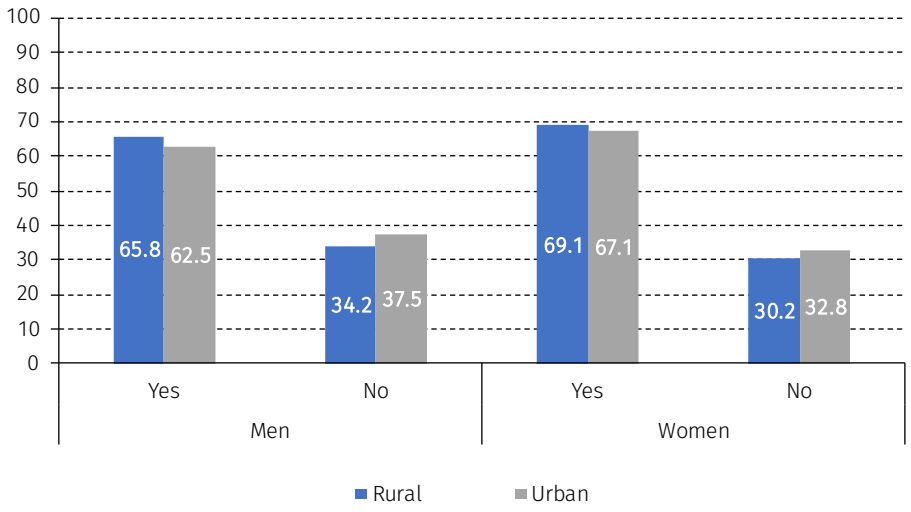
As for income, the percentage of rural women with the lowest income (39%) is similar to that in urban areas (40%). However, 47% of rural women had no income, which is higher than in urban settings (31%). This inequality may result from the unpaid work that many women perform in crops and fields (ILO, 2016). The percentage of rural men with the lowest incomes (53%) is much higher than in cities (38.8%). The percentage of men without income is about the same in rural and urban areas (13.2% and 13.6%, respectively).

By type of income, 50% of women in rural areas and 58% in urban areas receive fixed incomes. This proportion is considerably higher than for men at 29% in rural areas and 47% in urban areas. Variable and unpredictable income is more common in rural settings for men (36%) than for women (32%). The gap between men and women for variable and predictable income is narrower in cities.

In rural areas, most men are paid in cash (82%), but so are the women (72%). A payroll card is used to pay 15.4% of rural men and 26.4% of women. In rural settings, the proportion of men that get paid in cash is considerably lower than those in cities, though it is low for both men and women (60.5% and 59%, respectively). The difference is statistically significant with a 95% confidence interval. In urban areas, 37% of men and 37.7% of women receive their salaries through a payroll account. There are no significant differences by place of residence.

In all places, the percentage of women who find it hard to make ends meet is higher than that of men. The gap is 3.3 percentage points in rural and 4.6 percentage points in urban settings. Both gaps are statistically significant within a 95% confidence interval (see figure XIII.8). This could be explained by the gender pay gap documented by ILO (ILO, 2017).

Figure XIII.8
Dominican Republic: population with difficulties to cover expenses by sex and place of residence, 2019
(Percentages)



Source: Prepared by the authors, on the basis of Under-Directorate for Surveys of the Department for National Accounts and Economic Studies and the Under-Directorate for the Regulation of the Financial System of the Department of Financial Regulation and Stability Encuesta Nacional de Inclusión Financiera (ENIF) 2019.

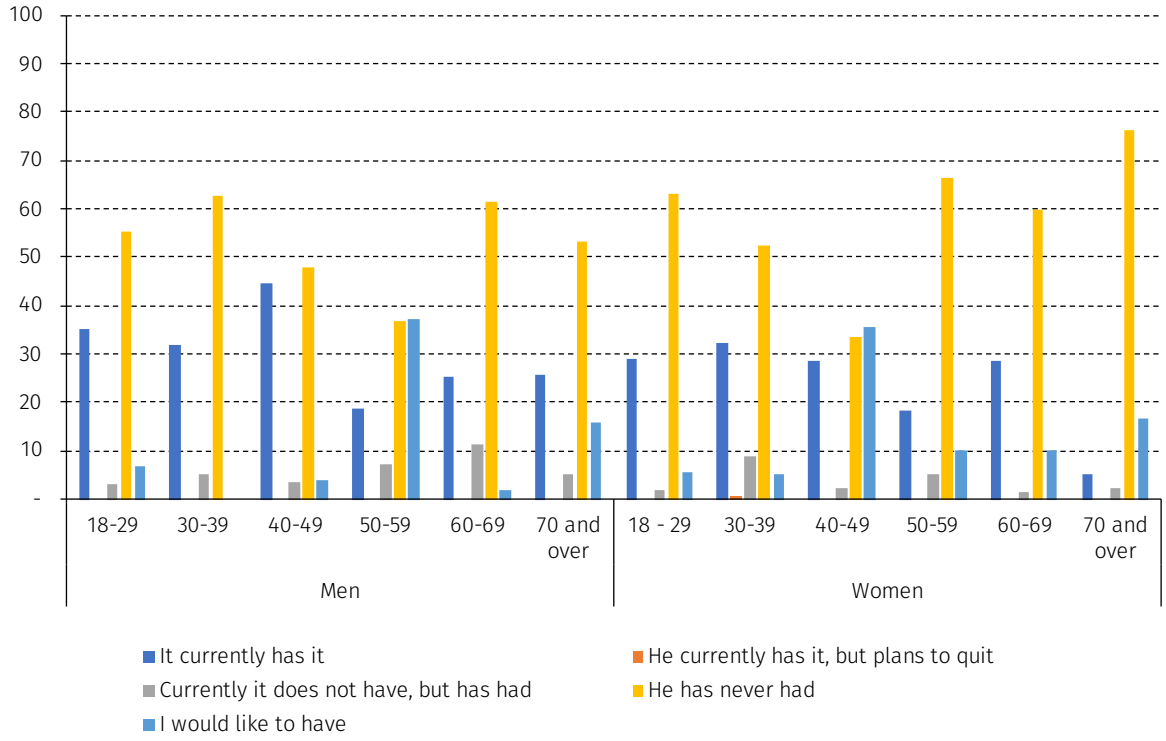
When rural populations find it hard to cover expenses, the most common option is to spend less. Both men and women do this, but the proportion is higher for women. The second option is to borrow from friends and family. Women do this in a ratio of 28.7%, while 29.7% of men act this way. The third most popular option is to recur to informal lenders. In urban settings, the first option is also to reduce expenditures, the second is to borrow from friends and family, and the third is to go to an informal lender. However, unlike in rural settings, both sexes draw from their savings in similar proportions.

In rural areas, savings accounts are more common among women between 30 and 39 years old: 32.3% have them. Among their male peers, 31.9% save money in a bank. A proportion of 44.5% of men between 40 and 49 years old have a savings account, whereas 35.6% of rural women between 40 and 49 expressed their wish to have one (see figure XIII.9).

In urban localities, more women between 30 and 39 have savings accounts (51.2%) compared to men in the same age group with savings accounts (48.1%). This trend repeats for most age groups: more city women than men tend to have a savings account, although this is not the case in the 40-49 age group (see figure XIII.10). Savings accounts are the financial product used the most by urban women, but it has the lowest yields and risks.

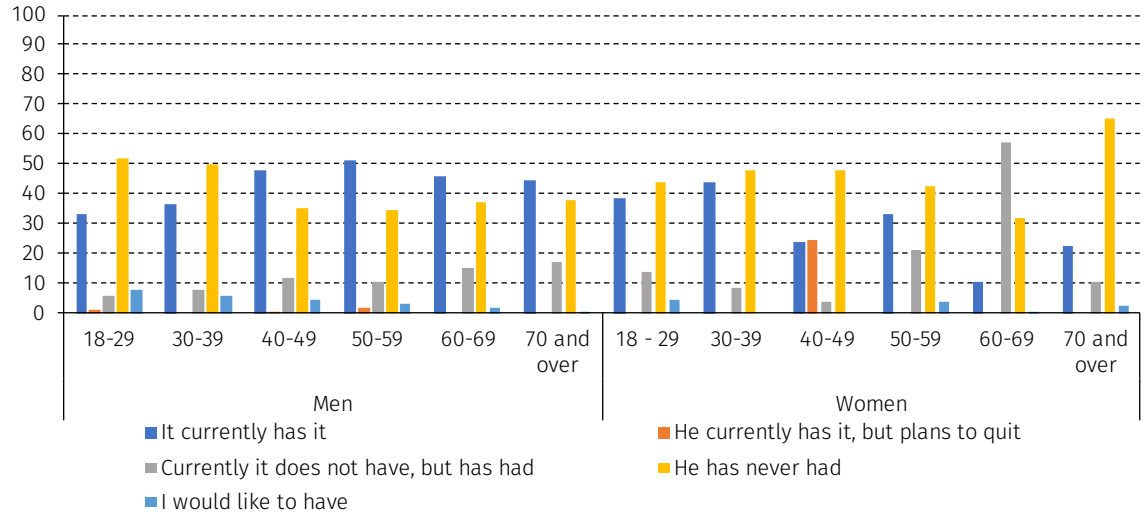
Regardless of age, payroll accounts are used little in rural settings. Most men and women answered that they had never had one. The highest percentage of women with a payroll account is in the 40 to 49-year-old group (see figure XIII.11). Unlike in rural areas, in urban localities the payroll account is used to a greater extent. Among persons 30 to 39 years old, 40.6% of women and 39.8% of men said they had one (see figure XIII.12).

Figure XIII.9
Dominican Republic: rural population with a savings account by sex and age, 2019
(Percentages)



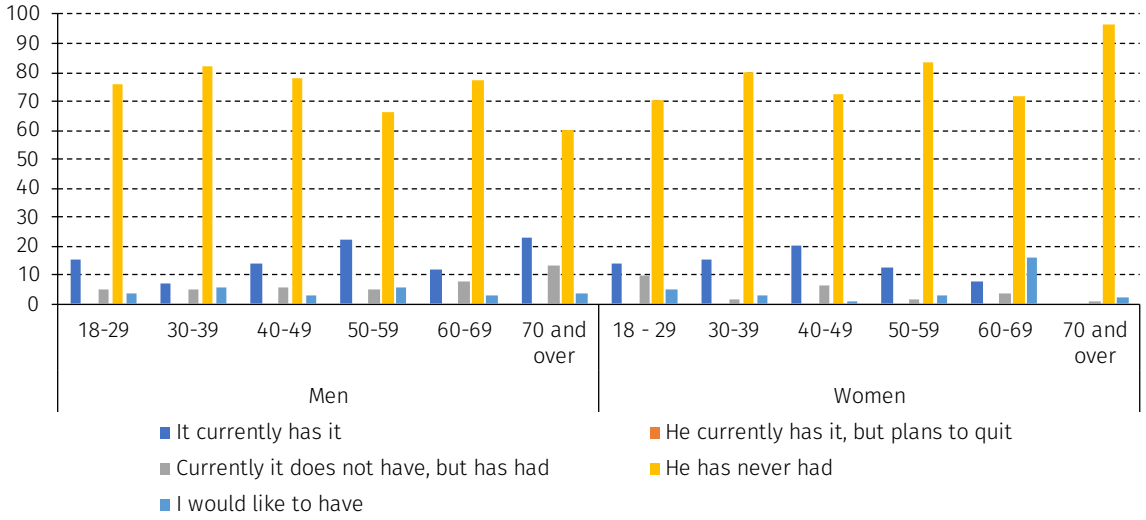
Source: Prepared by the authors, on the basis of Under-Directorate for Surveys of the Department for National Accounts and Economic Studies and the Under-Directorate for the Regulation of the Financial System of the Department of Financial Regulation and Stability Encuesta Nacional de Inclusión Financiera (ENIF) 2019.

Figure XIII.10
Dominican Republic: urban population with a savings account by sex and age, 2019
(Percentages)



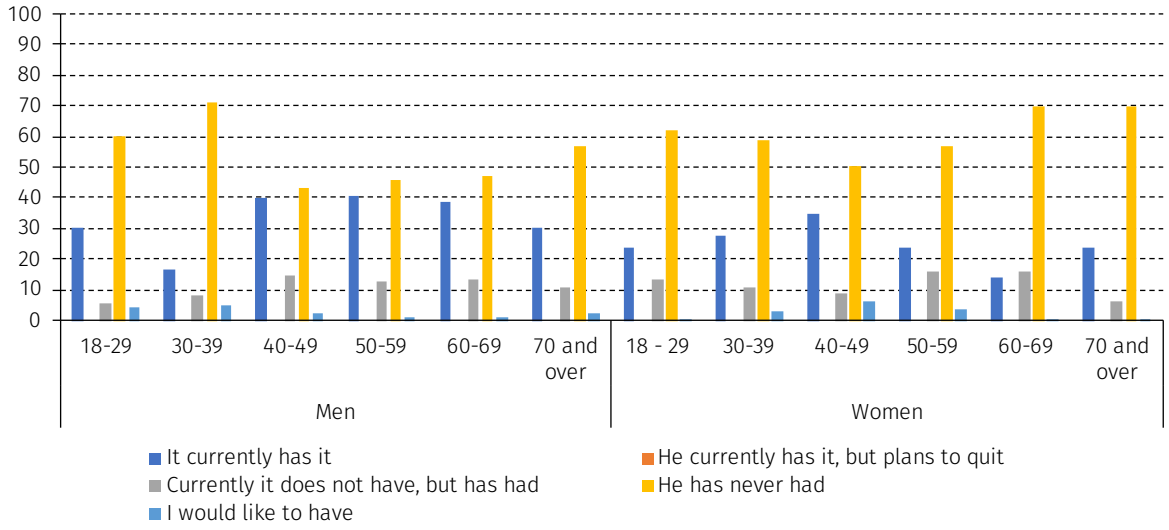
Source: Prepared by the authors, on the basis of Under-Directorate for Surveys of the Department for National Accounts and Economic Studies and the Under-Directorate for the Regulation of the Financial System of the Department of Financial Regulation and Stability Encuesta Nacional de Inclusión Financiera (ENIF) 2019.

Figure XIII.11
Dominican Republic: rural population with a savings account by sex and age, 2019
(Percentages)



Source: Prepared by the authors, on the basis of Under-Directorate for Surveys of the Department for National Accounts and Economic Studies and the Under-Directorate for the Regulation of the Financial System of the Department of Financial Regulation and Stability Encuesta Nacional de Inclusión Financiera (ENIF) 2019.

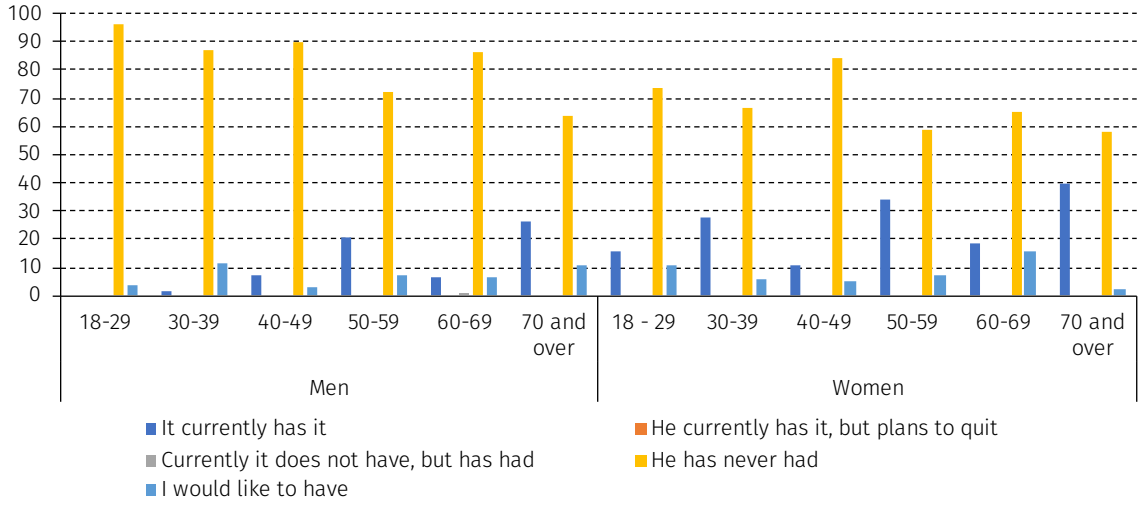
Figure XIII.12
Dominican Republic: urban population with a savings account by sex and age, 2019
(Percentages)



Source: Prepared by the authors, on the basis of Under-Directorate for Surveys of the Department for National Accounts and Economic Studies and the Under-Directorate for the Regulation of the Financial System of the Department of Financial Regulation and Stability Encuesta Nacional de Inclusión Financiera (ENIF) 2019.

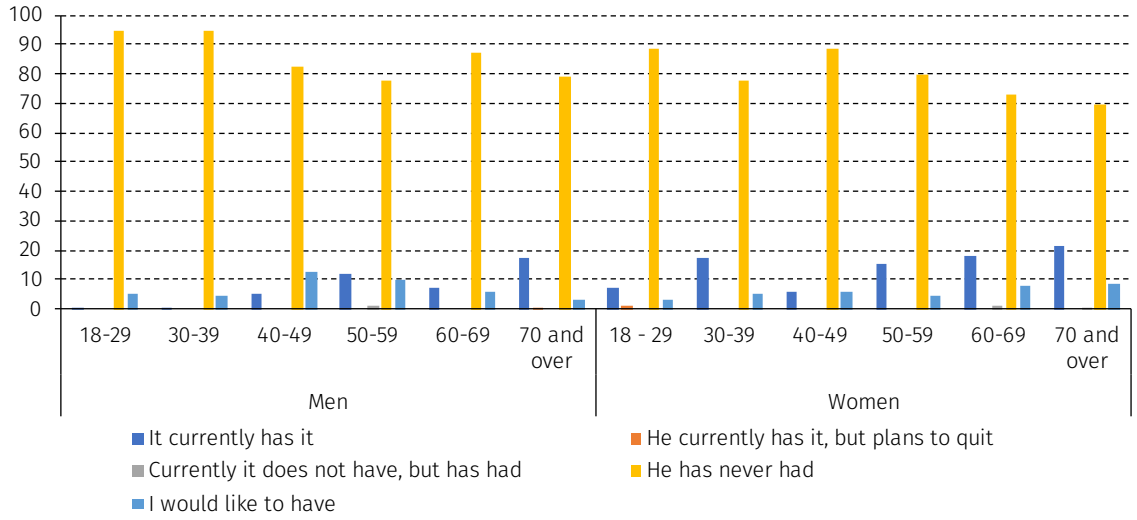
As for government accounts used to funnel aid, more women than men have one in all age groups. The 70-year-old group of women stands out with 39.7% (see figure XIII.13). This may be explained because women used to receive conditional transfers or government aid since they were considered better at managing those funds than their male peers. In the urban environment, access to government accounts is also observed in all age groups, but more women than men have them. Once again, the age group of 70-year-old women and older stands out because 21.4% have one (see figure XIII.14).

Figure XIII.13
Dominican Republic: rural population with a government account by sex and age, 2019
(Percentages)



Source: Prepared by the authors, on the basis of Under-Directorate for Surveys of the Department for National Accounts and Economic Studies and the Under-Directorate for the Regulation of the Financial System of the Department of Financial Regulation and Stability, Encuesta Nacional de Inclusión Financiera (ENIF) 2019.

Figure XIII.14
Dominican Republic: urban population with a government account by sex and age, 2019
(Percentages)



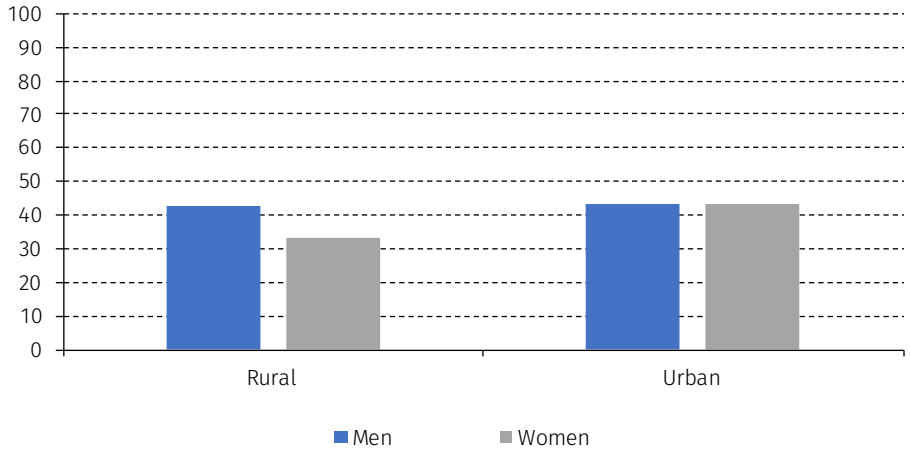
Source: Prepared by the authors, on the basis of Under-Directorate for Surveys of the Department for National Accounts and Economic Studies and the Under-Directorate for the Regulation of the Financial System of the Department of Financial Regulation and Stability, Encuesta Nacional de Inclusión Financiera (ENIF) 2019.

Data not disaggregated by place of residence show that, generally speaking, fewer women have mobile phones than men (78.8% and 82.6%, respectively). This difference is statistically significant with a 95% confidence interval. In rural settings, the proportion of men (71.7%) and women (71.4%) with mobile phones is very similar. In cities, the proportion of women with mobiles is 80.1%, while for men, it is 85.5%. This difference is statistically significant with a 95% confidence interval. Not having a mobile phone is an obstacle female entrepreneurs must overcome because limited access to technology curbs women's efforts to start a business (ILO, 2017).

The proportions are reversed considering mobiles with internet service since more rural women have them than rural men (80.3% and 69.9%, respectively). The same happens in urban settings, though the gap is considerably narrower. The proportion of women with Internet on their phones is 85.4%, while that of men is 80.4%. The difference is statistically significant with a 95% confidence interval.

As for savings and investments, there are no significant differences in urban settings, as 43.3% of men answered that they saved or invested in the past year, while 43.5% of women gave the same answer. Little more than 56% of persons in urban areas said they did not save or invest in the past year. In rural areas, 33.3% of women and 42.8% of men said they saved or invested in the past year. A large proportion of rural women (66.7%) answered that they did not save or invest, and neither did 56.9% of rural men (see figure XIII.15). Access to basic financial services such as savings is substantial for poverty alleviation, in addition to contributing to entrepreneurship, an important way to address poverty (ILO, 2017). Unfortunately, there is a gender gap, and, as shown by the data, women save and invest less than men.

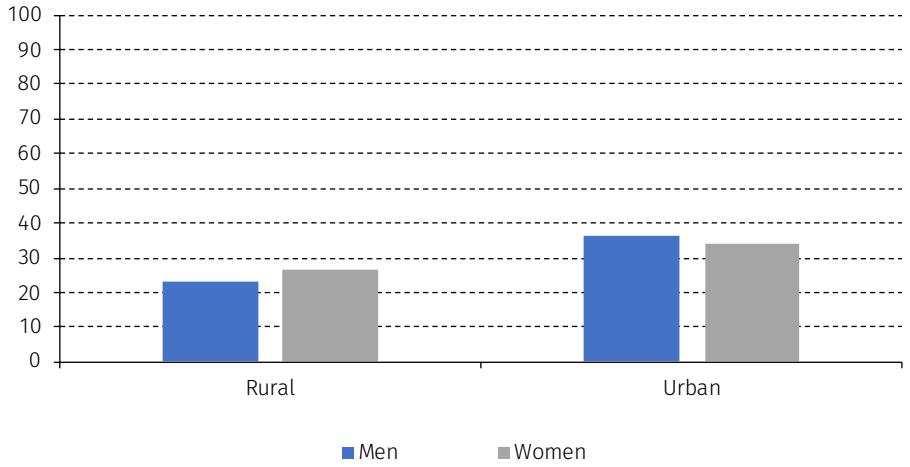
Figure XIII.15
Dominican Republic: population that saves or invests by sex and place of residence, 2019
(Percentages)



Source: Prepared by the authors, on the basis of Under-Directorate for Surveys of the Department for National Accounts and Economic Studies and the Under-Directorate for the Regulation of the Financial System of the Department of Financial Regulation and Stability Encuesta Nacional de Inclusión Financiera (ENIF) 2019.

More rural women (26.8%) than men (23.1%) used a financial institution's services. However, this was the reverse in urban settings, since 34.2% of women and 36.5% of men used a financial institution's services (see figure XIII.16). Financial services are increasingly more critical for economic activity and strongly impact women's financial inclusion. As may be observed, the percentage of rural women who use these services is higher than that of rural men. However, the opposite is true in urban settings. The proportion of urban women using a financial institution's services is lower than urban men's. Work is needed to close this gap.

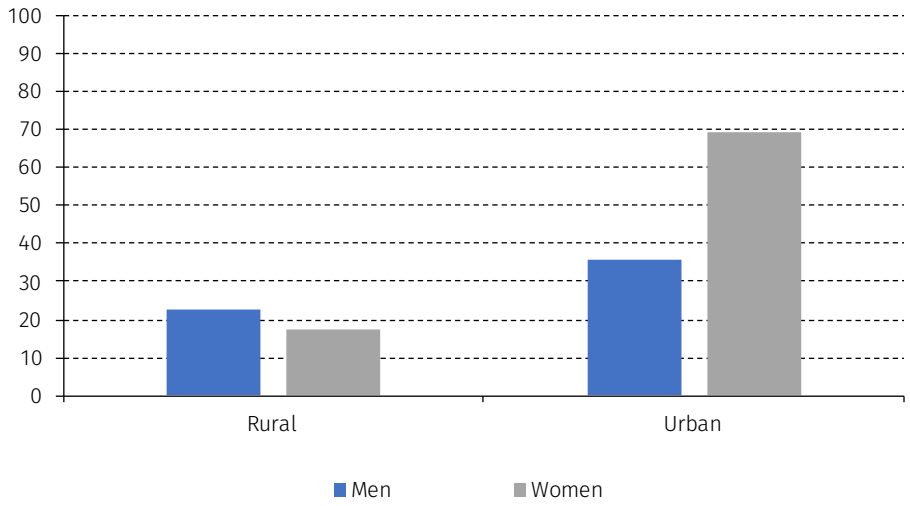
Figure XIII.16
Dominican Republic: population that uses a financial institution's services by sex and place of residence, 2019
(Percentages)



Source: Prepared by the authors, on the basis of Under-Directorate for Surveys of the Department for National Accounts and Economic Studies and the Under-Directorate for the Regulation of the Financial System of the Department of Financial Regulation and Stability Encuesta Nacional de Inclusión Financiera (ENIF) 2019.

In rural and urban areas, the first reason why people do not go to a bank's branch office is because they do not have an account, loan or bank card. Second, they do not need to go. Third, their income is insufficient or variable. A higher percentage (12.2%) of urban women gave this answer than rural women (9.4%). Most of the rural population did not use ATMs, but the proportion was higher for women than men (82.7% and 77.3%, respectively). Even though ATMs are more commonly used in urban areas, 60% of people did not use them; as in rural areas, the proportion of women is higher than for men (see figure XIII.17).

Figure XIII.17
Dominican Republic: population according to use of ATM by sex and place of residence, 2019
(Percentages)



Source: Prepared by the authors, on the basis of Under-Directorate for Surveys of the Department for National Accounts and Economic Studies and the Under-Directorate for the Regulation of the Financial System of the Department of Financial Regulation and Stability, Encuesta Nacional de Inclusión Financiera (ENIF) 2019.

As with financial services, regardless of location, people mostly do not use ATMs because they do not have an account, loan or bank card. This answer was given by 80% of surveyees, but the proportion was higher among rural women. The second reason was insufficient or variable income.

c) Statistics on the impact gender norms have on financial inclusion

The 2019 National Survey of Financial Inclusion (ENIF) of the Dominican Republic did not ask specific questions on social gender norms. However, there is statistically significant evidence that the proportion of rural women who use online banking is higher than that of men.[12] Similarly, data show that the proportion of urban women who use online banking is higher than that of urban men.[13] Absolute figures are included to highlight the difference between rural and urban areas by the number of online banking users (see table XIII.4).

[12] The hypothesis was tested to determine whether the proportions of rural men and women were statistically the same for the answer "yes". The confidence interval was 95%.

[13] Similarly, the hypothesis was tested to determine whether men and women in urban areas answered "yes" in the same proportion. Again, the confidence interval was 95%.

Table XIII.4
Dominican Republic: population that uses internet banking services to access their accounts, 2019

Place of residence	Sex	Uses internet banking	Bank users	Percentage
Rural	Men	17 598	20 751	84.8
	Women	23 992	26 013	92.2
Urban	Men	377 910	407 970	92.6
	Women	426 105	441 921	96.4

Source: Prepared by the authors, on the basis of Under-Directorate for Surveys of the Department for National Accounts and Economic Studies and the Under-Directorate for the Regulation of the Financial System of the Department of Financial Regulation and Stability Encuesta Nacional de Inclusión Financiera (ENIF) 2019.

Statistical analysis evinces that disparities in gender and place of residence affect financial inclusion. Most indicators tell that women, particularly in rural areas, tend to experience these effects more. Similarly, the analysis indicates a possible influence of social gender norms. For instance, there is evidence that married women have less access to bank offices and ATMs. This could be related to lower labour insertion (and incomes) because they perform unpaid work (care activities and household activities) or to a restricted autonomy that does not allow them to move freely, as they need their partner's permission or to tell him their whereabouts. In addition, women face safety problems, especially in rural areas, due to a lack of infrastructure, such as safe transportation and good street lighting.

Recent econometric studies (IDB, 2021) concluded that in Central America and particularly in the Dominican Republic, gender gaps work against women in business and personal settings. Furthermore, although econometric modelling controls observable differences (age, income, working age, ownership of a mobile phone, recipient of remittances from abroad, having an ID), women are still at a disadvantage compared to men. In other words, even if explicative variables had the same values for women as for men, women's financial inclusion would be lower.

Lack of financing to meet their needs is another factor that hampers women who try to start a business in Central America and the Dominican Republic (CELIEM, 2022). As manifested by 52% of the women in the sample, there is no equality of access to financing, and over 60% of women fund their business activities with their own money. Even in the commercial segment of microcredits, women lag significantly behind their male peers. A downward trend has thus been registered during the last six years (CELIEM, 2022).

Evidence shows that women in Central America and the Dominican Republic tend to present a lower credit risk than men, though their loans are also smaller (CELIEM, 2022). The hypothesis emerging from this result is that there are structural inequalities and gaps in income, ownership of fixed assets, savings and other aspects related to their care responsibilities. Together, these curb women's access to proper financing. The persistence of these gaps is an obstacle to greater productivity at the aggregate level and constrains growth in the rates of human capital accumulation. Both are critical factors in the economic development of any country. In addition, Duflo (2012) points out that discrimination in women's access to financing may represent a high cost for countries, as empirical evidence shows that women are better at managing the financial resources of their households.

C. Fieldwork analysis

This study is enriched with fieldwork that consisted of 63 in-depth interviews with persons living in urban, semi-urban and rural areas of the Dominican Republic. The fieldwork's results do not represent a statistically significant sample. However, they capture the everyday life stories of people, keeping an eye on social gender norms and their impact on financial inclusion.

Political and administrative criteria define rural and urban zones in the Dominican Republic.[14] The sample had three groups: Dominicans and two migrant groups (Haitians and Venezuelans). Socioeconomic diversity was taken into account. The National Statistics Bureau (ONE) of the Dominican Republic establishes five socioeconomic brackets: very low (E), low (D), medium-low (C), medium (B) and medium-high-high (A).[15] Interviewees were 75% women and 25% men. A small number of men was included because, according to Roa (2021), even though all members of society reinforce social gender norms, it may be perceived that men do not think that gender inequality exists but rather believe it is natural for women to take on specific roles or behave in certain ways in their communities, without even considering that such attitudes are discriminatory or result in a lack of opportunities.

The interviews consisted of questions based on Roa's work (2021). They lasted for about 90 minutes, and the questions, focused on social gender norms, inquired about the following seven aspects: work situation or role, business situation, access to financial products, ability to make financial decisions and negotiate in the household, the role played in the home and the community, mobility and social interaction and autonomy.

Table XIII.5
Dominican Republic: ain characteristics of persons interviewed in the course of fieldwork, 2021

Territory	Municipality	Socioeconomic group	Women	Men	Total
Rural	San Cristóbal	D	7	4	11
Semi-Urban	Quisqueya	D	7	3	10
Urban	Santiago, Santo Domingo, Los Alcarrizos	AB	12	0	12
		C	7	4	11
		D	14	5	19
					63

Source: Prepared by the authors, on the basis of interviews.

1. Work situation or role

Most businesses owned by the interviewees are very small and operate within the informal sector. Most sell food and beverages (coffee shops and food stands) or are beauty salons and street vendors (see image XIII.1).[16] The positive evaluation of women who are entrepreneurs is more frequent. However, this role is mediated by women's family responsibilities. Female entrepreneurs are appreciated by their communities because they help their partners and contribute to their families. Regarding the involvement of women in business, no significant differences were detected between the rural, semi-urban and urban areas.

[14] Urban population resides in municipal districts and the townships of municipalities, while the rural population lives elsewhere. For the purposes of this study, urban areas are Santiago, Santo Domingo and Los Alcarrizos. The rural area is Mana, in the San Cristóbal province. The municipality of Quisqueya is the "semi-urban" area considered by this study. There is no official "semi-urban" area in the Dominican Republic, so Quisqueya is classified as an urban municipality. However, it has many rural characteristics, such as dispersed households and primary sector activities, since many communities grow sugarcane.

[15] Average monthly incomes are as follows: (Quintile 1 - E) Ẍ 14,000 or less, (Quintile 2 - D) Ẍ 25,000, (Quintile 3 - C) Ẍ 32,000, (Quintile 4 - B) Ẍ 44,000, (Quintile 5 - A) Ẍ 92,000.

[16] The concept clouds presented in this section contain many words. The word in the largest type was the most mentioned in the 63 interviews. The smaller the type, the less familiar the word was to the interviewees.

Image XII.1
Dominican Republic: concept cloud used to identify the most common businesses of interviewees, 2021

Source: Prepared by the authors, on the basis of interviews.

2. Being a female entrepreneur

Female entrepreneurs often take family members into their business. Half of the interviewed women reported that they received financial or emotional support in their chores so they could devote time to their businesses. However, the interviewees also declared they faced different challenges when starting and growing a business. Among the obstacles were the demands of caring for and raising children and performing house chores. They also mentioned a lack of economic means, lack of financial education, racism, problems with papers caused by their migratory status and even gender violence. A good portion of interviewees mentioned three significant challenges to starting a business: money (seed capital), searching for clients or sales channels and the pandemic (several businesses started in its context) (see image XIII.2).

Image XIII.2
Dominican Republic: concept cloud used to identify the most common challenges that interviewees met to start a business, 2021

Source: Prepared by the authors, on the basis of interviews.

Among the women entrepreneurs who answered whether they felt discriminated against because of their sex (46%), 28% answered “yes”. When asked whether they met disadvantages because they were women, the opinion is that life is generally harder for them. For instance, they pointed out that men establish tighter networks than women because men begin to work at an early age and without time constraints since they do not have to care for household members or do chores. Also, some interviewed women affirmed that they faced difficulties when bargaining with suppliers and clients. They are not treated with the same consideration and respect as their male peers just because they are women. In addition, they are more exposed to work and sexual harassment, which strongly impacts their economic activities because they are placed in situations of risk and vulnerability.

3. Access to financial products

Among the interviewees, 35% answered that they do not have savings, and most of those that did, had them informally. Women often keep their savings in cash in their homes because they have small amounts. The idea prevails that amounts must be high to save in a financial institution. Also observed was the frequent use of collective savings schemes (popularly known as "San") to have funds for future investments or enough to put into a bank.

Most interviewed women did not like being in debt or paying interest. The interviews showed that the most significant barriers faced by migrants to access financial products arise from their migratory status and lack of documentation. No discrimination was reported when using financial services. However, female interviewees said it is better to visit a branch office in the company of their male partners because then the staff feels more trust. As concerns the ownership of financial assets, 73% of the interviewees answered the question asking if they had some assets, of which 72% answered "yes". A bank account, especially a savings account, was the most frequent answer, followed by a credit card and a house. Some people said they have more than one asset and that sometimes the assets they own are in both their name and their partner's.

4. Financial decision-making power and negotiation at home

The interviewees referred to women's role as suppliers that do not neglect home chores or the care they give. Within a household, financial decisions are often made jointly by the two adults in the couple when they are married or live together. There are no differences among the various kinds of financial decisions. All seem to be made together. When asked directly, persons living with a partner answered that they made financial decisions. However, once the conversation had started, it became clear that it was the man who decided.

In most cases, women administer the household's finances, regardless of whether the man is the main supplier. Besides, even when it is the man who brings in funds, it is the woman who decides how to use them, thus reinforcing their gender role as administrators. Finally, most interviewees value women who own assets with their partners or by inheritance. When asked if they hid some savings from their partners, persons who answered (47.6% of the total) said "yes" in a proportion of 57%. Some reasons given for such practice were that it gave independence, that it is a custom and that the money goes to an emergency fund. Other answers were that it is used for personal or unforeseen expenses. It is an "ace up the sleeve" and a private fund of their own.

5. Household and community roles

Generally speaking, most interviewed women were responsible for raising children and keeping house. Thus, women are appreciated in their communities due to their role in their families and are considered the primary support of the community. However, the assessment is not always favourable to women regarding leading roles, such as politics.

Considering the structuring role played by women within their communities, their principal function is to support their families. Male and female interviewees shared this way of thinking. Women are generally valued as entrepreneurs at different socioeconomic levels and in different places of residence. However, they are also expected to care for their families and keep house.

6. Social mobility and interactions

Roa's paper (2021) states that the supply barriers to women's financial inclusion include physical accessibility and the time and money it costs to travel to a branch office. The paper also mentions insecurity on the streets, especially in marginalized rural or urban communities without proper lighting or protection against crime. It also says that some women are restrained in their mobility and interactions with other men, sometimes even forbidden. In rural areas, this situation may even be expected. This creates a disadvantage for women, whose contact networks, which are important for a business, become less populated. As mentioned, women spend more time than men doing house and care work, limiting their opportunities for paid work and the time they have available for other activities and interactions. This is, therefore, a barrier against financial inclusion.

The interviewed women declared that their communities criticized them when they interacted with other persons, even for work reasons. Negative criticism of interactions with men in the community tends to fall harder on married women and young women. Generally speaking, the opinion of the interviewees was divided between those who think that the interaction of men and women within the community is all right (if and when they interact because of work) and those that felt that it depended on the degree of their interaction and how earnest and modest a woman's behaviour was (see image XIII.3). Several persons said that such exchanges might be subject to misinterpretations and that women should be wary about how they relate with the men of their communities.

Image XIII.3
Dominican Republic: concept cloud to identify the perceptions of interviewees on the interactions between men and women of the community, 2021

Source: Prepared by the authors, on the basis of interviews.

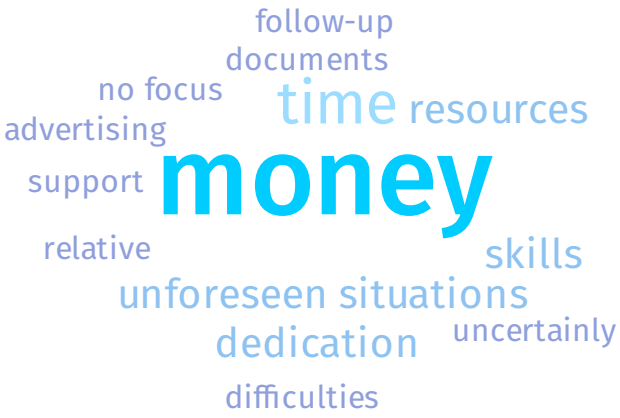
It may seem that men believe that women have more freedom than they do; in other words, in their perception, there are no constraints such as harassment, criticism, pressure or raising children, to mention a few. A good number of female interviewees indicated that the community's negative perceptions differ from their own thinking. Despite the negative perceptions, women recognize that societal changes point to new ways and modes of relating.

7. Autonomy

Women's autonomy may significantly impact their business activities, meaning that more autonomous women have more opportunities to make significant decisions (including financial decisions) about their lives (ECLAC, 2016). Nonetheless, women's autonomy may be affected by cultural and socioeconomic factors. For instance, in some countries, women may have less access to education and financial resources, limiting their abilities to start a business. Also, in some cultures, women can confront the social and cultural barriers that limit their capabilities to make important life decisions (ECLAC, 2016; World Bank, 2021). According to a World Bank (2021) study, women with greater control over their lives and finances are more likely to start successful businesses and innovate in their enterprises.

This section looks at the goals and objectives of the interviewees (all of whom are entrepreneurs). As an indicator of their level of autonomy, it will also examine their partners or other family members' influence on their decisions. This section also addresses whether they enjoy privacy regarding their mobile phones, differentiated education/raising of boys and girls, and, finally, choosing how many children to have. This is a roundabout way to shed light on the autonomy of women. Regarding goals and objectives, most interviewees mentioned having them, though they clearly face obstacles to achieving them. For example, a high percentage stated that money is the major constraint that keeps them from reaching their business goals. Time was also mentioned during several interviews (see image XIII.4).

Image XIII.4
Dominican Republic: concept cloud used to identify the most common limitations that interviewees face in their business, 2021



Source: Prepared by the authors, on the basis of interviews.

Most interviewees said they enjoy privacy regarding their mobile phones but have no issues sharing it with their partners. Regarding raising and educating boys and girls in a differentiated way, men and women agreed that their raising and education are indeed different. It was mentioned that even though girls also go to school nowadays, they are educated differently than boys because education means more than going to school. In most households, the girls are raised learning care work and house chores, while boys are taught to be suppliers; this may constrain future women who want to start a business. Many answers stated that boys are raised with more freedom, as there is the perception that girls face more dangers and, thus, need to be treated with greater consideration. Finally, it was pointed out that boys are freer to engage in sports, so they have more time to spare from an early age and are allowed to leave home.

Generally speaking, interviewed women considered they have high levels of autonomy regarding decisions on their personal finances. Nevertheless, when delving deeper into the issue, the reality of women who live with a partner is that they face limitations in managing their financial resources and that their autonomy to make decisions is constrained. Most persons indicated that they chose whom to marry and how many children they wanted to have. Since the interviews were conducted during the pandemic, some female interviewees included the COVID-19 pandemic among the problems their businesses faced. The pandemic affected their operations by decreasing sales.

D. Conclusions and recommendations

This chapter explains how social gender norms hinder women's financial inclusion in the Dominican Republic. Despite efforts made by the government and financial institutions, women are at a disadvantage compared to men when accessing and using financial services. The statistical analysis of the National Survey on Financial Inclusion (ENIF) and Global Findex indicators show that gender gaps in access to the financial system persist, even after controlling for observable variables such as education, income, working age, having a mobile phone and migratory status. Fieldwork shows that social gender norms and invisible barriers affect women's financial inclusion. The stories of the interviewed women tell of a myriad of interconnected challenges that may influence their opportunities and desires to acquire financial products.

In these interviews, female entrepreneurs reported that, despite having the opportunity and the ability to run their businesses, the expectations of partners and communities are often different and prioritize care and house chores. The communities where they develop try to restrain their possibilities and ambitions as business people, assuming that their primary goal should be to earn additional income

to support the household rather than become its main supplier. Also, rural women face mobility problems caused by a lack of safe and adequate transportation and infrastructure.

Social gender norms determine which business sectors or areas are acceptable for women. Most businesses owned by the interviewees are very small and operate within the informal sector. Food and beverage venues, grocery stores and beauty salons appeared frequently in the sample. Support networks and associations play an important role in the growth of a business. However, when time and mobility restrictions are in place, joining them or requesting help is difficult.

The analysis shows a differentiated education from childhood. Boys have more freedom of choice and more time to spare from home, whereas girls are taught house chores and have fewer choices. Though this is gradually changing, gender roles are more present in rural areas than urban settings. In rural areas, women face mobility problems, and their chances of inheriting are low; since a fixed asset is needed as collateral to obtain a loan, it is more difficult for rural women to run a business.

Several results of this study were also observed in an analysis made for Mexico (Romero, López and Hess, 2022). Thus, public policy recommendations are also similar. These policies fall into four lines of action:

(i) Programmes to boost the financial inclusion of women should take gender norms and invisible barriers into consideration. They should be part of more comprehensive policies against structural discrimination.

(ii) There are areas of opportunity to improve financial services and how they are announced to the population. The opportunities lay in improving trust in the banking system and guaranteeing the elimination of discriminatory practices in banking and financial services, including the attention provided at branch offices.

(iii) The banking and financial system must experiment with initiatives to break historic social gender norms and their impact on women's economic empowerment and autonomy, of which financial inclusion is an element.

(iv) It should also be a priority to create a safe environment where female entrepreneurs (generally women in the labour market) may carry out their activities.

Persistent gaps in financial inclusion that work against women are an obstacle to increasing the country's productivity and elevating the accumulation rates of physical and human capital. Since this hampers economic development, it is necessary and urgent for the Dominican Republic to close these gaps. A lower financial inclusion of women is the consequence of a society whose norms, which constrain their opportunities and limit their freedoms, negatively impact all aspects of women's lives and inhibit their advancement as individuals. The problem must be solved at its very root, the historic structural gaps of discrimination and exclusion in society, to overcome the challenges of their lower financial inclusion.

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Chapter XIV
Gaps in quality foreign direct investment in Mexico[1]

Jorge Mario Martínez Piva
Pablo Ruiz Nápoles

Introduction

Foreign direct investment (FDI) flows have strategic importance because they transfer knowledge and skills, grant access to intellectual property and create jobs. Of course, also because they may complement national savings with foreign savings.

However, the impacts of foreign direct investment on the host economy differ according to the nature of the sector, the regulations in place and, in general, how a transnational company inserts into the economy and society where it is installed. Several countries have carried out studies on these effects, with a view to defining their strategies to attract investment and benefit from investment flows.

There is no consensus on the analytical framework to study the impact of foreign direct investment on the host economy. Thus, this research designed a proposal for indicators that analyse the "quality of foreign direct investment". This study considers primarily the effects of foreign investment flows on a series of areas, analysed through input-output matrices.

The areas of impact of FDI were determined using development criteria, which in turn define the quality of the investment: contribution to gross production and value added, impact on exports, job creation, impact on sectoral productivity, impact on wages, backward and forward linkages and environmental sustainability. Due to a lack of data, other relevant areas for determining the quality of FDI, such as the impact on female employment or on the capacity to increase local innovation, were not analysed.

The chapter is divided into the following sections: background on quality foreign direct investment, methodological framework, analysis of quality FDI gaps and, finally, conclusions and policy recommendations.

A. Background

In the second half of the 20th century, protectionism prevailed in many developing countries. Their policies included barriers to FDI, as those countries feared the appropriation of their natural resources, the overexploitation of local labour and their dependence on central countries (Cardoso and Faletto, 1969). It was also recognized that domestic enterprises lacked the technology to compete with transnational companies. This was seen as an obstacle to industrialisation that forestalled the "structural change" necessary for development, since then conceived as the transition from an agrarian rural economy to an industrialized urban one, with diversified manufactures and higher levels of income per capita (Chenery and Srinivasan, 1988).

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Developing economies required external aid and credit to close the gaps in investment and currency-exchange and increase gross fixed capital formation. Thinking that strong State intervention in the form of public investment would fill both gaps, the industrialisation strategy of these countries resorted to international financial mechanisms. In the case of Mexico, State participation in increasing investment lasted between 1940 and 1980 (Moreno-Brid and Ros, 2009). FDI in Mexico was restricted in terms of foreign ownership and participation. Territorial and sectoral constraints were also in place. Too much foreign debt resulted in the well-known crisis of the late 1970s and early 1980s, which forced the countries to change their development model.

Although trade liberalisation and growing competition from foreign companies in Mexico began in the 1980s with its entry into the General Agreement on Tariffs and Trade in 1986, FDI legislation remained unchanged until 1992, after Mexico entered into the North American Free Trade Agreement (NAFTA), which forced free access for foreign investment (SECOFI, 1993). Thus, the inflow of FDI was closely linked to Mexico's international insertion and the promotion of its exports.

As of the 1990s, Mexico, like most Latin American and Caribbean countries, took part in the liberalisation of domestic markets and established an active policy to attract foreign investment. As expected, FDI produced benefits. The injected capital, combined with local capital, promoted growth in the economy and employment and an inflow of foreign currency that alleviated the external constraint on growth (Thirlwall, 1979). Two other benefits were improved competition in the host country, which reduced costs of local goods and services, and the introduction of direct (innovation) and indirect (spill over) technological improvements that increased the productivity of domestic sectors (Kumar, 1996). All this had effects on the modernisation of consumption patterns and the overall economy. Thus, it also impacted the reduction of poverty (Klein and others, 2001; Magombeyi and Odhiambo, 2017). However, not all foreign investment flows have the same effects. For this reason, in the 21st century, some international organisations and experts began to evaluate what has been called the "Quality of Foreign Direct Investment". Some of those papers and concepts are reviewed below.

1. Quality foreign direct investment

In 2016, the United Nations Conference on Trade and Development (UNCTAD) defined quality FDI as a foreign investment that significantly increases employment, improves skills and boosts the competitiveness of local enterprises. UNCTAD highlights the importance of promoting the number and quality of the linkages between foreign enterprises and their domestic affiliates. To strengthen these linkages, the governments of the cost countries can implement measures intended to raise the likelihood of spill overs in the areas of information, technology and training.

A study by the London School of Economics (Alfaro and Charlton, 2007) rates FDI according to its impact on the host country's economic growth and notes that a key element is the distinction between new (greenfield) FDI and FDI focused on mergers and acquisitions (M&A). The econometrics of that study includes 29 countries with available annual data between 1985 and 2000. The results identify two impact factors of FDI on the generation of added value. These factors are the capacity of the industrial sectors of the host country to adapt to the new technologies induced by FDI and the degree of external financial dependence of these sectors. In short, FDI will generate value added in sectors of the host country that are more linked to foreign technology and capital.

More recently, Moran, Görg and Seric (2016) defined quality FDI as investment carried out within a framework of policies that facilitate the greatest contribution to the inclusive and sustainable development of the host economy, achieving a structural transformation and productivity growth. These investments contribute to the creation of value-added decent jobs, facilitate technology and knowledge transfer, boost the competitiveness of local businesses and operate in a socially and environmentally responsible manner.

A 2018 study (Peres, Ameer and Xu, 2018) from Hunan University examined the impact of institutional quality on FDI. Using a panel-data model of 110 countries and annual data for 2002-2012, countries were separated into: 41 developed countries and 69 developing countries. Two indicators were used to represent governance: control of corruption and the rule of law. The work provides evidence that, in developed countries, institutional quality has a significant positive impact on FDI. But for developing countries, the results show that its impact is negligible due to the weak structure of local institutions.

The Organisation for Economic Co-operation and Development (OECD) (2019) addresses the definition and measurement of quality FDI and establishes five indicators for its measurement: (i) productivity and innovation; (ii) employment and job quality (wages, job stability and job security); (iii) human capital and skills; (iv) gender equality and (v) Carbon footprint. In addition, OECD developed indicators that describe how FDI relates to various aspects of sustainable development in recipient countries.

Between 2020 and 2021, the United Kingdom's Ministry for International Trade presented two reports on the economic impact of FDI. These reports were intended to promote investments in the United Kingdom as host country, and its data consisted of stocks of established FDI and annual flows of foreign investment.

The first report refers to the positive impact that FDI is expected to have on economic growth and the factors that influence it. FDI can generate overall economic growth when certain conditions are met in infrastructure, thematic group strengths, supply chain networks, the skills base and so on. It must be kept in mind that there are studies that argue that the effect of FDI on economic growth tends to be weak. In the Ministry's econometric model, each input factor (employment and domestic capital stocks) has an overall positive and significant impact on output. Foreign ownership does not have a statistically significant impact on Gross Value Added (GVA). Lastly, the variable of interest (GVA-normalised FDI stocks) has a relatively small but positive and statistically significant impact on production, suggesting that indirect effects on GVA are present in Great Britain.

The second report estimates the economic impact on employment. This estimation recognised the changing nature of foreign investment in certain industries. A 1% increase in FDI stocks in Great Britain is shown to have led to an increase in GVA of 0.09% on average when measured by capital. But when measured by employment, the impact on GVA was 0.24%. Employment grew by 0.08% while average annual wages increased by 0.04% when measured by capital, and 0.11%, when by employment. Work productivity grew by 0.03%. The report also explored the spatial distribution of foreign-owned multinationals to understand their contribution to regional economies. The analysis shows that while only 4% of local enterprises were foreign-owned in 2018, they accounted for almost 40% of the country's turnover and employed 4.9 million people. Besides, the activities of foreign multinationals were concentrated in certain regions, accounting for between 12% and 21% of jobs in the twelve regions of the country.

While there are a variety of interpretations of the effects of FDI in less developed countries, there is agreement on the meaning of quality FDI. First, FDI seems to have a positive impact on economic growth and, in some cases, also on employment. Several studies emphasize the need to study this impact, disaggregated for the different economic sectors, as well as to observe how it works in diverse regions of the same country.

2. Structural gaps

Development gaps are conceptualised as the difference between the current situation in one or more areas of development and the needs to be met in those same areas (Gaudin and Pareyón Noguez, 2020). As gaps are observed from a comparison point, they are closely linked to the concept of structural heterogeneity, that is, the coexistence of polarisations between spaces, social groups and economic activities. On one end, these activities are advanced and modern. On the other, they are backward, marginalised and dependent. In the Latin American context, heterogeneity is structural and tends to be maintained and reproduced over time. The countries of the subregion tend to have wider gaps than high-income countries, showing sharper inequality that affects more people, both in absolute and relative terms.

These gaps are the observable measure of structural heterogeneity and are manifested in various sectors, territories and social groups. Development entails closing these gaps with a view to reducing structural heterogeneity so that sectors furthest from the optimal national situation overcome their restrictions and move closer to the optimal, thus reducing internal inequalities in the countries of the region. In the case of quality FDI, gaps are observed both at the territorial and sectoral levels. FDI flows are highly concentrated in some States, but it is yet to be seen if this concentration has a correlation in terms of the quality of the FDI received. Likewise, it must be seen if there are sectoral gaps in quality FDI flows.

B. Methodological framework: scope and limitations

A set of indicators is proposed to measure the quality of FDI in Mexico. This proposal takes into account relevant studies on quality FDI and its relationship with the transformation of the development model proposed by ECLAC (ECLAC, 2012, 2020, 2021).

> "Structural change implies transforming the composition of output and international trade, of employment and the pattern of specialisation. Virtuous structural change is defined by two interrelated aspects: (i) an increase in the contribution of knowledge-intensive sectors or activities to output and trade and a denser and more diversified production matrix, with longer trajectories of productivity growth and spillover effects and technological externalities that benefit the whole system; and (ii) insertion into high-growth world markets in order to boost aggregate demand, production and job creation, with produces favourable effects on income distribution. The structural change that meets both criteria is essential to place an economy on a long-term high-growth path that is not compromised by an imbalance on the foreign front. This change is consistent, in particular, with an export growth rate that systematically covers the import bill and payments to factors (for instance, interest), thus keeping the current account balance as a percentage of GDP at manageable levels. The concept of virtuous structural change implies a distribution structure designed to reduce inequality" (ECLAC, 2012, pp.26-27).

FDI can contribute to structural change, fostering economic specialisation in dynamic sectors (Keynesian efficiency) and in sectors with increasing technological content, higher productivity and technological spillovers and externalities that benefit the entire system (Schumpeterian efficiency). Keynesian and Schumpeterian efficiencies should lead to insertion in dynamic world markets and boost aggregate demand, production and job creation, with favourable effects on income distribution. Nordhaus efficiency, understood as the environmental sustainability of investments and their positive effects on the sustainability of the economic system, adds to these two concepts.

From this perspective, the foreign direct investment that contributes to structural change and satisfies the three efficiencies described is what this paper means by quality FDI. With a view to measuring quality FDI, this study proposes the following indicators:

- Net FDI (greenfield plus extensions), excluding mergers and acquisitions (M&A).
- Contribution to gross production and value added.
- Impact on exports.
- Generation of high volumes of employment.
- Increase in sectoral productivity.
- Positive impact on wages.
- Creation of stronger interpectoral backward and forward linkages in the production structure.
- Environmental sustainability.

The quality FDI indicators shed light on the analysis of gaps between sectors, territories and social groups. Quality FDI produces different levels of gross fixed capital formation and impacts differently on GDP, employment, exports, linkages, environmental sustainability, technology and wages, as well as productivity and territorial distribution. The gaps analysed do not refer only to flows (in millions of dollars) but to quality, which allows FDI to have a positive impact on development.

The biggest challenge in defining and monitoring quality FDI is in the data. Several indicators have been used to measure the impact of FDI on employment, value added, production and exports. These indicators use input-output analysis and the corresponding information disaggregated by subsectors. Indicators from the National Accounts, disaggregated by subsectors, were also used. The essential data for this work came from information on FDI of the Secretariat of Economy, disaggregated by sectors and entities.

A major difficulty was that this information, even when it actually measures investments in machinery, equipment and buildings, is information on flows. In other words, it did not provide the value of stocks by subsector accrued at the end of each year of the study, but only the annual FDI inflows. This means that the expected impact of an investment is not necessarily contemporary with the investment itself. It also means that, in a given year, production and exports of FDI sectors use investments previously installed. For some subsectors and years, the lack of consistency between sources regarding the concept of investment as gross fixed capital formation created additional problems. The itemisation of the North American Industry Classification System, which sometimes does coincide with the traditional system, also created problems. Finally, in some cases, for some years, the information on whole sectors and subsectors is classified as confidential, but this does not mean that they are null in the analysis.

C. Gap analysis

The analysis of quality FDI uses only "net FDI" data, which includes flows for "greenfield and extensions" but excludes flows from mergers and acquisitions. Although mergers and acquisitions could imply the arrival of knowledge, access to patents and organisational improvements, they are not considered quality FDI because they focus on the acquisition of existent assets, not the creation of new ones.

1. FDI quality indicators

a) Net FDI (greenfield plus extensions)

Net FDI (greenfield plus extensions) by subsector highlights some features of FDI in 2017–2019 (see table XIV.1). The more important subsectors are classified in the usual order: primary, secondary and tertiary activities, as itemised by the North American Industry Classification System (NAICS). It is observed that FDI concentrates on 15 of 79 economic subsectors that represented 79.2% of the total in 2017, 82.2% in 2018 and 78.1% in 2019. Transport equipment (subsector 32) stands out, concentrating 27.5% of net FDI in 2017, 26.3% in 2018 and 26.5% in 2019, that is, more than a quarter of the FDI during that period.

Table XIV.1
Mexico: net foreign direct investment flow[a], 2017-2019
(Million pesos)

No.	NAICS	Subsectors	2017		2018		2019	
			Pesos	Percentage	Pesos	Percentage	Pesos	Percentage
6	211	Oil and gas extraction	14 214.0	3.2	17 576.3	3.9	19 853.3	3.7
7	212	Mining of metallic and non-metallic ores, except petroleum	13 935.4	3.2	12 640.4	2.8	12 675.8	2.4
9	221	Generation, transmission and distribution of electrical energy	11 769.5	2.7	36 742.1	8.2	25 573.4	4.8
12	237	Construction of civil engineering works	38 954.0	8.9	28 679.3	6.4	1 837.3	0.3
24	325	Chemical manufacturing	2 840.9	0.6	12 624.8	2.8	34 581.9	6.5
25	326	Plastics and rubber industry	17 664.9	4.0	19 889.9	4.4	16 415.3	3.1
27	331	Basic metal industries	4 235.3	1.0	10 992.7	2.4	5 642.9	1.1
29	333	Manufacturing of machinery and equipment	5 964.7	1.4	9 253.8	2.1	2 865.7	0.5
30	334	Manufacturing of computer, communication and measurement equipment	14 060.1	3.2	28 755.1	6.4	9 780.0	1.8
31	335	Manufacturing of electrical equipment, appliances and accessories	13 088.3	3.0	10 981.0	2.4	16 520.7	3.1
32	336	Manufacturing of transportation equipment	120 851.4	27.5	118 426.3	26.3	141 879.9	26.5
35	430	Wholesale trade	33 138.4	7.5	34 758.8	7.7	47 207.8	8.8
42	486	Pipeline transport	37 959.4	8.6	9 082.7	2.0	7 749.3	1.4
51	517	Telecommunications	-578.6	-0.1	7 657.5	1.7	22 079.0	4.1
55	522	Non-stock market credit and financial intermediation institutions	20 198.1	4.6	12 326.4	2.7	19 247.0	3.6
Subtotal 15 subsectors			348 295.8	79.2	370 387.2	82.2	383 909.3	71.8
Total 79 subsectors			439 999.2	100	450 548.8	100	534 570.4	100

Source: Prepared by the authors, on the basis of Secretariat of Economy of the Government of Mexico.
[a] Greenfield plus extensions.

When expanded to 26 subsectors, it is observed that these represent 92.9% of total FDI, which suggests high sectoral concentration and points to a first domestic gap. The first criterion for selecting these 26 subsectors was that, on average, they amounted to more than 1% of total net FDI (see table XIV.2). A subset of 13 subsectors that exceed an average annual amount of 10 billion pesos appears in bold type. According to the classification of the input-output matrix the 13 subsectors are: in the primary sector: (6) petroleum, (7) mining, (9) electric power and (12) construction; in the manufacturing sector: (15) beverages and tobacco, (24) chemicals, (25) plastic and rubber, (30) computer equipment, (31) electrical appliances and (32) transportation equipment; in the services sector: (35) wholesale trade, (42) pipeline transportation and (55) banking system.

Table XIV.2
Mexico: subsectors of the economy that concentrate net FDI, 2017-2019
(Billions of pesos at current prices)

No.	NAICS	Subsectors	Billion pesos	Percentage
6	**211**	**Oil and gas extraction**	**17.2**	**3.6**
7	**212**	**Mining of metallic and non-metallic minerals**	**13.1**	**2.8**
9	**221**	**Generation, transmission and distribution of electric power**	**24.7**	**5.2**
12	**237**	**Construction of civil engineering works**	**23.2**	**4.9**
14	311	Food industry	5.9	1.2
15	**312**	**Beverage and tobacco industry**	**10.8**	**2.3**
24	**325**	**Chemical manufacturing**	**16.7**	**3.5**
25	**326**	**Plastics and rubber industry**	**18.0**	**3.8**
27	331	Basic metal industries	7.0	1.5
28	332	Manufacturing of metal products	7.5	1.6
29	333	Manufacturing of machinery and equipment	6.0	1.3
30	**334**	**Manufacturing of computer equipment**	**17.5**	**3.7**
31	**335**	**Manufacturing of electrical equipment, appliances and accessories**	**13.5**	**2.8**
32	**336**	**Manufacturing of transportation equipment**	**127.1**	**26.7**
34	339	Other manufacturing industries	6.8	1.4
35	**430**	**Wholesale trade**	**38.4**	**8.1**
36	460	Retail trade	8.5	1.8
42	**486**	**Pipeline transport**	**18.3**	**3.8**
51	517	Telecommunications	9.7	2.0
55	**522**	**Credit intermediation institutions**	**17.3**	**3.6**
56	523	Stock exchange, exchange and financial investment activities	6.2	1.3
57	524	Surety, insurance and pension companies	5.0	1.0
58	531	Real estate services	5.6	1.2
59	532	Movable property rental services	7.0	1.5
61	541	Professional, scientific and technical services	5.0	1.0
73	721	Temporary accommodation services	5.6	1.2
Subtotal 26 selected subsectors			441.4	92.9
Total net FDI			475.0	100

SourcePrepared by the authors, on the basis of National Institute of Statistics and Geography (INEGI) and the Secretariat of Economy of the Government of Mexico.

b) FDI in gross production and in value added

Based on the input-output model, the impact of FDI is measured through its relationship with all subsectors of the economy on gross production and value added. Gross production or gross production value (GPV) measures the value of a subsector's total output, including inputs and value added (wages, profits and taxes). All subsectors considered, FDI generates between 1.6% and 1.8% of GPV of the overall economy. As for GPV generated by FDI, 20 subsectors account for between 78% and 82%, and the 15 subsectors that receive the largest FDI flows are among the group of the 20 most relevant sectors (see table XIV.3).

Regarding value added (VA), which National Accounts make equivalent to gross domestic product (GDP), the results of the impact of FDI for the three years of this study confirm the importance of the 15 subsectors mentioned above among the 20 most important ones. However, the remaining five are not the same. Another difference is that FDI generates less VA as a proportion of the overall economy than as a proportion of gross production: between 1.4% and 1.6% for the period of this study. In terms of added value generation, it is observed that the 15 subsectors in which FDI participates have a high impact, but together they represent a small part of the value added generated by the economy. The rest of the value added is generated by other components of final demand, including domestic public and private investment. Considering the value added generated by net FDI in all the 61 subsectors of the economy in which it participates, its impact represents only 1.5% of the domestic total.

Table XIV.3
Mexico: gross production generated by net FDI, 2017-2019
(Million pesos)

No.	NAICS	Subsectors	2017		2018		2019	
			Million pesos	Percentage	Million pesos	Percentage	Million pesos	Percentage
6	211	Oil and gas extraction	18 046.8	2.7	23 338.6	3.6	26 303.1	3.5
7	212	Mining of metallic and non-metallic minerals	19 690.5	2.9	18 784.2	2.9	19 025.5	2.5
9	221	Generation, transmission and distribution of electrical energy	19 829.4	3.0	44 151.1	6.9	35 234.1	4.7
12	237	Construction of civil engineering works	39 698.1	5.9	29 163.5	4.5	1 964.5	0.3
23	324	Manufacturing of oil and coal products	6 939.4	1.0	8 523.8	1.3	9 657.7	1.3
24	325	Chemical manufacturing	11 079.5	1.7	20 747.1	3.2	44 444.9	5.9
25	326	Plastics and rubber industry	25 037.1	3.7	23 458.4	3.6	20 943.3	2.8
27	331	Basic metal industries	17 271.7	2.6	22 446.4	3.5	17 282.8	2.3
28	332	Manufacturing of metal products	14 049.7	2.1	8 815.1	1.4	12 989.7	1.7
29	333	Manufacturing of machinery and equipment	6 959.8	1.0	11 335.7	1.8	3 701.5	0.5
30	334	Manufacturing of computer and communications equipment	15 642.9	2.3	30 381.3	4.7	10 457.3	1.4
31	335	Manufacturing of electrical equipment, appliances and accessories	14 164.7	2.1	12 940.8	2.0	17 630.7	2.3
32	336	Manufacturing of transportation equipment	170 185.4	25.5	142 955.6	22.2	158 274.3	21.0
35	431	Wholesale trade	54 944.0	8.2	54 159.9	8.4	82 596.2	11.0
36	460	Retail trade	10 219.6	1.5	11 372.2	1.8	20 644.6	2.7
42	486	Pipeline transport	20 630.0	3.1	9 483.7	1.5	8 798.1	1.2
51	517	Telecommunications	2 614.2	0.4	10 405.5	1.6	25 179.4	3.3
55	522	Credit and financial intermediation institutions	23 623.8	3.5	15 176.1	2.4	22 564.2	3.0
61	541	Professional, scientific and technical services	14 092.7	2.1	10 935.9	1.7	16 893.1	2.2
63	561	Business support services	18 798.9	2.8	16 461.8	2.6	23 957.7	3.2
Subtotal 20 sectors			523 518.0	78.3	525 036.5	81.6	578 542.6	76.8
Total 79 subsectors			668 538.1	100.0	643 299.3	100.0	753 649.3	100.0
Total Gross Production			37 168 708.9	1.8	39 802 036.3	1.6	40 894 326.8	1.8

Source: Prepared by the authors, on the basis of input product model and the National Accounts of the National Institute of Statistics and Geography (INEGI).

Table XIV.4
Mexico: total value added generated by net FDI, 2017-2019
(Million pesos at current prices)

No.	NAICS	Subsectors	2017		2018		2019	
			Million pesos	Percentage	Million pesos	Percentage	Million pesos	Percentage
6	211	Oil and gas extraction	13 001.1	4.1	16 359.6	5.4	19 451.9	5.1
7	212	Mining of metallic and non-metallic minerals,	13 337.6	4.2	12 573.4	4.1	12 703.8	3.4
9	221	Generation, transmission and distribution of electrical energy	13 847.3	4.3	28 485.3	9.4	23 179.1	6.1
12	237	Construction of civil engineering works	20 212.1	6.3	14 992.3	4.9	982.5	0.3
24	325	Chemical manufacturing	2 811.3	0.9	5 194.9	1.7	11 798.0	3.1
25	326	Plastics and rubber industry	7 136.4	2.2	6 704.4	2.2	5 965.0	1.6
27	331	Basic metal industries	5 185.3	1.6	6 946.9	2.3	5 136.1	1.4
29	333	Manufacturing of machinery and equipment	2 590.3	0.8	4 223.7	1.4	1 359.3	0.4
30	334	Manufacturing of computer and communications equipment	3 230.4	1.0	6 392.6	2.1	2 352.7	0.6
31	335	Manufacturing of electrical equipment, appliances and accessories	3 423.7	1.1	3 236.1	1.1	4 389.3	1.2
32	336	Manufacturing of transportation equipment	41 105.4	12.8	35 087.7	11.5	38 253.4	10.1
35	430	Wholesale trade	44 986.9	14.1	44 348.7	14.6	67 450.2	17.8
36	461	Retail trade	8 265.4	2.6	9 237.3	3.0	16 823.6	4.4
42	486	Pipeline transport	9 425.0	2.9	4 506.4	1.5	4 006.4	1.1
51	517	Telecommunications	1 636.4	0.5	6 527.3	2.1	15 799.6	4.2
55	522	Credit and financial intermediation institutions	17 854.0	5.6	11 493.7	3.8	17 300.2	4.6
58	531	Real estate services	14 930.0	4.7	7 037.3	2.3	9 579.5	2.5
61	541	Professional, scientific and technical services	10 277.0	3.2	7 983.1	2.6	12 442.1	3.3
63	561	Business support services	16 012.3	5.0	14 042.3	4.6	20 629.5	5.5
73	721	Temporary accommodation services	3 871.2	1.2	5 676.6	1.9	5 342.9	1.4
Subtotal 20 subsectors			253 139.0	79.1	251 049.6	82.6	294 944.9	77.9
Total 79 subsectors			320 053.7	100.0	304 025.0	100.0	378 504.6	100.0
Total Domestic Gross Value Added			20 699 789.9	1.5	22 191 163.9	1.4	23 023 594.1	1.6

Source: Prepared by the authors, on the basis of input product model and the National Accounts of the National Institute of Statistics and Geography (INEGI).

The generation of value added is highly concentrated in a few subsectors, as 11 of them generated, on average, more than 10 billion pesos of value added per year in 2017-2019: (6), (7), (9), (12), (31), (32), (35), (51), (55), (58) and (61). None of these subsectors belong to the primary sector (see table XIV.5). These 11 subsectors intersect with the set of 13 subsectors with the highest volume of investment, making a subset of eight subsectors. The remaining three are not subsectors that stand out for their annual volume: (51), (58) and (61).

Table XIV.5
Mexico: impact of net FDI on value added, 2017-2019
(Billion pesos)

No.	NAICS	Subsectors	Billion pesos	Percentage
6	211	Oil and gas extraction	**16.3**	5.8
7	212	Mining of metallic and non-metallic minerals	**12.9**	4.6
9	221	Generation, transmission and distribution of electric power.	**21.8**	7.7
12	**237**	**Construction of civil engineering works**	**12.1**	4.3
14	311	Food industry	3.0	1.1
15	312	Beverage and tobacco industry	5.1	1.8
24	325	Chemical manufacturing	6.6	2.3
25	326	Plastics and rubber industry	6.6	2.3
27	331	Basic metal industries	5.8	2.0
28	332	Manufacturing of metal products	2.7	1.0
29	333	Manufacturing of machinery and equipment	4.0	1.4
30	334	Manufacturing of computer equipment	3.7	1.3
31	335	Manufacturing of electrical equipment, appliances and accessories	**38.1**	13.5
32	**336**	**Manufacturing of transportation equipment**	**52.3**	18.5
34	339	Other manufacturing industries	2.1	0.7
35	**430**	**Wholesale trade**	**11.4**	4.1
36	460	Retail trade	6.0	2.1
42	486	Pipeline transport	8.0	2.8
51	517	Telecommunications	**15.5**	5.5
55	522	Credit intermediation institutions	**10.5**	3.7
56	523	Stock exchange, exchange and financial investment activities	4.2	1.5
57	524	Surety, insurance and pension companies	2.9	1.0
58	531	Real estate services	**10.5**	3.7
59	532	Movable property rental services	4.7	1.7
61	**541**	**Professional, scientific and technical services**	**10.2**	3.6
73	721	Temporary accommodation services	5.0	1.8
Subtotal 26 selected subsectors			282.0	100.0
Total net FDI			334.2	84.4
Domestic Total			21 971.5	1.5

Source: Prepared by the authors, on the basis of input-output model and data from the National Institute of Statistics and Geography and the Secretariat of Economy of the Government of Mexico.

c) Impact of net FDI on exports

FDI received in Mexico has a strong impact on total exports, representing 81% in the years considered by this study (see table XIV.6). Table XIV.7 shows the exports of enterprises with foreign investment in order of importance; 13 subsectors account for 92.2% of the total. Six stand out, representing 81% of the total. Almost all are manufactures: (32) manufacturing of transport equipment, (30) manufacturing of computer equipment, (31) manufacturing of electrical appliances, (35) wholesale trade, (29) manufacturing of machinery and equipment and (34) other manufactures. This concentration also has a geographical correlative, so it shows two gaps: sectoral and territorial. The impact of VA on exports of enterprises with FDI concentrates on 15 subsectors that represent 82% of the total. Two of these stand out for their level of impact: (32) Manufacturing of transport equipment and (35) wholesale trade, which together make for 43.2% (see table XIV.8).

Table XIV.6
Mexico: exports of companies with FDI as the proportion of total exports, 2017-2019
(Millions of pesos and percentages)

	2017	2018	2019
Exports of enterprises with foreign investment	6 218 556.2	6 843 646.1	7 071 925.6
Percentage of total exports	80.3	80.3	81.2
Total exports of Mexico	7 746 341.5	8 527 349.6	8 714 487.2

Source: Prepared by the authors, on the basis of information of the Secretariat of Economy of the Government of Mexico.

Table XIV.7
Mexico: exports of companies with FDI, 2017-2109
(Million pesos)

No.	NAICS	Subsector	2017	2018	2019	Percentage
32	336	Manufacturing of transportation equipment	2 770 661.9	3 093 658.4	3 217 054.4	45.5
30	334	Manufacturing of computer and communication equipment	1 075 191.4	1 131 287.2	1 293 264.4	18.3
31	335	Manufacturing of electrical equipment, appliances and accessories	393 655.7	411 678.0	421 460.8	6.0
35	431	Wholesale trade	309 521.8	420 122.4	326 311.4	4.6
29	333	Manufacturing of machinery and equipment	246 167.5	279 337.4	297 712.4	4.2
34	339	Other manufacturing industries	158 397.2	170 852.5	172 717.8	2.4
25	326	Plastics and rubber industry	139 254.6	149 549.1	154 959.9	2.2
24	325	Chemical manufacturing	144 382.0	146 916.6	143 967.5	2.0
28	332	Manufacturing of metal products	137 078.7	135 035.1	137 464.0	1.9
27	331	Basic metal industries	105 839.3	127 997.3	111 378.4	1.6
14	311	Food industry	78 319.2	78 662.9	85 506.8	1.2
15	312	Beverage and tobacco industry	65 789.6	76 504.3	81 779.0	1.2
7	212	Mining of metallic and non-metallic minerals	93 380.0	89 027.8	78 291.3	1.1
Subtotal (13 subsectors)			5 717 638.9	6 310 628.9	6 521 868.0	92.2
Other subsectors (66)			500 917.3	533 017.2	550 057.6	7.8
Totals			6 218 556.2	6 843 646.1	7 071 925.6	100.0

Source: Prepared by the authors, on the basis of National Institute of Statistics and Geography (INEGI) and the Secretariat of Economy of the Government of Mexico.

Table XIV.8
Mexico: value added induced by exports of enterprises with FDI, 2017-2019
(Million pesos)

No.	NAICS	Subsector	2017	2018	2019	Percentage
32	336	Manufacturing of transportation equipment	747 021.8	836 548.7	863 134.1	23.3
35	431	Wholesale trade	518 555.4	608 565.0	736 915.8	19.9
30	334	Manufacturing of computer and communication equipment	228 928.0	243 591.7	292 477.4	7.9
63	561	Business support services	177 868.4	183 961.7	202 240.5	5.5
7	212	Mining of metallic and non-metallic minerals	122 494.9	112 987.3	121 501.7	3.3
29	333	Manufacturing of machinery and equipment	97 246.5	109 261.2	114 204.6	3.1
27	331	Basic metal industries	103 801.9	115 431.6	110 389.7	3.0

No.	NAICS	Subsector	2017	2018	2019	Percentage
31	335	Manufacturing of electrical equipment, appliances and accessories	99 340.0	106 775.3	108 311.9	2.9
9	221	Generation, transmission and distribution of electrical energy	78 347.6	74 594.7	93 171.5	2.5
36	461	Retail trade	93 638.7	95 003.8	80 198.1	2.2
25	326	Plastics and rubber industry	60 423.7	63 585.7	67 505.7	1.8
28	332	Manufacturing of metal products	56 339.2	54 607.6	64 659.4	1.7
61	541	Professional, scientific and technical services	60 452.1	65 013.6	63 006.7	1.7
24	325	Chemical manufacturing	60 450.4	58 090.0	61 033.8	1.6
40	484	Freight motor transport	46 146.1	47 540.6	60 787.7	1.6
Subtotal 15 subsectors			2 551 054.8	2 775 558.4	3 039 538.6	82.2
Other subsectors (64)			609 674.7	631 343.0	659 635.8	17.8
Total 79 subsectors			3 160 729.5	3 406 901.4	3 699 174.5	100.0

Source: Prepared by the authors, on the basis of input-output model.

Table XIV.9 shows the weight of FDI in the generation of exportation products: 81% of total Mexican exports in 2017-2019. The 26 subsectors that receive most of the net FDI in Mexico account for 94% of exports made by foreign companies. Of these subsectors, 18 stand out with amounts, on average, greater than 10 billion pesos per year for the period of this study: in the primary sector, (6) and (7); in the manufacturing sector: (14), (15), (24), (25), (27), (28), (29), (30), (31), (32) and (34); and in the services sector, (9), (35), (36), (58) and (61). This information stresses the high concentration of Mexican exports in the hands of foreign companies (net FDI), as well as a large number of foreign exporting companies concentrated in a few subsectors of the economy.

Table XIV.9
Mexico: impact of net FDI associated with exports, 2017-2019
(Billion pesos and thousand people)

No.	NAICS	Subsectors	Billion pesos				Thousand people	
			EXP	Percentage	VA EX	Percentage	EMP EX	Percentage
6	211	Oil and gas extraction	**18.7**	0.3	**33.3**	1.2	2.1	0.1
7	212	Mining of metallic and non-metallic minerals	**86.9**	1.4	**119.0**	4.3	**77.0**	2.4
9	221	Generation, transmission and distribution of electrical energy.	**11.1**	0.2	**82.0**	2.9	**18.9**	0.6
12	237	Construction of civil engineering works	7.5	0.1	4.2	0.1	**10.9**	0.3
14	311	Food industry	**80.8**	1.3	**36.6**	1.3	**48.3**	1.5
15	312	Beverage and tobacco industry	**74.7**	1.2	**34.5**	1.2	**17.8**	0.6
24	325	Chemical manufacturing	**145.1**	2.3	**59.9**	2.1	**49.4**	1.5
25	326	Plastics and rubber industry	**147.9**	2.3	**63.8**	2.3	**162.2**	5
27	331	Basic metal industries	**115.1**	1.8	**109.9**	3.9	**39.7**	1.2
28	332	Manufacturing of metal products	**136.5**	2.2	**58.5**	2.1	**155.2**	4.8
29	333	Manufacturing of machinery and equipment	**274.4**	4.4	**106.9**	3.8	**196.7**	6.1
30	334	Manufacturing of computer equipment	**1 166.6**	18.5	**255.0**	9.1	**614.3**	19.1
31	335	Manufacturing of electrical equipment, appliances and accessories	**408.9**	6.5	**104.8**	3.8	**232.3**	7.2
32	336	Manufacturing of transportation equipment	**3.027.1**	48.1	**815.6**	29.2	**843.4**	26.2
34	339	Other manufacturing industries	**167.3**	2.7	**49.2**	1.8	**198.9**	6.2
35	430	Wholesale trade	**352.0**	5.6	**621.3**	22.3	**253.2**	7.9
36	460	Retail trade	**27.8**	0.4	**89.6**	3.2	**156.3**	4.9
42	486	Pipeline transport	4.1	0.1	4.0	0.1	1.3	0
51	517	Telecommunications	0.9	0	**22.2**	0.8	7.6	0.2
55	522	Credit intermediation institutions	0.7	0	**19.9**	0.7	6.3	0.2
56	523	Stock exchange, exchange and investment activities	4.2	0.1	5.5	0.2	3.2	0.1
57	524	Surety, insurance and pension companies	0.1	0	5.6	0.2	4.1	0.1
58	531	Real estate services	**16.0**	0.3	**51.7**	1.9	**10.7**	0.3
59	532	Movable property rental services	6.2	0.1	7.4	0.3	9.7	0.3
61	541	Professional, scientific and technical services	**17.3**	0.3	**62.8**	2.3	**90.0**	2.8
73	721	Temporary accommodation services	0.2	0	7.0	0.3	5.4	0.2
Subtotal 26 selected subsectors			6 298.1	100	2 788.7	100	3 215.0	100
Total net FDI			6 711.4	93.8	3 422.3	81.5	5 639.1	57
Domestic Total			8 329.4	80.6				

Source: Prepared by the author, on the basis of input-output model, the National Institute of Statistics and Geography (INEGI) and the Secretariat of Economy of the Government of Mexico.
EXP = Exports of companies with FDI.
VA EX = Value Added generated by FDI Exports.
EMP EX = Employment generated by FDI exports.

The direct and indirect impact on VA of the exports of enterprises with net FDI shows on the input-output matrices. Table XIV.4 presents the 20 subsectors that generated more than 10 billion pesos of VA in the period of this study. All the important export subsectors with FDI generate over 10 billion pesos of VA. Two subsectors in the services sector join them: (51) telecommunications and (55) financial intermediation. Regarding employment, the subsectors that generate more than 10,000 jobs on average per year are the same initial 18 subsectors except (6); that is, there are 17. Figures for those subsectors are highlighted in yellow. As for manufactures, the most prominent sectors in terms of their exports and their impact on value added are (30) computer equipment and (32) transportation equipment. This set of 18 subsectors forms a subset of the universe of 26 subsectors that concentrate net FDI (see table XIV.2). The subset is different from the 13 subsectors that concentrate the most net FDI, shown in bold type. In other words, the 13 subsectors that concentrate the most FDI belong to the group of subsectors with FDI, excepting construction (12), are high exporters.

d) Impact of FDI on employment

The input-output analysis measures the impact of FDI on job creation. An initial observation is that INEGI employment data by subsector include formal and informal employment. These are the main subsectors in which the FDI participates that generate the highest volume of employment: 21 subsectors represent between 77% and 82% of the employment generated by FDI in the period (see table XIV.10). Net FDI directly generates between 1% and 1.2% of total employment in the Mexican economy. An important difference with respect to the impacts on gross production and value added is that, of 15 subsectors that receive the bulk of FDI, only 11 show here, while four, oil (6), basic metal industries (27), transport by pipelines (42) and telecommunications (51) are left out.

Ten subsectors, despite not being among the most important recipients of net FDI, generated between 21% and 27% of employment in the period. Business support services (63) stands out from those ten. Enterprises in this subsector are not characterized by high volumes of investment because they usually receive low capital investments. However, they generate high volumes of employment through support services.[2] It is important to delve into the analysis of job creation in the "business support services" subsector (NAICS 561), which generated between 21% and 27% of employment in the period; it would be worthwhile to disaggregate it in future studies. Of the subsectors that generate the most domestic employment (see table XIV.11), only four are prominent recipients of net FDI: construction (12), manufacturing of computer equipment (30), transport equipment (32) and wholesale trade (35). Thus, job creation in the Mexican economy comes mainly from other sources of final demand.

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[2] Subsector 561 of the North American Industry Classification System: Economic units primarily engaged in providing business support services, such as business administration, staff recruitment and placement, secretarial support, photocopying, collections, credit investigation, travel organisation, investigation, protection and security, cleaning, packaging and labelling of goods owned by third parties, and organisation of conventions and trade and industrial fairs.
It also includes: units engaged in executive search consultancy; proofreading; stenography services not performed in court; voicemail services; promotion of cities that have infrastructure to hold congresses, conventions, fairs and seminars; design, implementation and coordination of services in a tourism destination; timeshare exchange services; lie detection services; high-security locksmith services; monitoring services in combination with commercialization; installation and repair of security systems; cleaning the of airplanes, ships, trains and rail cars; design, care and maintenance of parks and gardens in combination with the construction of walkways, ponds, ornaments, fences and similar structures; and model agencies.

Table XIV.10
Mexico: employment generated by net FDI, 2017-2019
(Number of people)

No.	NAICS	Subsectors	2017		2018		2019	
			2017	Percentage	2018	Percentage	2019	Percentage
7	212	Mining (except oil and gas)	8 764	1,8	8 241	2,1	8 002	1,8
9	221	Utilities	3 482	0,7	6 763	1,7	4 832	1,1
12	237	Heavy and civil engineering constrution	53 252	11	37 818	9,6	2 679	0,6
13	238	Specialized construction work	14 79	3,1	10 985	2,8	10 093	2,3
24	325	Chemical manufacturing	2 274	0,5	4 19	1,1	10 132	2,3
25	326	Plastic and rubber products manufacturing	19 672	4,1	17 177	4,4	13 892	3,1
28	332	Fabricated metal product manufacturing	10 937	2,3	6 513	1,7	9 723	2,2
29	333	Machinery manufacturing	4 711	1	7 828	2	2 508	0,6
30	334	Computer and electronic product manufacturing measurement	7 839	1,6	15 522	4	5 597	1,3
31	335	Electrical equipment, appliance, and component manufacturing, electric-power generation equipment	7 821	1,6	7 066	1,8	9 599	2,1
32	336	Transportation equipment manufacturing	42 811	8,9	36 804	9,4	38 767	8,7
34	339	Miscellaneous manufacturing	6 441	1,3	7 143	1,8	11 648	2,6
35	430	Wholese trade	18 904	3,9	17 744	4,5	27 31	6,1
36	460	Retail trade	15 093	3,1	15 907	4	28 169	6,3
47	493	Warehousing services	1 757	0,4	5 754	1,5	2 308	0,5
55	522	Credit and finance intermeditation, excluding the stock exchange	6 221	1,3	3 578	0,9	4 939	1,1
61	541	Professional, scientific and technical services	15 123	3,1	11 522	2,9	17 213	3,8
63	561	Business support services	100 467	20,8	84 815	21,6	120 576	26,9
73	721	Food sevices and drinking places	3 169	0,7	4 347	1,1	3 86	0,9
74	722	Food and beverages preparation services	32 035	6,6	8 089	2,1	6 87	1,5
75	811	Repair and maintenance services	13 37	2,8	9 277	2,4	9 295	2,1
Subtotal 21 subsectors			382 713	79,2	323 504	82,3	343 073	76,6
Total 79 subsectors			483 211	100	392 954	100	447 601	100
Domestic total			38 696 893	1,2	39 313 943	1	39 440 522	1,1

Source: Prepared by the authors, on the basis of National Institute of Statistics and Geography (INEGI), input-output model and of the National Accounts.

Table XIV.11
Mexico: total national employment 2017-2019
(Figures and percentages)

No.	NAICS	Subsectors	2017		2018		2019	
			Number	Percentage	Number	Percentage	Number	Percentage
1	111	Agriculture	2 378 980	6,1	2 337 835	5,9	2 232 588	5,7
2	112	Animal breeding	498 559	1,3	507 422	1,3	515 095	1,3
11	236	Construction	3 077 542	8	3 178 271	8,1	3 069 088	7,8
12	237	Heavy and civil engineering construction	765 594	2	764 73	1,9	741 325	1,9
13	238	Specialized constrution work	626 593	1,6	661 341	1,7	656 208	1,7
14	311	Food manufacturing	1 045 905	2,7	1 071 666	2,7	1 090 054	2,8
30	334	Computer and electronic product manufacturing	809 971	2,1	851 152	2,2	940 821	2,4
32	336	Transportation equipment manufacturing	879 141	2,3	954 402	2,4	965 256	2,4
35	431	Wholesale trade	864 681	2,2	893 428	2,3	914 331	2,3
36	461	Retail trade	3 742 893	9,7	3 765 302	9,6	3 829 198	9,7
40	484	Freight trucks and lorries	944 954	2,4	937 364	2,4	954 441	2,4
41	485	Passenger transportation, excluding railways	997 063	2,6	1 020 697	2,6	1 030 321	2,6
61	541	Professional, scientific and technical services	597 462	1,5	621 861	1,6	608 556	1,5
63	561	Business support services	4 532 202	11,7	4 676 682	11,9	4 797 987	12,2
65	611	Educational services	2 382 585	6,2	2 399 268	6,1	2 403 597	6,1
67	622	Hospitals	586 387	1,5	596 161	1,5	600 797	1,5
74	722	Food and beverages preparation services	1 119 779	2,9	1 139 431	2,9	1 157 548	2,9
75	811	Repair and maintenance services	635 939	1,6	641 011	1,6	613 119	1,6
78	814	Households with domestic employees	2 432 306	6,3	2 374 735	6	2 483 618	6,3
79	931	Legislative, government and judiciary activities	2 742 975	7,1	2 800 134	7,1	2 777 502	7
Subtotal 20 subsectors			31 661 511	81,8	32 192 893	81,9	32 381 450	82,1
Total 79 subsectors			38 696 893	100	39 313 943	100	39 440 522	100

Source: Prepared by the authors, on the basis of National Institute of Statistics and Geography (INEGI), input-output model and of the National Accounts.

FDI generates relatively few jobs for a country as large as Mexico. The employment it generates concentrates in a few sectors (only six of those with high added value employ more than 10.000 employees), and only four of those have high added value (see table XIV.12). The impact on employment is 1.1% of the domestic total.

Table XIV.12
Mexico: impact on value added and employment of net FDI, 2017-2019
(Billion pesos and thousand people)

No.	NAICS	Subsectors	Added value		Employment	
			Billions	Percentage	Thousand people	Percentage
6	211	Oil and gas extraction	**16.3**	5.8	1.0	0.3
7	212	Mining of metallic and non-metallic minerals	**12.9**	4.6	8.3	2.4
9	221	Generation, transmission and distribution of electric power.	**21.8**	7.7	5.0	1.4
12	**237**	**Construction of civil engineering works**	**12.1**	4.3	**31.2**	8.9
14	311	Food industry	3.0	1.1	3.9	1.1
15	312	Beverage and tobacco industry	5.1	1.8	2.6	0.7
24	325	Chemical manufacturing	6.6	2.3	5.5	1.6
25	326	Plastics and rubber industry	6.6	2.3	**16.9**	4.8
27	331	Basic metal industries	5.8	2	2.1	0.6
28	332	Manufacturing of metal products	2.7	1	9.1	2.6
29	333	Manufacturing of machinery and equipment	4.0	1.4	5.0	1.4
30	334	Manufacturing of computer equipment	3.7	1.3	9.7	2.8
31	335	Manufacturing of electrical equipment, appliances and accessories	**38.1**	13.5	8.2	2.3
32	**336**	**Manufacturing of transportation equipment**	**52.3**	18.5	**39.5**	11.3
34	339	Other manufacturing industries	2.1	0.7	8.4	2.4
35	**430**	**Wholesale trade**	**11.4**	4.1	**21.3**	6.1
36	460	Retail trade	6.0	2.1	**19.7**	5.6
42	486	Pipeline transport	8.0	2.8	2.1	0.6
51	517	Telecommunications	**15.5**	5.5	2.7	0.8
55	522	Credit intermediation institutions	**10.5**	3.7	4.9	1.4
56	523	Stock exchange, exchange and financial investment activities	4.2	1.5	2.4	0.7
57	524	Surety, insurance and pension companies	2.9	1	2.1	0.6
58	531	Real estate services	**10.5**	3.7	2.2	0.6
59	532	Movable property rental services	4.7	1.7	6.3	1.8
61	**541**	**Professional, scientific and technical services**	**10.2**	3.6	**14.6**	4.2
73	721	Temporary accommodation services	5.0	1.8	3.8	1.1
Subtotal 26 selected subsectors			282.0	100	349.8	100
Total net FDI			334.2	84.4	441.3	79.3
Domestic Total			21 971.5	1.5	39 150.5	1.1

Source: Prepared by the authors, on the basis of input-output model, the National Institute of Statistics and Geography (INEGI) and the Secretariat of Economy of the Government of Mexico.

Six subsectors generated the most employment —over 10.000 jobs per year on average during the period of this study: (12), (25), (32), (35), (36) and (61). Of these, only four subsectors are also among the thirteen largest subsectors in the years considered by this study (see table 3): (12), (25), (32) and (35). Outstanding are four subsectors that, besides generating high employment (greater than 10% of total employment in the subsector), also generate high added value: (12), (32), (35) and (61).

e) Net FDI labour productivity

This indicator is built from information published by INEGI only for manufacturing industries. The base of this indices is 2013=100. Subsectors are classified into low, medium and high technology. In the high-technology subsectors, labour productivity decreased or grew very little in the 2017–2019 period (see table XIV.13). Only three of these subsectors showed a slight increase: manufacturing of machinery and equipment (29), manufacturing of computer and communications equipment (30) and manufacturing of electrical equipment, appliance, components and accessories (31). These subsectors qualify as quality FDI because they increase productivity with respect to the base period.

Table XIV.13
Mexico: labour productivity and foreign investment, 2017-2019
(Millions of pesos per year)

No.	NAICS	Subsectors	Index base 2013=100			FDI	
			2017	2018	2019	2017-2019	Percentage
14	311	Food manufacturing	102	104,3	104,8	17 685,0	2,5
15	312	Beverage and tobacco products manufacturing	117,4	121,2	123,8	32 507,0	4,6
34	339	Miscellaneous manufacturing	105,9	105,9	108,1	20 533,4	2,9
		Low-technology manufacturing	108,4	110,4	112,2	70 725,4	10
25	326	Plastics and rubber products manufacturing	101,5	100,8	95,7	53 970,1	7,6
27	331	Primary metal manufacturing	99,9	94,2	88,8	20 870,9	2,9
28	332	Fabricated metal product manufacturing	103,9	104,1	99,5	22 394,6	3,2
		Medium-technology manufacturing	101,8	99,7	94,7	97 235,6	13,7
24	325	Chemical manufacturing	98,2	96,4	94,5	50 047,6	7
29	**333**	**Machinery manufacturing**	**99**	**100,8**	**100,7**	**18 084,2**	**2,5**
30	**334**	**Computer and electronic product manufacturing**	**97**	**97,6**	**101,6**	**52 595,2**	**7,4**
31	**335**	**Electrical equipment, appliance, and component manufacturing**	**101**	**100,5**	**101,2**	**40 590,0**	**5,7**
32	336	Transportation equipment manufacturing	97,5	94,8	93,7	381 157,6	53,7
		High-technology manufacturing	98,5	98	98,3	542 474,6	76,4
Total 13 manufacturing subsectors						710 435,5	100

Source: Prepared by the authors, on the basis of National Institute of Statistics and Geography (INEGI) and of the Secretariat of Economy.

f) Impact on wages

The analysis of quality FDI should include its positive impact on closing labour gaps and on the working conditions of workers, as recommended by the International Labour Organisation. FDI helps to reduce inequality in income levels and gender gaps in employment and brings increased wages and benefits from transnational corporations. The available information does not make it possible to address all these aspects of employment. For this reason, the impact on employment of quality FDI is analysed indirectly through average wages paid by the different subsectors of the economy (see table XIV.14). The main constraint of this analysis is that it does not discriminate between foreign and domestic enterprises.

Table XIV.14
Mexico: wages per person employed in FDI, 2017-2019
(Annual thousand pesos per person)

No.	NAICS	Subsectors	Thousand pesos per person
6	211	Oil and gas extraction	782.1
56	523	Stock exchange, exchange and financial investment activities	766.1
55	522	Non-stock market credit and financial intermediation institutions	718.7
9	221	Generation, transmission and distribution of electrical energy	631.2
42	486	Pipeline transport	616.6
51	517	Telecommunications	474.3
24	325	Chemical manufacturing	334.1
27	331	Basic metal industries	309.5
57	524	Surety, insurance and pension companies	304.3
61	541	Professional, scientific and technical services	**230.3**
30	334	Manufacturing of computer, communications and measurement equipment	**223.8**
29	333	Manufacturing of machinery and equipment	**220.2**
7	212	Mining of metallic and non-metallic minerals, except oil and gas	**207.7**
32	336	Manufacturing of transportation equipment	**200.1**
31	335	Manufacturing of electrical equipment, appliances and components	**179.7**
15	312	Beverage and tobacco industry	**170.4**
25	326	Plastics and rubber industry	**137.5**
28	332	Manufacturing of metal products	**133.1**
36	461	Retail trade	**132.8**
34	339	Other manufacturing industries	**121.4**
12	237	Construction of civil engineering works	**106.2**
73	721	Temporary accommodation services	**104.4**
14	311	Food industry	**103.3**
58	531	Real estate services	**103.1**
59	532	Movable property rental services	84.8
35	431	Wholesale trade	74
		Simple average 26 subsectors	287.3
		Simple average 79 subsectors	225.2
		Weighted average 79 subsectors	159

Source: Prepared by the authors, on the basis of input-output model, the National Institute of Statistics and Geography (INEGI) and the Secretariat of Economy of the Government of Mexico.

INEGI and the Secretariat of Economy provide data on the average annual wages paid per person employed in the 79 subsectors of the economy in the study period. With this information, workers and wages were estimated for each of the 26 subsectors that concentrate net FDI. Table XIV.14 highlights in blue the 15 subsectors that pay about the same wages as the national average (159,000 pesos per year). The subsectors that pay the highest wages are not those with the highest technology or manufacturing sectors. The highest-paying subsectors are: (6) oil and gas, (9) electric power; (42) pipeline transport, (55) banks and (56) stock market and financial activities.

g) Intersectoral backward and forward linkages

FDI can help close the investment-savings gap. This is especially true of net FDI. However, studies done by Hirschman (1958) stress that, because of the structural heterogeneity of less developed economies, investments do not have the same impact on the overall economy but depend on the sector in which they are carried out. In other words, investment is more important and gives better results in some economic activities than in others. Different authors highlight that, in the least developed countries, investment, domestic or foreign, should be applied to sectors with strong backward linkages so that its multiplier effect on final demand is greater while helping industrialisation at the same time. To enhance the multiplier effect in the economy, sectors that are strongly linked to domestic and international production chains (key sectors) should be promoted.

Analysis of differentiated impacts on the economy can be done from the perspective of supply or demand. In the first case, the impact that, in order to get the inputs they need to grow, some branches of the economy make on meeting the internal needs of other branches can be analysed. Demand quantifies the impact that productive activity has on the demand for inputs or final goods produced by other economic activities. The study of the direct and indirect impacts of investments, or of any other variable of final demand, is carried out through backward or forward linkages, as these appear in an input-output matrix (IOM). This study used an IOM estimate for 2018 that presents general results for all subsectors (79) of the economy. Table XIV.15 shows the results of these calculations for the initial group of 26 subsectors that concentrated most of the net FDI in Mexico in 2018.

An important distinction was made regarding linkages estimated using a domestic OIM (which does not include imports of inputs) or the total OIM (which does include them). If this measurement is understood as a proxy for production chains, then the value of the backward linkages of each subsector will include foreign linkages if an OIM includes imports. If it does not include them, only domestic linkages are being accounted for. Depending on which markets they serve, the forward linkages of the subsectors are more or less strong in both total and domestic OIMS. For each subsector, the measurement of these linkages takes into account both the number of subsectors with which it has a backward or forward relationship as well as the intensity of that relationship. In each case, the result lays around the weighted average of the entire economy. Therefore, a value larger than one (1) indicates a subsector with linkages above average, while a value under one (1) indicates the opposite. A value close to zero indicates a subsector with weak linkages with the other subsectors.

Using these criteria, table XIV.15 shows the nine subsectors that, among a total of 26, have the strongest backward linkages. These subsectors are shown in light blue: (12), (14), (15), (24), (27), (28), (42), (56) and (57). In mustard colour appear the ten subsectors that have strong domestic forward linkages: (6), (9), (12), (15), (25), (51), (55), (58), (59) and (61). In the intersection between those two groups fall only two subsectors: construction (12) and the beverage and tobacco industries (15). In the terminology of the input-output analysis (Miller and Blair, 2009), they would be classified as *key sectors* for the domestic economy.

The same colours, light blue and mustard, highlight the subsectors with high backward and forward linkages in the total OIM. The 14 subsectors with strong backward linkages are: (12), (14), (15), (24), (25), (27), (28), (29), (30), (31), (32), (34), (42) and (58). And the subset of 15 subsectors with strong linkages on the supply side is: (6), (7), (9), (24), (25), (27), (28), (29), (30), (31), (34), (42), (56), (59) and (61). In the intersection between those two subsectors are the following: (24), (25), (27), (28), (29), (30), (31), (34) and (42). These are *key subsectors*, that is, subsectors whose production and supply chains, imports included, have important foreign linkages.

From the point of view of backward and foreign linkages, both internal and external, all subsectors that concentrate net FDI are relevant, except the following three: wholesale trade (35), retail trade (36) and temporary accommodation services (73). However, from the point of view of demand links, the Mexican economy has more foreign than domestic linkages: 9 important subsectors against 14 subsectors. But from the supply point of view, there are ten important subsectors against 15. In highly or moderately industrialized economies, among key sectors will always be found (12) construction and (32) transport equipment, also known as the motor-vehicle industry. In the case of Mexico, the motor-vehicle industry subsector (32) has few linkages with the domestic economy (see table XIV.15) but is closely linked to foreign suppliers. However, this subsector does not play an important role in domestic or foreign supply. It seems like a case of reversed import substitution.

Table XIV.15
Mexico: total normalized linkages in 2018 OIM
(Indexes)

No.	NAICS	Subsector	Domestic OIM		Total OIM	
			Backward	Forward	Backward	Forward
6	211	Oil and gas extraction	0.88445	1.24709	0.84365	1.55162
7	212	Mining of metallic and non-metallic minerals	0,93393	0.66134	0.86616	1.65231
9	221	Power generation, transmission and distribution	0.95918	1.16231	0.95177	1.21891
12	237	Construction of civil engineering works	1.05497	1.37664	1.03532	0.47633
14	311	Food industry	1.21991	0.68385	1.09327	0.61733
15	312	Beverage and tobacco industry	1.07207	1.06637	1.08297	0.49912
24	325	Chemical manufacturing	1.11125	0.97509	1.34569	2.27425
25	326	Plastics and rubber industry	0.99789	1.23027	1.35226	1.58566
27	331	Basic metal industries	1.14635	0.93031	1.23541	1.76950
28	332	Manufacturing of metal products	1.12306	0.70024	1.33707	1.56967
29	333	Manufacturing of machinery and equipment	0.93725	0.67512	1.28309	1.53872
30	334	Manufacturing of computer equipment	0.77726	0.70342	1.77838	1.67500
31	335	Manufacturing of electrical equipment, appliances and accessories	0.95261	0.72230	1.49951	1.45630
32	336	Manufacturing of transportation equipment	0.99088	0.70744	1.50642	0.83685
34	339	Other manufacturing industries	0.85765	0.96383	1.46589	1.23686
35	430	Wholesale trade	0.84454	0.76617	0.68461	0.82861
36	460	Retail trade	0.85252	0.79060	0.68660	0.59357
42	486	Pipeline transport	1.21931	0.64724	1.02008	2.61902
51	517	Telecommunications	0.89488	1.52805	0.97716	0.83730
55	522	Credit intermediation institutions	0.91394	1.98801	0.69047	0.65990
56	523	Stock exchange, exchange and investment activities	1.09546	0.79648	0.85297	1.65206
57	524	Surety, insurance and pension companies	1.14126	0.78172	1.00419	0.86429
58	531	Real estate services	0.76518	1.42660	0.56893	0.57078
59	532	Movable property rental services	0.94578	1.29730	0.93737	1.11814
61	541	Professional, scientific and technical services	0.91168	1.61330	0.76298	1.26906
73	721	Temporary accommodation services	0.91020	0.77234	0.79295	0.60880

Source: Prepared by the authors, on the basis of input-output model.

There are six key subsectors that have strong backward (demand) and forward (supply) linkages: chemical manufacturing (24), plastic and rubber products (25), machinery and equipment (29), computer equipment (30), electrical appliances and equipment (31) and pipeline transport (42). There are two subsectors that are internationally recognized for towing many backward linkages, though they push few forward linkages. These are construction (12) and manufacturing of transportation equipment (32). The subsectors associated with extraction activities: oil (6), mining (7) and electricity (9), although they are important suppliers, they have little influence on demand. Finally, two services subsectors, wholesale trade (35) and the banking system (55), are relatively independent from the rest of the structure. Net quality FDI is foreign investment in manufactures that concentrate on key subsectors. The exception is pipeline transport, which belongs to the tertiary sector (see table XIV.16).

Table XIV.16
Mexico: FDI linkages, 2018

	Forward	Forward
	Low <1	High >1
Backward	Mostly	Strong suppliers
High >1	Demanders	and demanders
	(12) Construction	(24) Chemical manufacturing
	(32) Transportation equipment	(25) Plastics and rubber products
		(29) Machinery and equipment
		(30) Computer equipment (31) Electrical appliances and equipment
		(42) Pipeline transportation
Backward	Relatively	Mostly
Low <1	Independent	Suppliers
	(35) Wholesale trade	(6) Oil and gas extraction
	(55) Credit institutions	(7) Mining
		(9) Electric power

Source: Prepared by the authors, on the basis of National Institute of Statistics and Geography (INEGI) data.

h) Environmental sustainability and net FDI

High-quality investments must lead to a change in the development model and favour an environmentally sustainable economy. Climate change caused by the emission of greenhouse-effect gases (GHGs) is only part of the problem since there are other environmental issues that put at risk the biodiversity and habitability of the planet. Unfortunately, indicators for the impact of FDI on the environment are scarce, so this study only considers GHGs emissions in the production of goods and services and their distribution in the economy. This estimation methodology is recommended by the United Nations (IPCC, 1996).

For the Mexican economy, there are records of the annual GHGs emissions, measured in gigagrams (Gg) of CO_2, produced by the 26 selected subsectors (see table XIV.17). INEGI keeps those records, which classify the information provided by the National Institute of Climate Change according to the itemisation used by the North American Industry Classification System. The subsectors in that classification (79) contain a more or less large number of enterprises that, together, emit the amounts recorded by INEGI. However, each of those enterprises may operate with different environmental technologies. A fundamental limitation is that records do not distinguish between transnational enterprises and other companies.

Using data from official sources, table XIV.17 shows the emissions of each of the 26 selected subsectors as a proportion of the national total in 2018. There were 19 subsectors with emissions under 1% of the total: (12), (14), (15), (25), (29), (30), (31), (32), (34), (35), (42), (51), (55), (56), (57), (58), (59), (61) and (73). At the current level of technology they employ, all these subsectors, on average, are low emitters, so the FDI that participates in them can be considered a high-quality investment.

However, the indicator does not show the impact that the output of some of these subsectors may have in the future. For instance, (32) transport equipment only emits 0.6% of total GHG emissions, but the cars and trucks it produces for other subsectors emit lots of gases. There is yet another major problem. Namely, as the indicator cannot tell between transnational and domestic enterprises, it is not possible to know for certain whether FDI contributes to sustainable structural change. For instance, the electric power generation, transmission and distribution sector (9) appears as a polluting sector according to the indicator, which does not say which technological paths FDI follows. Therefore, this indicator is weak and does not provide a sensible measure for the sustainability of FDI.

Table XIV.17
Mexico: GHGs emissions, 2018
(Gg CO_2)

No.	NAICS	Subsectors	Gg CO_2 eq.	Percentage
6	211	Oil and gas extraction	12 006.0	2.1
7	212	Mining of metallic and non-metallic minerals	6 134.8	1.1
9	221	Electric power generation, transmission and distribution	97 690.1	17.1
12	**237**	**Construction of civil engineering works**	**3 560.0**	**0.6**
14	**311**	**Food industry**	**5 394.4**	**0.9**
15	**312**	**Beverage and tobacco industry**	**999.6**	**0.2**
24	325	Chemical manufacturing	12 381.9	2.2
25	**326**	**Plastics and rubber industry**	**2 238.2**	**0.4**
27	331	Basic metal industries	9 899.3	1.7
28	332	Manufacturing of metal products	6 444.6	1.1
29	**333**	**Manufacturing of machinery and equipment**	**2 242.0**	**0.4**
30	**334**	**Manufacturing of computer equipment**	**3 093.5**	**0.5**
31	**335**	**Manufacturing of electrical equipment, appliances and accessories**	**1 255.5**	**0.2**
32	**336**	**Manufacturing of transportation equipment**	**3 265.2**	**0.6**
34	**339**	**Other manufacturing industries**	**3 125.1**	**0.5**
35	**430**	**Wholesale trade**	**4 006.3**	**0.7**
36	460	Retail trade	12 435.6	2.2
42	**486**	**Pipeline transport**	**3 424.0**	**0.6**
51	**517**	**Telecommunications**	**1 678.2**	**0.3**
55	**522**	**Credit intermediation institutions**	**784.5**	**0.1**
56	**523**	**Stock exchange, exchange and investment activities**	**35**	**0**
57	**524**	**Surety, insurance and pension companies**	**289.2**	**0.1**
58	**531**	**Real estate services**	**976.5**	**0.2**
59	**532**	**Movable property rental services**	**27.5**	**0**
61	**541**	**Professional, scientific and technical services**	**2 906.4**	**0.5**
73	**721**	**Temporary accommodation services**	**4 071.6**	**0.7**
Total selected subsectors (26)			200 365.1	35.2
Total for all subsectors (79)			569 873.7	100

Source: Prepared by the authors, on the basis of National Institute of Statistics (INEGI) and the National Institute of Ecology and Climate Change (INECC) of the Secretariat of the Environment and Natural Resources (SEMARNAT) of the Government of Mexico.

2. Identified gaps in quality FDI in Mexico

Indicators on the quality of FDI in Mexico show gaps between territories and sectors. There is heterogeneity in terms of the amounts of foreign investment that subsectors attract and of the places in which transnational companies operate. Table XIV.18 highlights in yellow the 13 subsectors to which net FDI has flowed the most. As a generator of gross production, value added, and direct employment, FDI stands out in only three subsectors. However, the impact of FDI is very prominent on exports, where it concentrates on 13 subsectors, of which 12 have a strong impact on the generation of added value and employment.

Estimations for linkages made in 2018 show that only five manufacturing subsectors and one service subsector can be considered key due to their forward and backward linkages. Subsectors that have only high backward linkages stand out because they drag demand and, therefore, their effects on final demand are greater than those of other subsectors. This is a very important observation when designing economic policy.

Regarding productivity, 7 of the 12 manufacturing subsectors considered in this study have labour productivity indices above 100. There is net FDI in all of them. Regarding wages paid by enterprises with FDI, companies do not make this kind of data public. Domestic annual wages are listed by subsector and classified by falling above or below average to determine which subsectors pay good wages. Nine subsectors pay more than average wages: two of them are extractive, one is the electric power subsector, another two are manufacturing subsectors, and four are engaged in service activities. Finally, according to the sustainability analysis based on GHG emissions, ten subsectors individually generate less than 1% per year.

None of the subsectors that attract net FDI satisfactorily meets all the requirements to be considered quality investments. However, four subsectors come close to the concept of quality FDI: (29) manufacturing of machinery and equipment, (30) manufacturing of computer equipment, (31) manufacturing of electrical appliances and (32) manufacturing of transport equipment. All these subsectors stand out in meeting most of the proposed indicators.

Table XIV.18
Mexico: subsectors that concentrate net FDI and its quality performance, 2017-2019
(Billion pesos at current prices)

No.	NAICS	Subsectors	NET FDI		VAIIED	EMIIED	EXPIIED		VAIEIED		EIEIED	Linkages		Productivity	Salaries	Ssustainability (GHG)	
			2017-2019		2017-2019	2017-2019	2017-2019		2017-2019		2017-2019	Backward	Forward	Index	Annual	2018	
			Billions	%	Billions	Thousands	Billions	%	Billions	%	Thousands	Index		Index	Thousands	GgCO2	%
6	211	Oil and gas extraction	17.2	3.6	16.3	1.0						0.84	1.55		782.1	12 006,0	2,1
7	212	Mining of metallic and non-metallic minerals	13.1	2.8	12.9	8.3	86.9	1.3	119.0	3.5		0.87	1.65		207.7	6 134,8	1,1
9	221	Electric power generation, transmission and distribution	24.7	5.2	21.8	5.0			82.0	2.4		0.95	1.22		631.2	97 690,1	17,1
12	237	Construction of civil engineering works	23.2	4.9	12.1	31.2						1.04	0.48			3 560,0	0,6
14	311	Food industry	5.9	1.2			80.8	1.2						103.7			
15	312	Beverage and tobacco industry	10.8	2.3			74.7	1.1						120.8	170.4		
24	325	Chemical manufacturing	16.7	3.5	6.6	5.5	145.1	2.2	59.9	1.7		1.35	2.27	96.4	334.1	12 381,9	2,2
25	326	Plastics and rubber industry	18.0	3.8	6.6	16.9	147.9	2.2	63.8	1.9	162	1.35	1.59	99.3		2 238,2	0,4
27	331	Basic metal industries	7.0	1.5	5.8		115.1	1.7	109.9	3.2				94.3	309.5	9 899,3	1,7
28	332	Manufacturing of metal products	7.5	1.6	2.7	9.1	136.5	2.0	58.5	1.7	155			102.5			
29	333	Manufacturing of machinery and equipment	6.0	1.3	4.0	5.0	274.4	4.1	106.9	3.1	197	1.24	1.77	100.2	220.2	2 242,0	0,4
30	334	Manufacturing of computer equipment	17.5	3.7	3.7	9.7	1 166.6	17.4	255.0	7.5	614	1.78	1.67	98.7	223.8	3 093,5	0,5
31	335	Manufacturing of electrical equipment, appliances and accessories	13.5	2.8	38.1	8.2	408.9	6.1	104.8	3.1	232	1.50	1.46	100.9	179.7	1 255,5	0,2
32	336	Manufacturing of transportation equipment	127.1	26.7	52.3	39.5	3 027.1	45.1	815.6	23.8	843	1.51	0.84	95.3	200.1	3 265,2	0,6
34	339	Other manufacturing industries	6.8	1.4		8.4	167.3	2.5			199			106.6			
35	430	Wholesale trade	38.4	8.1	11.4	21.3	352.0	5.2	621.3	18.2	253	0.68	0.83			4 006,3	0,7
36	460	Retail trade	8.5	1.8	6.0	19.7			89.6	2.6	156					12 435,6	2,2
42	486	Pipeline transport	18.3	3.8	8.0							1.02	2.62		616.6	3 424,0	0,6
51	517	Telecommunications	9.7	2.0	15.5										474.3		
55	522	Credit intermediation institutions	17.3	3.6	10.5	4.9						0.69	0.66		718.7		
56	523	Stock exchange, exchange and investment activities	6.2	1.3													
57	524	Surety, insurance and pension companies	5.0	1.0													
58	531	Real estate services	5.6	1.2													
59	532	Movable property rental services	7.0	1.5													
61	541	Professional, scientific and technical services	5.0	1.0	10.2	14.6			62.8	1.8					230.3	2 906,4	0,5
73	721	Temporary accommodation services	5.6	1.2	5.0	3.8										4 071,6	0,7
Subtotal 26 selected subsectors			441.4	92.9	266.4	349.8	6 183.4	92.1	2 788.7	81.5	4 607				159.0	180 610.4	31.7
Total FDI			475.0	100.0	334.2	441.3	6 711.4	100.0	3 422.3	100.0	5 639						
Total national					21 971.5	39 150.5	8 329.4	80.6								569 873.7	

Source: Prepared by the authors, on the basis of National Institute of Statistics and Geography (INEGI) and the Secretariat of Economy of the Government of Mexico.
NET FDI = Net Foreign Direct Investment (greenfield + extensions).
VAIIED = Value Added Induced by Foreign Direct Investment.
EMIIED = Employment Induced by Foreign Direct Investment.
EXPIIED = Exports induced by Foreign Direct Investment.
VAIIEIED = Value added induced by Foreign Direct Investment.
EIEIED = Employment Induced by FDI Exports.
GHG = Greenhouse Gases.

a) Territorial gaps in quality FDI in Mexico

The unequal distribution of FDI between States represents an important gap. Table XIV.19 shows that 9 of the 32 Mexican States account for the highest percentage of the population (48.1%) and GDP (58%), though they only make up 38% of the country's territory. The States that concentrate most (66%) net FDI flows are: five on the northern border (Baja California, Chihuahua, Coahuila, Nuevo León and Tamaulipas), two in the Bajío region (Guanajuato and Jalisco), and two in the centre of the country (Estado de México and Mexico City). Three States stand out for concentrating 36% of total FDI in the years considered by this study: Mexico City, Estado de México and Nuevo León. In contrast, ten states that extend over 30% of the national territory individually captured less than 1% of FDI in 2017-2019. From more to less foreign investment, these states are Sonora, Michoacán, Durango, Hidalgo, Tlaxcala, Campeche, Chiapas, Nayarit, Yucatan and Colima. From this perspective, net FDI contributes relatively little to close the investment gap in Mexico and rather reinforces concentration.

Table XIV.19
Mexico: basic data by state, 2017-2019

	Area	Population	GDP	FDI
	2020	2020	2017-19	2017-19
	Percentages of the total			
Mexico City	0.08	7.31	16.21	19.12
Edo. de México	1.14	13.48	8.97	8.85
Nuevo León	3.27	4.59	7.86	8.67
Coahuila	7.73	2.5	3.71	7.29
Guanajuato	1.56	4.89	4.28	4.9
Tamaulipas	4.09	2.8	3.04	4.58
Chihuahua	12.62	2.97	3.45	4.37
Baja California	3.64	2.99	3.46	4.31
Jalisco	4.01	6.62	7.09	3.95
Total 9 states	38.13	48.16	58.08	66.03
Total 23 states	61.87	51.84	41.92	33.97
Total 32 states	100	100	100	100

Source: Prepared by the author, on the basis of National Institute of Statistics and Geography (INEGI) and the Ministry of Economy of the Government of Mexico.

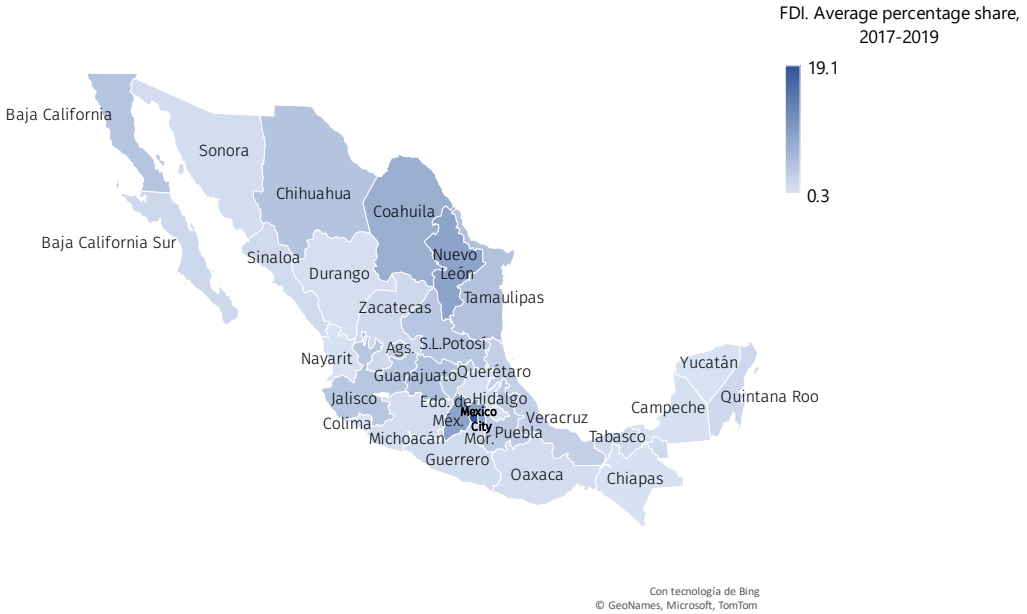
By subsectors, manufacturing of transport equipment (32) receives the highest percentage of net FDI. That subsector works in 11 states: Nuevo León, Coahuila, Chihuahua, Sonora, Aguascalientes, Guanajuato, San Luis Potosí, Estado de México, Querétaro, Puebla and Morelos. The oil and gas subsector also attracts net FDI, but in more modest amounts. Oil and gas is located in the four states on the coast of the Gulf of Mexico: Tamaulipas, Veracruz, Tabasco and Campeche (see table XIV.20 and map XIV.1).

Table XIV.20
Mexico: FDI annual average, 2017-2019
(Million pesos)

Subsector/state	2017-2019	Percentage
Misc. high-med 3	**178.268.1**	**27.4**
Mexico City	124 493.1	19.1
Baja California	28 045.0	4.3
Jalisco	25 730.0	4
Motor vehicles 11	**328 671.6**	**50.5**
Edo. de México	57 622.0	8.8
Nuevo León	56 463.9	8.7
Coahuila	47 466.6	7.3
Guanajuato	31 910.5	4.9
Chihuahua	28 439.9	4.4
San Luis Potosí	25 591.5	3.9
Puebla	23 215.0	3.6
Querétaro	21 486.0	3.3
Aguascalientes	20 520.7	3.2
Morelos	9 627.4	1.5
Sonora	6 328.2	1
Oil and gas 4	**61 191.7**	**9.4**
Tamaulipas	29 800.7	4.6
Veracruz	18 532.9	2.8
Tabasco	9 020.9	1.4
Campeche	3 837.2	0.6
Mining 3	**21 030.2**	**3.2**
Tourism 3	**24 843.9**	**3.8**
Misc. low 8	**37 172.7**	**5.7**
Total	651 178.3	100

Source: Prepared by the author, on the basis of Ministry of Economy of the Government of Mexico.

Map XIV.1
Mexico: share of FDI by state
(Average FDI 2017-2019)



Source: Prepared by the author, on the basis of National Institute of Statistics and Geography (INEGI) and the Secretariat of Economy of the Government of Mexico.

b) Sectoral gap

Net FDI is highly concentrated in a few subsectors. Thus, it is not possible to narrow gaps in productive diversification, especially when this variable is analysed by territories. A net FDI that concentrates on a few sectors and territories generates vulnerability to external shocks. It also generates high fiscal dependence and a high concentration of jobs, which reduces the bargaining power of the public sector and of workers. Twenty-six subsectors concentrate 92.6% of net FDI, and the motor vehicle sector stands out as the largest recipient of net FDI in Mexico.

Net FDI is concentrated in the secondary sector and, to a lesser extent, in the tertiary sector, generating a deep investment gap in the primary sector. In the latter sector, FDI concentrates on the oil and gas and mining sectors. Besides, the contribution to value added in production is concentrated in 20 subsectors, and most of them belong to the secondary and tertiary sectors, where the transport industry stands out again. Once more, the primary sector lags behind.

Job creation is also concentrated in a couple of subsectors, transport equipment and electrical equipment, appliances and components. Services and manufactures are salient for the employment they create. Only four subsectors stand out for high job creation (more than 10.000 jobs) and added value: construction (12); wholesale trade (35); professional, scientific and technical services (61); and (32) manufacturing of transport equipment. The transport equipment subsector stands out for its high generation of employment and high generation of added value (see table XIV.12).

c) Gaps in export capabilities

Net FDI in Mexico is mainly oriented towards export activities and represented 81% of total exports between 2017 and 2019. The set of 26 most relevant subsectors accounts for 94% of exports made by enterprises with net FDI. The high concentration of Mexican exports in the hands of transnational companies shows a huge gap between transnational and domestic companies regarding the benefits they are able to attain from international trade, particularly with the United States by means of USMCA.

Also, the exports of companies with FDI concentrate in a few subsectors, most of them belonging to the secondary sector. Thirteen subsectors account for 92.2% of total exports, and six of them represent 81% of the total: (32) transport equipment, (30) computer equipment, (31) electrical equipment, appliances and components, (35) wholesale trade, (29) manufacturing of machinery and equipment and (34) other manufactures.

The input-output methodology shows that the impact on added value (subsectors that generate more than 10 billion pesos of VA) concentrates in 15 subsectors that make up 82% of the total. Two of those generate 43.2%: (32) transport equipment and (35) wholesale trade. Fourteen subsectors concentrate 82% of job creation through FDI exports. Salient among these are the following: (63) business support services, (32) transport equipment and (30) manufacturing of computer and communications equipment. These three subsectors account for 47% of the total jobs induced by exports of enterprises with foreign investment. This high concentration of job creation in a few sectors widens the gaps in the benefits that FDI brings in.

D. Conclusions and policy recommendations

Quality FDI contributes to the inclusive and sustainable development of host countries and their different territories. However, in Mexico, there are significant gaps between regions in terms of their ability to attract and use quality FDI. There are also sectoral gaps and gaps in the impacts on the overall economy and, in particular, on the foreign sector. The gaps analysed in this paper measure the structural heterogeneity of the Mexican economy. The objective of development is to narrow those gaps and to try to bring closer to optimal national levels the sectors placed farthest away, thus reducing the internal inequalities of the country. To weaken the forces that generate structural gaps, development policies that break causation and start a new virtuous circle must be put in place.

It is important that investment policies are incorporated into a State policy for productive development. Productive policies explain the development of countries, and their implementation requires the alignement of public actions on innovation, taxes and incentives, education, and foreign trade. FDI will contribute to productive policies if it brings in quality investments that narrow output gaps. This study identified three gaps in quality FDI in Mexico: the territorial gap, the sectoral gap, and the export capabilities gap.

The territorial gap can be explained by the strategies and motivations that drive transnational companies to transfer their capital, such as the search for natural resources, competitive advantages and productivity and proximity to markets. Transnational enterprises seek a series of conditions according to their objectives and the nature of their operations. In the case of Mexico, this has led them to concentrate on a few states. They choose a location because it is near to the United States market or close to large Mexican consumer markets. But also because they can use infrastructure and services that incentivise greater efficiency in their outputs. Therefore, a development policy is necessary to boost investment in states where quality FDI and narrow down the territorial gap.

Driving quality FDI into the States that attract the least investments may require a keener focus on productive infrastructure: roads, ports and railways that facilitate local and international trade, connectivity and stable broadband, access to energy and warehouses and office buildings. Especially important may be to focus on the skills and knowledge that enterprises search for, good schools and colleges and premium research centres. Government incentives for investment should also be available. State and federal promotion policies must work in coordination and be altogether aimed to help the under-favoured states and to develop infrastructure that favour domestic and foreign investments. Quality FDI may also be cultivated with incentives tied to the environmental standards set by the host country or to the job profiles and inclusive policies that it wants from companies.

The concentration of FDI in a few sectors inhibits the creation of a more complex production matrix that facilitates backward and forward linkages, affecting the creation of local jobs and inducing a high component of imports in domestic output. These few sectors are also geographically concentrated in a few states. Specialised programmes meant to attract FDI in a coordinated manner between the different State levels have succeeded. Investments have been made in non-traditional sectors, proving that government efforts can direct investment and even change the productive trajectory of a region. However, the receiving economy must have the specialised infrastructure that each industry requires. International experiences show that governments can promote diversity in production by offering incentives to specific sectors. Any incentives must respond to the quality FDI profile that each country and region needs.

FDI has direct positive effects on Mexico's export capabilities. But exports are highly concentrated in the hands of transnational firms, and the purchases they induce in the domestic economy are relatively small. The value of imports induced by exports represents 42%, while domestic added value is 57.8%. But in sectors such as transport equipment (32) and computer equipment (30), these values, respectively, are 51.5% and 48.5%, and 71.9% and 28.1%. There are successful experiences and programmes that have promoted the generation of new export companies driven by the capabilities of transnational corporations. These programmes focus on areas such as spin-offs that create linkages with suppliers through policies for the promotion of productive clusters.

Spin-offs make it easier for new enterprises to emerge out of existing productive experiences. Spin-offs profit from new processes, products or services based on knowledge previously acquired and on the results obtained by transnational companies. A new company can then create new production lines or participate in the production linkages of the original company. Barriers to the entry of new businesses can be overcome with public and private programmes on financing, research and development of products and services, enforceable intellectual property legislation, infrastructure and human resources.

To promote the creation of enterprises derived from transnational corporations, existing domestic companies, as well as support for new entrepreneurs, must receive incentives and support, which help them to convert their plants and processes. Business incubators are also helpful, as they encourage the design of prototypes and the formal start-up of enterprises that produce new products or services. They also cooperate in managing knowledge, intellectual property, physical space, equipment, logistics and access to financing. To reduce geographic concentration, the government may launch business incubators

whose objective is to create new companies in a specific geographic area. Incubators may also be established in the private sector, which usually provides financial support in the form of venture capital.

In addition, transnational enterprises need supplies that could be provided by local companies. This would push them to improve their factories, designs and processes to meet the requirements of transnational enterprises. Thus, it is important that local support programmes exist. Procurement, which entails the knowledge of production processes, can lead to exports to broader markets. There are successful experiences that have created new suppliers and fostered the build-up of local capacities that benefit from the demand created by transnational corporations.

Another strategy that could be promoted through public and private programmes and initiatives is the creation of dynamically interrelated productive spaces. The aim is to take advantage of the geographic concentration of producers and suppliers that the establishment of a transnational company often triggers. These "clusters" facilitate logistics and generate economies of scale, transfer of knowledge, support networks and the exchange of products, services and information. Common initiatives reduce investment risks and consolidate support for innovation and entrepreneurship. Clusters foster export capabilities and profit from linkages, knowledge and dynamism of one or more transnational enterprises.

To conclude, it is important to recognise that the analysis of quality FDI in Mexico is yet to be enriched by data on employment and wages disaggregated, for instance, by sex and level of education or training, by location of production plants and place where the investment was recorded. Also desirable is to have specific data on investments in environmentally sustainable technologies and information on pollution that goes beyond greenhouse-effect gases. Moreover, current data on GHGs do not distinguish between transnational and domestic enterprises.

Another difficulty in measuring quality FDI in Mexico lies in the impossibility of finding information by subsectors on the value of assets accumulated at the end of each year. As only the annual FDI inflows can be found, the impact of an investment is not necessarily contemporary to the investment, and the output produced in any given year by a sector with FDI reflects investments previously made. An additional problem lies in the lack of consistency between data sources, as some define investment as gross fixed capital formation in some subsectors in some years. Yet another problem is that the definitions of subsectors as itemised in the North American Industry Classification System do not always coincide with the traditional system.

A final and very important consideration is that, sometimes, data for entire sectors and subsectors are classified as confidential. Though these data are not available for analysis, they cannot be taken as negligible. To improve the design of public policies that attract FDI and promote its positive effects on the local economy, it will be necessary to conduct more research that looks into specific locations, as well as to improve existing data on the activities carried out by transnational corporations.

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Chapter XV
Innovation gaps in coffee-growing MSMEs in El Salvador and Guatemala

Leda Peralta Quesada
Luis Sánchez
Silvia Vilimelis

Introduction

Millions of people wake up to a cup of coffee. Coffee contains antioxidants, brings cultures together, is a stimulant, and brings people together. However, many consumers are unaware of the origin of their coffee, the types of beans they consume, and the relationships of coffee traders and distributors with growers. Most of the value of a cup of coffee is generated and appropriated in the final linkages of the value chain. Although coffee must be processed before consumption, the quality of a cup of coffee and its cost are determined by the quality of the cherry and how coffee was grown and cultivated. In other words, a cup of quality or speciality coffee sprouts on a plantation that meets certain requirements and has certain characteristics. However, the distribution and appropriation of the wealth that coffee creates do not always recognise neither this trajectory nor the innovations made by coffee growers in their farms and the risks they take, especially small producers.

Given their productive capacity and the different crises that the coffee sector has faced, Central American countries tend to focus on growing quality and differentiated coffees. This means that their coffee tends to meet high-quality standards and is produced using practices desirable by destination markets. These characteristics suggest that the productive sector has a great capacity to participate more closely in commercialisation and, thus, to appropriate more value. However, between 65% and 70% of the value produced during coffee processing occurs in the industrialisation and commercialisation links, which show high concentration and oligopsonistic traits, besides being located in the importing countries.

Considering the potential of innovation for structural change in the development model, this study analyses the main gaps faced by coffee micro-, small- and medium-sized enterprises (MSMEs) in order to move up the value chain towards the commercialisation link through innovation. To this end, this study presents an indicator to determine the capacity of coffee growers in El Salvador and Guatemala to use innovation for accessing the commercialisation link. This indicator will make it possible to find the conditions that would facilitate the participation of small growers in commercialisation and the opportunities that innovation offers to achieve this objective. In its conclusions, the study will provide some reflections and lessons learned that can inform public policy.

A. Theoretical framework

The coffee value chain concentrates its value on the preproduction and postproduction links, which encompass research and development, quality inputs, transformation, distribution, marketing, sales, and market intelligence. Despite this, developing countries tend to focus their strategies on production due to favourable conditions for cultivation in the Central American subregion. Though the subregion has produced some of the world's best coffees for over two centuries, focus still lays on the production

linkage and, despite the innovations in this link, there has been no structural change that improves the participation of producing countries or the income of coffee growers.

1. An uneven playing field

The Latin American and Caribbean region is characterised by deeply entrenched socioeconomic inequalities based on traditional patterns of wealth distribution that result in structural gaps that limit sustainable and inclusive development. These historical-structural gaps are not temporary; they are reproduced through social patterns that encourage the arbitrary appropriation of resources by a minority. Production in the region has not undergone a transformation towards industry and mechanisation, as has happened in developed countries. The consequence is a high level of heterogeneity in productivity, income and well-being.

The workings of trade and the value chain of coffee are not immune to these heterogeneities —which spring from the colonial period— so they clearly display the characteristics of a typical centre-periphery organisation that has seen negligible changes in its dynamics since it was established in Central America, some 250 years ago. At the domestic level, coffee growers and, in general, farmers and people living in rural areas experience high levels of poverty, have little access to financing and make limited use of technology and innovation. These gaps are wider in smaller companies and in population groups such as women, communities of African descent, Indigenous Peoples and older persons. Externally, trade and non-trade barriers have been raised, which favour the concentration of postproduction links in a few non-coffee-producing corporations located in developed countries. These dynamics have almost eliminated the bargaining power of small producers and countries with low production volumes. They also have widened the distance between coffee growers and consumers and moved pricing away from the production process. For this reason, many coffee growers operate at a loss.

2. Innovation for upgrading

Science, innovation and technology are key to the development of the economy and society. They are the building blocks of the structural change on which sustainable knowledge-based economies stand. Value chain analysis makes it possible to identify the links that add the most value and, therefore, contribute to generating quality jobs and wealth. Innovation, the articulation of links and the removal of obstacles may improve the performance of the chain and lead to the economic, social and environmental scaling of the enterprises of which it is made.[1]

There is ample evidence for a virtuous circle in which investment in research and development (R&D), innovation, productivity and per capita income reinforce each other, leading to sustained long-term growth rates. However, for developing countries, there is no conclusive proof that enterprises can transform R&D into innovation. This can be partly explained because, in developing countries, companies are far from the technological frontier and have few incentives and resources to invest in innovation. Usually, innovation in these companies is not disruptive but incremental; that is, it has little or no impact on international markets, and the changes it brings on are based on imitation and technology transfer (Grazzi and Pietrobelli, 2016). On the other hand, micro, small, and medium-sized enterprises (MSMEs) find it difficult to detect spaces where innovation could improve their processes and products. Besides, they face financial exclusion and limited finance for innovation. In addition, the dynamics and structure of the value chain make it difficult for MSME to upgrade to linkages that add more value.

Despite the subregion's experience in coffee production and innovations in the sector, its participation continues to focus on production. Its growers have very little participation in the links that generate the most value, such as industrialisation, trade, and distribution. Although they have made interesting and varied innovations on the production link, producing countries and their enterprises continue to face obstacles. Those innovations have not led to their upgrading into new links, and the governance of the value chain hinders their entry into other production stages. One way to visualise these

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[1] Economic scaling means the transformation of the links in the chain and of the chain itself towards better products and services, superior production processes, and knowledge-intensive activities with greater added value. With social upgrading, the people and communities that make chain raise their standards of living through decent employment with social security, labor rights and a safe work environment (Padilla and Oddone, 2016).

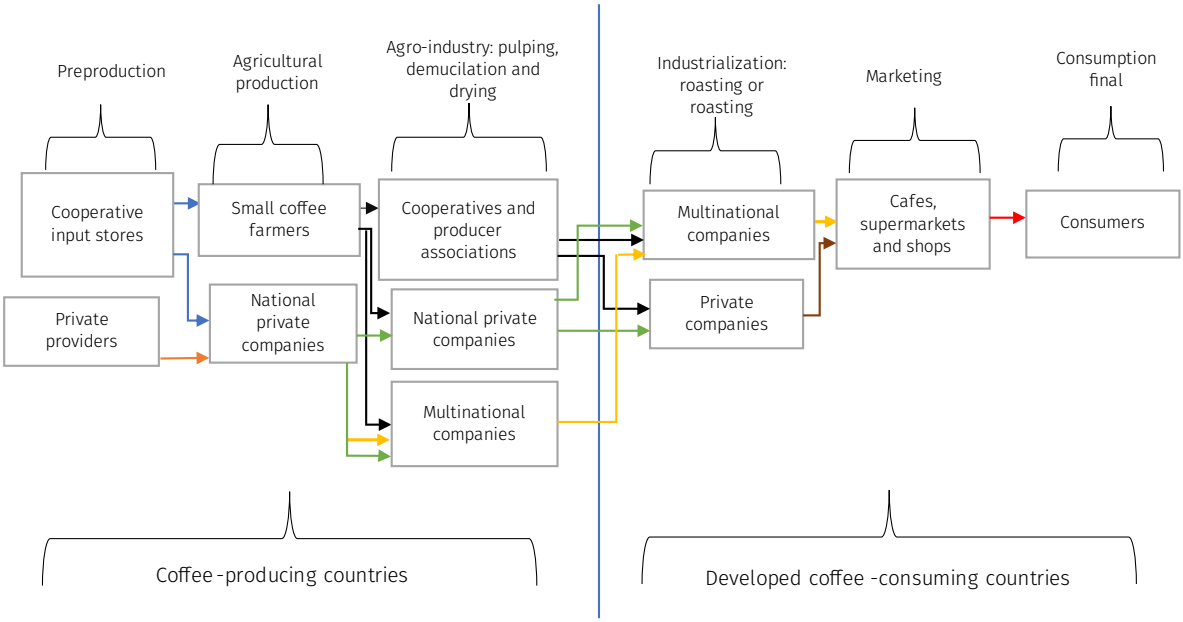
disparities is by looking at coffee exports, which add to US$ 20 billion, compared to the industry revenues of US$ 200 billion (2017-2018) (ICO, 2019).

Despite its innovative growing methods and specialisation in quality coffee, the subregion remains limited to growing beans and has not been able to upgrade through innovation. Thus, innovation is not enough to transform the coffee sector, it should be accompanied by institutional capacities, meet market needs, and address the governance that determines the dynamics of the industry.

3. Custody of the postproduction

The stages of coffee processing that add the most value are industrialisation and commercialisation. However, the participation of MMSMEs and producer countries concentrates on production, the chain's link on which appropriation of value is smaller, compared to the portion that goes to transnational corporations and countries that import coffee (see diagram XV.1).

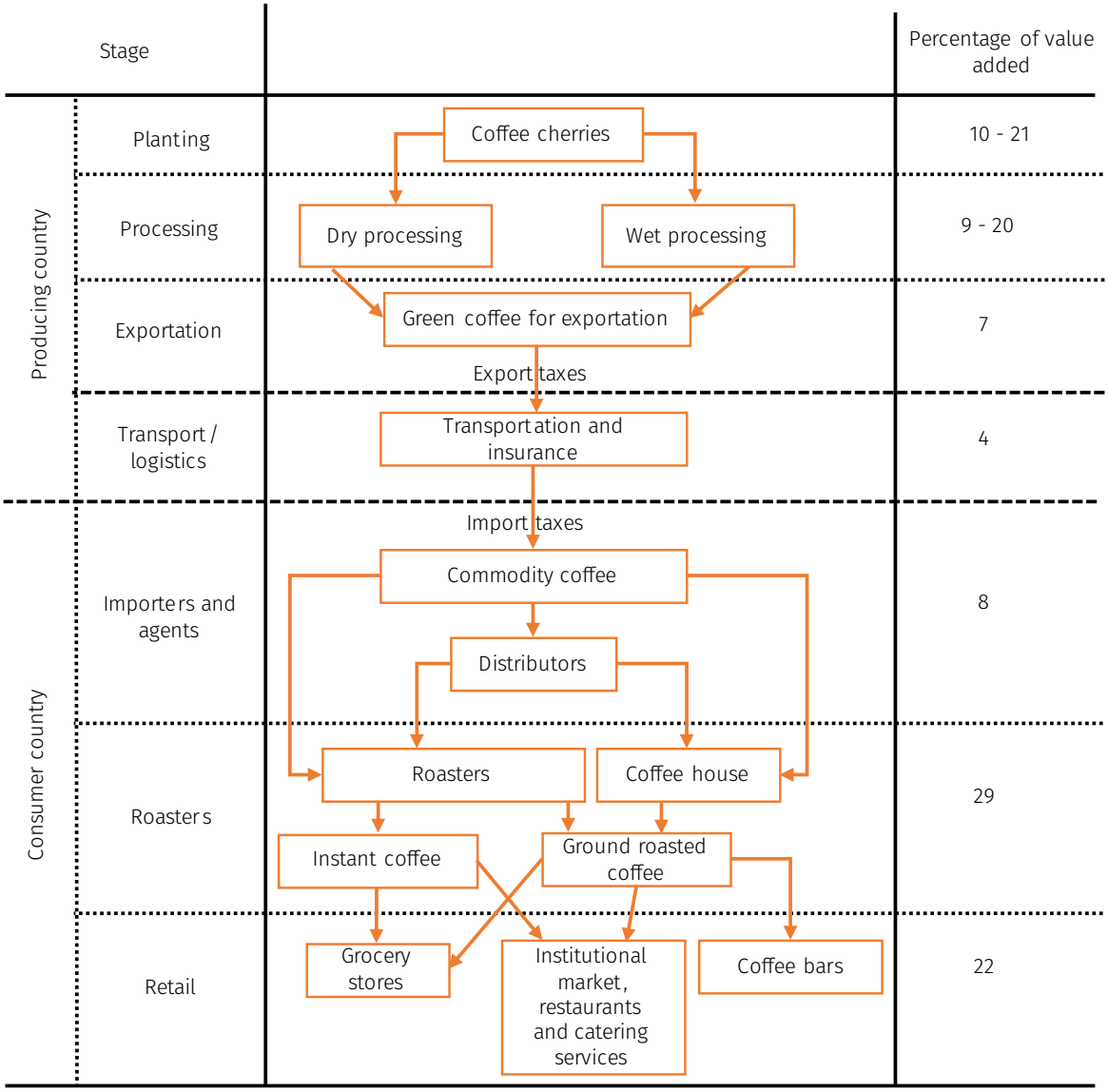
Diagram XV.1
El Salvador and Guatemala: value chain of coffee



Source: Prepared by the authors.

It is estimated that, in the 1970s, 20% of the retail price of coffee stayed in producing countries. By 1990, the proportion had fallen to 13%. Between 2010 and 2016, it remained between 10% and 17%. In terms of retail price, a pound of roasted coffee can sell for as much as an estimated $8 ($3.5 in the United States, $5.5 in Germany, $6 in Japan and $8 in Italy), compared to $2 for a pound of green coffee (Frohmann, Mulder and Olmos, 2020). Recent data from the International Coffee Organisation (ICO) tell the same story. While in the United Kingdom, a pound of coffee was sold for US$ 17.55 in 2019, in El Salvador, each pound went for US$ 0.66. In 2018, in Guatemala, the price was US$ 1.22 (OIC, 2019). Depending on their processing capacity, producing countries can appropriate between 30% and 50% of the value of processed coffee (see diagram XV.2).

Diagram XV.2
Processed coffee value chain



Source: Prepared by the authors, on the basis of N. Marín and A. Vasco, "La tostión como valor agregado en los cafés especiales", *Revista de Investigación de la Facultad de Ingeniería* Ing-Eam, vol. 4, No. 1, 2017, pp. 33-45.

Almost the entire process of roasting and grinding is carried out in importing countries such as the United States, the European Union or Japan. These, the last steps before the final sale, are the stages in which coffee adds most of its value. About 30% of the chain's total income is generated in this link, and up to 70% is generated in the final three links, which take place in the importing country (ECLAC/INDOCAFE/CNCCMDL, 2020). Only 0.1% of the coffee exported by El Salvador and Guatemala is roasted and ground there, while 99.7% is green coffee that sails away unroasted and non-decaffeinated (TradeMap, 2020).

Imports of green coffee are generally made by a small group of coffee distribution corporations. A similar concentration is observed in the roasting and commercialisation of coffee. These companies use sales channels such as supermarkets, specialised stores, restaurants and bars, or, more recently, online platforms. They handle marketing and reach end consumers, either by studying or by transforming market demand. They tend to buy coffee grown under certification schemes if markets so demand it, but they

often create these programmes, which become mandatory for their suppliers. In this way, they work all along the value chain, from the very first link to when a cup of coffee is sold, both to certify the quality of the drink and to ensure that the commodity is available for their supply chains.

Generally speaking, coffee-producing countries appropriate and produce less value than the consumer countries, which concentrate on the transformation, marketing, knowledge and market-building processes. The transformation and trade links work within an oligopsonistic market controlled by some five companies that trade around 50% of the exports of green coffee (Neumann Kaffee Gruppe, Louis Dreyfus Company, ECOM Agroindustrial Corp Ltd, ED&F Man Coffee Limited and OLAM Coffee), while ten other companies roast 35% of the world's coffee (Nestlé, JDE Peet's, The JM Smucker Co., Starbucks, Strauss, Lavazza, Melitta, UCC, Tachibo and Massimo Zanetti Beverage Group) (Panhuysen and Pierrot, 2020). These dynamics, exacerbated by the characteristics of Central American MMSMEs, result in practically zero participation of small growers and producing countries in the postproduction links. Growers that roast and trade do it with a small part of the production.

4. Challenges to innovation

During the COVID-19 pandemic, the acceleration of digital transformation occurred together with changes in consumer behaviours. Consumers now seek hand-made products and services that have a positive impact on producers and their communities, and are environmentally sustainable. These changes represent two areas of opportunity for innovation in the coffee sector.

- The digital transformation of the production process: Available technologies can help to improve agricultural productivity through a variety of tools to control planting, harvesting and storage conditions. And R&D could generate innovations to solve some of the most common challenges during production, such as the quality and affordability of fertilisers and freshness. Out of farms, the digital transformation also contributes to improving business management with business tools, access to knowledge and collaborative spaces and alternative financing.
- It also opens direct communication channels with consumers and makes producers visible. Product traceability, which has become a key instrument for the transparency of production processes, could show how income is distributed along a chain, something that interests responsible consumers. A wide variety of channels, such as social media, instant messaging and e-commerce platforms, are now available to communicate with buyers and sell directly to consumers.

The potential for innovation is huge. However, the capacity of the region and its enterprises to adopt the changes must be carefully pondered (Peralta, 2021). Perhaps the greatest risk is the widening of the digital gap between developing and developed countries, between urban and rural populations and enterprises, between industries and between socio-demographic groups, a gap that particularly affects women, older persons and low-income families. This digital gap is also exacerbated by other infrastructure and education gaps that hinder a more intensive and advanced use of digital tools, for example, by companies located in rural and peri-urban areas. Besides, Central America is still a consumer of digital products and services produced in other regions, and the markets for some digital platforms show monopolistic trends (UNCTAD, 2019).

MMSMEs face systemic challenges for innovation. There is a need for a shared long-term commitment, and a common strategy must be devised to articulate the components of the sector, its mandates, budgets, priorities and visions; the orientation and quality of human resources, which encompasses both business and institutional capacities; the financing of production and insurance against risks. And this strategy will need data and information for better decision-making and public policies. Table 1 presents some indicators of innovation that make it possible to visualise the wide gap between developed and developing countries.

Table XV.1
Selected countries: innovation indicators, last available year

Global Innovation Index 2022			Sustainable Development Goals 2020	
Rank	Economy	Score	Spending on R&D[a] *(Percentage of GDP)*	Researchers[b] *(Per million people)*
1	Switzerland	64.6	3.15	5 552
2	United States	61.8	3.45	4 821.2
5	Netherlands	58	2.29	5 911.7
8	Germany	57.2	3.14	5 393.1
12	France	55	2.35	4 926.2
13	Japan	53.6	3.26	5 454.7
26	Belgium	46.9	3.48	5 750.1
28	Italy	46.1	1.53	2 671.8
29	Spain	44.6	1.41	3 109.2
54	Brazil	32.5	1.21	na
63	Colombia	29.2	0.29	88
100	El Salvador	19.9	0.17	73
110	Guatemala	17.8	0.03	14.4

Source: Prepared by the authors, on the basis of United Nations Educational, Scientific and Cultural Organization (UNESCO), UIS.Stat 2023 [online database] http://data.uis.unesco.org/#; and World Intellectual Property Organization (WIPO), *Global Innovation Index 2022: What is the future of innovation-driven growth?* (ISBN: 978-92-805-3433-7), Geneva, 2022.
[a] Data for Brazil, El Salvador, Guatemala and Switzerland correspond to 2019.
[b] Data for El Salvador, Guatemala, the United States and Switzerland correspond to 2019 and Colombia to 2017.

There are few links between innovation and sectors such as agriculture and business development. These conditions cause the dispersion of government interventions and make it difficult to create a favourable environment in which MMSMEs can opt for innovation processes as mechanisms to improve their competitiveness, productivity and employment.

Latin American MSMEs show lower productivity and innovation capabilities than their peers and larger companies in developed regions, such as Europe. The main reasons are access to telecommunications and electricity infrastructure, training (business, technical, digital and soft-skills) and financing according to their needs and characteristics. Women, small companies and enterprises located in rural areas face an additional series of challenges, such as the availability of time and money to take on innovation and learning tasks.

Apart from the challenges to innovation, MSMEs face yet another series of challenges regarding the commercialisation of their products (Rodríguez and Riveros, 2016). Among them are the following:

- Market competition: expansion of global supply chains, constant entry of new players, a wide range of strict quality requirements, chains in the hands of a few players that control information and governance and uneven bargaining power of small producers.
- Weak support services: information, technical assistance, financial services, resources such as water and energy, transport, internet, supplies, warehousing and machinery and maintenance.
- Weak organisation of producers, which affects their access to production factors and support services.
- Narrow market view and emphasis on production: production, trading and consumption decisions of small producers are determined by limited options. Due to imperfect information and a high-risk environment, growers tend to choose among the resources they have at hand, the knowledge and practices they acquired by custom and the opportunities they identify without aiming at meeting market needs.

- Low value added: MSMEs tend to sell generic products without differentiation or diversification and with little postharvest treatment.
- Limited infrastructure and communications in rural areas: besides public infrastructure, perishable products shipped to distant markets require storage facilities, transport costs and capital to create stocks.

A weak public governance structure discourages the participation of small producers in international markets and exposes them to the high market and climate risks associated with coffee growing.

The region's MSMEs lag behind in innovation, and the weaknesses of rigid and captive governance create a large number of entry barriers for producing countries and coffee growers, who cannot foray into postproduction links.

B. Methodological framework

The Central American subregion has been producing coffee since the 18th century and has managed to position its beans among the best in the world. Specialisation in production has resulted in a great diversity of innovations during the production process, including social innovations where associativity plays a central role, as well as upgrading efforts to participate in links along the chain that add greater value. Although innovation is crucial to guarantee productivity in the fields, reduce production costs and improve the quality of beans, it has not transformed into structural change, so producing countries and companies that take part just in the production stage continue to obtain a low proportion of income, given their permanence. As it currently runs, most of the value in the value chain is added in the postproduction stages. However, innovation often occurs during production. There are two main reasons for this. First, the Central American subregion focuses on the production of high-quality coffee since competing with countries that produce large volumes is difficult. Second, both large purchasing companies and importing countries are increasingly interested in high social and environmental standards during production, which reflects in regulations and certifications.

Although production in the subregion tends to get paid for its quality and for some certifications, the proportion of final value that they actually deserve is not clear, so the way in which MSMEs and associations of producing countries participate in the global chain remains unchanged. This section examines the main barriers to commercialisation faced by MSMEs and the opportunities that innovation provides for upgrading into higher-value links. Innovation and commercialisation are different processes that face their own challenges. But they complement each other in improving companies and the production system. Together, they may determine the capacity of MSMEs to upgrade links that add more value. This study identified eight areas that facilitate or hinder the chances of coffee-growing MSMEs to participate in commercialisation. Table XV.2 summarises the importance of these areas, the barriers they face, and the opportunities to surmount the obstacles.

Table XV.2
Central America: barriers, enabling conditions and opportunities for the commercialisation of coffee

Topic	Relevance	Barriers for small producers	Facilitating conditions	Opportunities for innovation
Access to markets	Most of the coffee is exported for consumption in developed countries	The market concentrates on postharvest stages Trade regulations and tariffs Distance between producers and consumers Limited bargaining power of small producers and developing countries	Scope and clarity of the national development strategy Trade negotiations and agreements Nation branding and country quality	Compliance with environmental and social standards Knowledge of and access to markets Access to pricing information Meeting buyers at trade events

Topic	Relevance	Barriers for small producers	Facilitating conditions	Opportunities for innovation
Legal aspects	Requirements to export or participate in the supply chains of purchasing companies	Diversity, cost and complexity of procedures and requirements Different levels of formality for associations and companies	Easy procedures and digital government Formal and strong associations Channelling of processes and procedures through associations	Collective innovation Scalability of public programmes for innovation Access to information on procedures
Diversification	New spaces for the creation or appropriation of value	Producing countries and their production-focused companies Absence or reduced scope of national scaling strategies Poor knowledge and participation in markets Weak innovation strategies and intra-industry linkages	History and in-depth knowledge of coffee Promotion strategy with a strong R + D + i component (Research + Development + innovation) Financing for innovation and diversification Catalysing innovation through associations	Innovations to solve major challenges in the sector The incursion into dynamic sectors such as bioeconomy Strengthening business skills Foray into complementary sectors such as tourism and cosmetics
Financing and access to capital	Probing new links requires resources and involves risks	Environmental and commercial risks in coffee production Availability, relevance and approach of financial services for MSMEs and agriculture Production costs and role of intermediaries Limited transport, logistics and telecommunications infrastructure in rural areas	Capital to invest and innovate adapted to coffee-growing companies Availability of green financing Promotion of financial protection for small producers Associations operate promotion and protection funds Design and implementation of products adapted to the sector	Promote direct consumer contact (D2C) and business-to-business (B2B) Examine existing intermediation processes Access to alternative financing (fintech) Building up financial skills Design of inclusive financing instruments
Institutionality and associativity	Governance of the chain creates high barriers to entry for postproduction links	Market concentration in industrialisation and trade Scope and clarity of the national development strategy Weight of countries and their companies in global trade	Specialisation and resources of public development institutions Existence of R + D + i support organisations Efficiency and transparency of associations Public-private partnerships	Process facilitation and digital government Boosting R + D + i through partnerships Access to training and technical assistance
Production	Participation in international trade requires stable production in high volumes and of high quality	Small production of countries and their enterprises Access to inputs and productive infrastructure	Quality of the beans produced Production practices in accordance with the requirements of destination countries and consumers	Transfer of production know-how to new links Traceability and certification of products and processes Producer visibility along the chain

Topic	Relevance	Barriers for small producers	Facilitating conditions	Opportunities for innovation
		Little appreciation of the risks assumed during production Effects of climate change and disasters	Increase in production volumes through associativity Continuous improvement of high-quality, differentiated coffees	Marketing of quality coffee micro-batches
Sustainability and social responsibility	Sustainability and social responsibility	Weaknesses in environmental management at the national level Participation of groups and areas in a situation of exclusion	Sector recognition of the importance of sustainability Implementation of social and environmental standards	Circular economy Regenerative agriculture Traceability to the producer Access to new niches devoted to social and environmental responsibility Revaluation of local hand-made products
Information and communication technologies	New channels of distribution and communication with consumers	Skills and digital infrastructure gaps Logistical deficiencies, especially in rural areas	Sector strategy for digital transformation Promotion of intra-industry linkages	Creation of digital tools in the region Digital marketing and e-commerce Direct links with consumers Digital skills Quality and availability of sectoral data

Source: Prepared by the authors.

The dimensions of analysis were designed after the findings presented in previous sections and after consultations with sector stakeholders, including academics, the public sector, international organisations, national and local associations, transnational corporations and local companies of all sizes in all the links of the sector's chain. These dimensions seek to assess the capacity of coffee MSMEs to profit from innovation as a tool to upgrade into the commercialisation link. They also reveal the gaps between MSMEs and large companies. Thus, they help to identify the conditions that MSMEs must face when commercialising their produce, which are the basic enabling conditions and which dimensions need to be improved (see table XV.3).

Table XV.3
Dimensions of analysis

Dimension	Description	Components
Access to markets	Production units can link with international markets and comply with trade regulations	Trade agreements Denomination of origin or differentiation Access to pricing information Knowledge and advice for market access Trade promotion strategy International regulations
Legal aspects	National and international regulations and legal aspects of trade	Trademarks Access to information on regulations and procedures Compliance with sanitary requirements

Dimension	Description	Components
		Formal creation of corporations or associations
Diversification	Production units can scale to new links in the chain or link up with other industries	Linkage with other productive sectors Chaining with other links along the value chain Transformation of the final product
Financing and access to capital	Production unit can obtain financial services and products for production, innovation and risk management	Availability of financial services Access to finance for production and innovation Insurance
Institutionality and associativity	Strength of supporting institutions and strategies for promoting coffee Role of associativity in scaling	National body for the promotion of the sector Research and development institutions National and international associativity Quality of association governance
Production	Growing practices ensure productivity, sustainability and quality	Quality of a cup of coffee Use of technology to extend product life Traceability Yield Access to technical assistance Quality of agricultural inputs Promotion programmes
Sustainability and social responsibility	Standards for production and trade (social, environmental and business, national and international)	Compliance with social and environmental standards, national and international Protection of biodiversity Waste management Management of water resources and wastewater Response to climate change
Information and communication technologies	Use of technology for production and marketing	Access to technical assistance Access to financing Operational and administrative management Traceability Producer visibility Payment management E-commerce

Source: Prepared by the authors.

Individuals and groups representing 95 production companies, growers, exporters, cooperatives and associations of all sizes were interviewed. Responses obtained through individual interviews and in guided meetings with focus groups are consistent. However, the groups gave additional information on the challenges faced by coffee growers.

The results of this study classify companies in scores from 0 to 100, according to the following categories of innovation: initial, moderate, strong and forefront. Sixty-eight per cent of producers stand at the initial (34%) or moderate (35%) levels, 29% at the strong level, and only 2% at the forefront score. All enterprises classified at the entry-level are small enterprises, and most do not belong to any associations or belong to informal groups. Most of the enterprises at the moderate level are small associatedand medium-sized enterprises. It is important to mention that some medium-sized and large

producers made it to the forefront category, while no small producer, associated or not, obtained that category. Unlike medium and large producers, only small producers fall into the initial category.

The results show that, for both small and medium-sized production units, the areas in which they score the lowest are financing, diversification and technology. The smallest gaps between production units of different sizes occur in an institutional framework, access to markets and legal aspects. For El Salvador, differences are somewhat more pronounced than for Guatemala. Associativity stood up as a key factor in improving innovation capacities since small associated growers present significantly better results than small non-associated producers. This same happens with medium-sized producers, although the larger a producer is, the less it needs to associate. Final scores indicate that associations and cooperatives reach higher categories than individual producers, which reinforces the hypothesis of the importance of associativity as a tool for innovation.

C. Gap analysis

Given the associative characteristics of the sector and the role that larger companies play in the collection, marketing, and export of coffee, interviews included micro, small, medium and large companies, as well as producer associations. Most small enterprises engage only on the production link. As their size increases, coffee-growing enterprises participate in other activities such as collecting, processing, marketing, and exporting.

In Guatemala, 41% of the companies are engaged in coffee production, 38% represent cooperatives or associations, 13% are exporters, and 8% process coffee cherries into beans ready for consumption. In El Salvador, 84% are growers, 10% process coffee, 4% are export companies, and 2% belong to associations. Men constitute 70% of the managers of production units, while only 23% of managers are women, and 7% did not provide information. This gender inequality reflects the male predominance in the coffee industry, which is also evident in the composition of the boards of directors of associations and cooperatives, where 61% of the members are men and 39% are women. According to the interviews, coffee growers sell approximately 90% of their produce as green coffee on international markets, while the remaining 10% is roasted, ground, and marketed to small customers, local coffee shops or through social media.

1. Discussion of results

A detailed analysis of each dimension allows a broader perspective of the situation of small, medium and large production units and the capacity gaps between them. This section presents a characterisation of the results for each dimension.

a) Access to markets

More than 95% of the coffee produced in El Salvador and Guatemala is exported to be transformed and consumed in developed countries. Therefore, before upgrading to the commercialisation of coffee, MSMEs must consider their capacity to process the product and the conditions and requirements of exportation markets and final consumers. However, MSMEs do not have a say on prices and are far away from consumers, so they are not always able to upgrade.

In the late 1980s, market liberalisation and price deregulation led coffee into the futures market, where MSMEs and producing countries do not usually operate, and few players determine prices. In addition, price movements do not always recognise the quality of the Central American produce or cover production costs. Coffee-growing MSMEs have limited access to price information. Even if they do have it, their size limits their ability to transform information into investments or better contracts. These circumstances are aggravated by the intermediaries and oligopolies present in the sector. In situations of poverty, small producers are in urgent need of cash, so they depend on prices offered by intermediaries.

Tariffs also determine the motivation and capacity to export processed coffee. The United States does not impose duties on coffee at any level of processing. The European Union levies higher tariffs on roasted coffee compared to green coffee: 9% on decaffeinated roasted coffee, 8.3% on decaffeinated non-roasted coffee, 7.5% on non-decaffeinated roast coffee and 0% on green coffee. Whether decaffeinated

or not, Japan applies 12% (under the Most Favoured Nation clause) and 10% (under the Generalised System of Preferences) to roasted coffee. Duties on green coffee are 0%. These tariffs discourage the export of processed coffee and protect roasters in destination countries, thus facilitating the concentration of activities with the highest value added in links located in developed countries (MacMap, 2022; FAO, 2021).

Less than 0.2% of the coffee exported by producing countries is roasted and ground, while 5% is sold as instant coffee and the remainder as unprocessed beans. In other words, for every 1,000 cups drunk in importing countries, only two are made with coffee that was roasted and ground in the country of origin (International Trade Forum, 2004). Producers, being far away from consumers, often ignore their tastes and requirements. Moreover, the world's leading roasting companies are able to shape or transform demand, given their in-depth market knowledge and adaptability. Brand positioning is also difficult. Supermarkets concentrate a high percentage of sales and, being near consumers, are able to identify and shape, first-hand, tastes, preferences and purchasing habits, which they transmit to other actors in the chain (IICA, 2018).

In this scenario, MSMEs can hardly participate in postproduction links, especially due to the complexity of marketing processes, high entry barriers and their limited capacities to deal with these dynamics. This study found that one of the challenges that production units face when selling their coffee is their lack of knowledge of the processes they must follow to place their product in new international markets. Even when they know these processes, sometimes they cannot find new trading opportunities easily and leave the responsibility of marketing to the association or cooperative to which they belong. In Guatemala, 27% of the productive units stated that they ignore the processes they must follow to sell their coffee in new international markets, and 38% indicate that, despite having that know-how, they cannot find new buyers, so the cooperative runs the processes to sell their coffee. In El Salvador, 66% of those interviewed ignore the requirements to sell coffee in international markets. Around 58% of the production units in both countries are aware of and comply with the requirements to market their product locally.

Trading coffee in local or international markets also requires identifying profiles of potential buyers with whom to start negotiating their products. Coffee produced in El Salvador and Guatemala has the potential to attract consumers and markets that appreciate its quality, highlighting the good soil and high altitude at which it is grown. Either by a denomination of origin or altitude of cultivation, 40% of the Guatemalan productive units indicate that the region where their coffee is grown has the necessary characteristics to differentiate itself in local and international markets. In El Salvador, 70% of interviewees responded like that.

At the country level, it is important to determine whether the objectives of the national development strategy for the sector include links beyond production. The government is crucial in establishing trade negotiations and agreements that facilitate the participation of MSMEs and national associations in the commercialisation of their produce. Although the chain's own dynamics and the concentration of players determine the entry of new sellers, governments have regulatory and commercial tools they can put into use. For example, the stabilisation of producer prices carried out in countries such as Colombia and Costa Rica provides certainty and security, especially when international prices are low. The measure allows the generation of resources to invest in R+D+i.

b) Legal aspects

Most coffee is exported, so companies must comply with a number of national and international regulations. In addition to trade requirements, more and more purchasing countries and companies have set social and environmental standards and certifications needed to enter their markets or participate in their supply chains. Aside from meeting requirements, enterprises must understand the paperwork and have the time and resources to run through them.

Given that MSMEs tend to face challenges in these aspects, the completion of legal requirements is normally assumed by associations or cooperatives, who transfer them to growers through agreements that offer technical assistance and financing in exchange for meeting some standards. These associations or cooperatives often have brands that are marketed locally or internationally. Although this teamwork helps MSMEs to surmount some obstacles, it also creates some barriers to knowledge about the operation

of the system. For example, coffee certifications tend to be awarded to the cooperative, so even when growers meet the standards required, their production is not certified.

In Guatemala, 48% do not have a registered trademark to market their product. The proportion in El Salvador is 82%. This poses a marketing challenge for them since branding is one of the main elements to position themselves in the minds of consumers. A proportion of 43% Guatemalan and 94% Salvadoran growers do not have a national or international health registration that allows them to market their product more easily in world markets. This could represent a non-tariff barrier. Not having health registrations and trademarks, most small producers sell their coffee to an association or company that does. It is important to highlight that 89% of those interviewed in Guatemala and 96% in El Salvador belong to some type of association. However, when analysing the type of association to which they belong, it was found that many of them are informal groups, for instance, a WhatsApp group. Besides, many interviewees equal a business relationship with an exporting or collecting company to belonging to an association.

In general, associations create benefits for small producers, but their full implementation meets challenges, for instance, the transaction costs involve (information, coordination and supervision). In order to last, associations must also build trust and a sense of belonging. Once they have lasted for a while, they may become resistant to change. Therefore, associations must have clear objectives shared and understood by their partners and affiliates. They must be transparent, and their governance must be inclusive. It is observed that small producers have different kinds of associations that fulfil different roles. For instance, there are informal groups that use social networks to do business and exchange information. These groups work at the same time with formal local and national associations. There are associations that function as coffee collectors, and their decisions are taken without asking growers for their opinion, while in other associations, growers have a voice and a vote. Each space plays different roles and provides different types of benefits to its members.

Exporting and entering new markets demand that companies or associations be fully registered and formalised. Formalisation also facilitates access to public programmes and financing. Although the majority of small producers are associated, the level of formality of these associations varies. Associations, when formal, help coffee growers access programmes and initiatives of the government and other institutions. They also make it easier for them to comply with the export requirements determined by coffee-importing countries. Formal associations also tend to have access to resources allowing them to invest in R+D+ i, streamline administrative and technical procedures and guarantee some degree of market power from the first link in the value chain.

c) Diversification

The crises suffered by the sector and the sophistication of the regional supply have contributed to diversification. Moved by plant diseases, natural disasters and crises in global production, many producers and associations have incorporated new crops on their farms, sometimes for self-consumption, sometimes to add value to coffee growing or generate income through the sale of other agricultural products. In many cases, it is not clear whether diversification has a strategic purpose or if it responds to a contraction or weakening of the sector.

There is little diversification among small producers, either through linkages with other sectors (tourism, timber, agribusiness, retail) or upgrading to other links in the production chain. Among other reasons, this happens because of the limitations MSMEs face in areas such as research, development, innovation, data analysis, market knowledge and access to investment finance. Thus, 65% of the productive units interviewed in Guatemala and 20% in El Salvador indicate that they have linked their business to other products or services in sectors such as tourism, for instance. Similarly, 13% of the productive units interviewed in Guatemala indicate that they sell coffee-derived products since different presentations open up an opportunity to diversify production and obtain a higher financial income.

Whether it aims at moving up the chain or at linking up with other industries, diversification tends to be found in mature and organised companies that have strategic plans, invest in innovation and understand market fluctuations. Diversification is observed on two fronts, to link with industries other than coffee and to upgrade to other links within the coffee value chain.

As for linking with other industries, there is a natural tie with agriculture through the production of inputs such as organic fertilisers and manure. There is also the marketing of the timber that shelters the coffee bush. The positioning of certain brands has also allowed them to enter retail, tourism, gastronomy and cosmetics. Some cooperatives focus 60% of their business on coffee and the remainder on other activities, from supermarkets to the production of agricultural inputs. Apart from generating income, this diversifies the risks of the cooperatives, allows them to obtain knowledge of the market from other points of view and contributes to the circularity of the coffee production cycle.

Upgrading within the coffee value chain focuses on the constant search for improving the quality of the beans. For example, the development of new varieties for cultivation or processing through differentiated processes, the export of micro-batches and the growing of different types of coffee tailored for small niches (organic, shade-grown, eco-friendly, ethnic-origin, among others). There are efforts to scale up towards links, such as the production of inputs, roasting and exportation. However, this kind of upgrading happens in a minority of companies and associations, and most produce is exported as green coffee. Therefore, there is great potential for diversification, but it must be strategically guided by national and business interests and capabilities. This strategy must consider access to R+D+ i, financing and markets.

d) Financing and access to capital

Foraying into new markets, innovating products and processes and participating in new links require capital and involve risks. And the region still needs to improve its efforts to finance MSMEs and the agricultural sector. Coffee-growing MSMEs generally do not have the financial capacity or skills to access appropriate financial products, while the banking system tends not to adapt to the needs and characteristics of agricultural MSMEs. In the case of coffee, the seasonality of the harvest (once a year) and the time a bush takes before being productive (three to four years) are not considered. Although there are initiatives to boost the business, many efforts to support MSMEs tend to focus on entrepreneurship and production, with less attention to the potential for innovation and upgrading.

Given that these structural problems are difficult to solve, it is important to recognise the role that associations may play in providing access to financing and capital to their members, either through their own resources or as administrators of public resources funnelled into the sector. In addition, they support their partners in times of crisis.

This dimension presents one of the main limitations for the companies that were interviewed, regardless of their size. In the case of Guatemala, coffee growers have less access to financial services and products (48%) compared to El Salvador (82%). However, access to financial services and products through cooperatives is higher in Guatemala (20%) than in El Salvador (10%). In Guatemala, 32% of coffee growers do not have access to any type of financial product or service. Coffee growers declared that they do not use traditional banks because of the following reasons:

- It does not suit my needs.
- I do not meet their requirements.
- I am not aware of the benefits of or procedures for acquiring financial services.
- I do not trust financial services.

Financing goes not only to innovation. Coffee-growing faces risks that also require financial protection, especially from the effects of climate change and disasters. There is little availability of green funds that increase the environmental sustainability of farms. Agricultural insurance to cover shocks caused by natural events or price crises is seldom to be found. The impacts of climate change are increasingly marked, and agriculture, in general, is one of the sectors that suffers the most from it.

Similarly, when coffee prices are in the derivatives markets, some volatility appears. In any case, small producers are often the least resilient to cope with and recover from these crises. Financial protection helps to avoid socioeconomic setbacks in cases of disaster or crisis and prevents many growers from being forced to abandon coffee to move to safer crops or activities such as cattle ranching or even to emigrate.

The possibilities of participating in other links in the chain are also determined by access to support infrastructure. Deficient transport infrastructure, digital gaps, energy instability, and poor water management increase production costs, create new intermediaries and altogether, compromise the ability of companies to participate in new links.

e) Institutionality and associativity

The strength of institutions and associations is key to the ability of MSMEs to innovate and participate in the commercialisation of coffee. Although most producers belong to an association, there is great dispersion in how satisfied they are with the management of the association. Approval rates range from 50% to 90%. Besides, ties with international organisations are few. When there are any, they run through the cooperative. Likewise, few growers work with the national exporters union, and many are even unaware of its existence. This limits the ability of producers to participate in commercialisation and have a greater representation in decision-making in the sector. Small coffee growers are also under-represented in trading spaces, which may limit their ability to negotiate better prices and conditions for their production. Finally, very few are aware that research institutes exist and have resources available for them. This may limit the growers' ability to innovate and improve their agricultural practices.

The preference for large-scale farms during the 1980s and 1990s resulted in many countries, especially developing countries, withdrawing government aid for small producers. This was the consequence of structural adjustment programmes that had to reduce the State's role in agricultural production and to achieve correct prices (UNCTAD, 2015). However, strong public and private support institutions and clear promotion policies and strategies are key to the capacity of companies to innovate and have access to the research and financing they need to upgrade. In the region, there is a lack of specialised technical assistance in areas such as production, diversification, business management, market knowledge and price information, traceability, natural resource management and integration in agroforestry systems, among other aspects (Contreras and others, 2018).

In addition to the innovation challenges faced by the region and its enterprises, the ability of MSMEs to engage in commercialisation is also affected by the governance of the coffee value chain. In more elaborate processes, such as roasting, there is a significant concentration in a small group of companies, which have a great influence on which food options are available and on the purchase terms they offer to their suppliers (IICA, 2018). Due to the considerable value added concentrated in the last links of the chain, decision-making and bargaining power centre on large multinational enterprises (World Bank, 2012).

When a country sets a policy to promote the sector, companies and associations have more opportunities to innovate, be it through technical assistance, access to specific financing for coffee growing or national branding. It is easier for national companies to enter international markets when their government try to position its products. As for associativity, it is observed that small producers tend to belong to some type of formal or informal association. The actions carried out by cooperatives, associations or federations allow coffee MSMEs to link, directly or indirectly, with the collection and transformation links.

Associations are catalysts for innovation and thus enable MSMEs to overcome many of the barriers they face to innovate and upgrade. Associations perform functions that facilitate participation in commercialisation:

- They make it possible to reach exportable volumes as required by purchasing companies.
- They increase the group's bargaining power.
- They are natural spaces for exchange and collective innovation, besides tending to invest in R+D+i.
- They facilitate access to financing and working capital.
- They foster business, financial, digital and soft skills.
- They increase the resilience of their members to shocks.
- They improve the availability of data on the sector.
- They provide contacts with buyers.

Associations provide a good number of benefits. They also face as many challenges. The capacity of associations to facilitate the upgrading of producers is closely linked to the quality of their management in aspects such as example, leadership, efficient and strategic use of resources, transparency in decision-making and the inclusiveness of all partners, especially the small ones. Clear ties between producers and associations also matter. Producers can join as members with decision-making powers or affiliates who profit from the benefits that the association offers but without taking part in its decisions. Associations must establish mechanisms for their members to evaluate their performance, along with facilitating communication, decentralising decision-making, engaging members in the association's activities and, above all, promoting transparency in their actions.

Although associations provide scale and participate in links such as transformation, many work as a bridge between MSMEs and large importing companies or other buyers in the destination countries. Therefore, there are less involved in the transformation of coffee for end-users and disengage from commercialisation and public relations with individual consumers. Although some cooperatives in the subregion have taken over all links along the chain, the production they sell directly to consumers tends to be a small proportion compared to the production sold to large roasting companies in importing countries. According to the interviews, some cooperatives sell around 40% of their production to one buyer. This kind of large-volume sales provides stability and certainty to the association and its members but does not necessarily get the best price for coffee, especially if it is of top quality, and opens market knowledge gaps.

f) Production

Despite the quality of their coffee, the Central American countries represent a small part of world production. The subregion has focused on improving bean quality and productivity. To this end, various innovations have been made along the production process, such as compliance with environmental and social standards and management of some of the risks associated with climate change. This requires cultural changes, access to education, technical assistance and support and funding. However, given the structure of the chain and the volumes of production in these countries, often producers are not proportionally compensated for their efforts to innovate or the risks they take. Growers are not made visible, and their bargaining power does not increase.

The subregion cannot easily compete with the volumes produced by countries such as Brazil and Viet Nam, where the process is heavily mechanised. But they have an advantage in the quality and differentiation of coffee. For example, the quality of a cup of coffee is one major internationally comparable measure. All the production units interviewed in this study claim their score between 80 and 90 points. It is also very important to preserve the quality and freshness of the product during roasting and distribution, so it is important to apply technologies that extend the useful life of coffee. In both countries, most of the production units interviewed stated that they use GrainPro and Ecotact bags and bring sacks to export gold coffee. For roasted ground coffee, they use trilaminar bags with an oxygen valve.

Additionally, there is an increase in the use of traceability mechanisms. This is also not a guarantee on the way coffee is produced, but it makes visible each actor along the chain and provides transparency on how income is appropriated throughout the process. Traceability schemes are used by 86% of the production units interviewed in Guatemala and 41% in El Salvador, although only 14% in Guatemala and 18% in El Salvador do so by means of digital tools.

Coffee companies possess many strengths that could facilitate their foray into commercialisation: an innovative spirit, pride in the quality of their beans and technical know-how of the growing process. However, the subregion and its companies have focused on production, placing little emphasis on other links. If the region's growers are to profit from their extensive experience in production and innovate their way up to new links, now it is time to create new strengths. For example, producers need to discard the pulp produced during processing. This has led the sector to enter the bioeconomy through organic matter biodigesters. They also use the peel of coffee beans to create new products, such as tea, energy drinks and flour. Environmental requirements and soil degradation have resulted in the creation of organic fertilisers, reforestation and regenerative agriculture practices. Moreover, access to quality inputs is crucial to maintain environmental and quality standards. For instance, 36% of the production units interviewed in Guatemala and 88% in El Salvador answered that they purchase their inputs with their own

financial resources. The rest acquires them through an association or cooperative. It seems that it would be a sensible strategy to invest in R+D+i.

g) Sustainability and social responsibility

Sustainability and social responsibility are increasingly important issues in coffee production. Although most producers comply with socioenvironmental standards set by purchasing companies and importing countries, they do not have a certification that attests to their responsible management. Certifications are usually awarded to cooperatives, which makes traceability to the producer difficult. Some distinguished certifications are Organic, Fair Trade, Rainforest Alliance and C.A.F.E. Practices. However, there is variable management of coffee sub-products, such as pulp, mucilage and mead. The range moves between 26% and 75%. There is also limited management of fresh and wastewater.

Despite these challenges, increasing reforestation efforts and the incorporation of associated crops are being carried out to improve the sustainability of the sector. In addition, budding efforts are being made to improve the participation of women and young people, as generational renewal is a challenge in coffee production. The interest of the national coffee sectors in improving their quality and entering specialised niches, the efforts to mitigate and adapt to climate change and the growing social and environmental requirements of importing countries and purchasing companies have led producers to implement standards, certifications and other innovations. These efforts contribute to improving the sustainability of the sector through better working conditions, the prohibition of child labour, the management of natural resources and waste, the reduction of greenhouse gas emissions, the protection of biodiversity and technification.

However, there is little clarity on how the economic benefits generated by these improvements are distributed or if they alter the ability of MSMEs to move up the chain or appropriate greater value. In addition, the coffee sector continues to face unresolved challenges such as poverty, business abandonment, the difficulty of achieving a generational change and migration, all of which are exacerbated by climate change and natural disasters. In this context, some countries, companies and cooperatives in the subregion have undertaken diversification, R&D and innovation projects. Also, they have established their own certifications and proven themselves at selling their best coffee while searching to increase the participation of women and young people.

In mature, specialized and organized industries that count on institutional support and access to R&D, there is more innovation to improve the sustainability of the sector. Especially important are their actions for a circular economy and regenerative agriculture. These efforts are aimed at meeting the environmental requirements of buyers and addressing the main environmental concerns around coffee production, such as deforestation, reduction of biodiversity, water management, soil protection, and the use and disposal of processing by-products (pulp, mucilage and mead).

There is a great diversity of public-private projects and initiatives that focus on climate change, not only for the innovation in research and development that this entails when testing climate-resilient hybrid seeds but also for all the benefits it provides to coffee growers and the stability of their farms. Besides improving production, this has allowed companies to diversify, for example, by entering into the production of agricultural inputs or products for other industries, such as flour and beverages. Finally, there are traceability initiatives, which allow us to better understand the whole production process and make visible the work of the people engaged in coffee growing.

h) Information and communication technologies

In the coffee sector, the adoption of information and communication technologies (ICTs) has been limited. A significant proportion of producers, between 12% and 57%, still do not use digital tools for marketing, which can affect their competitiveness. In addition, very few use digital tools to manage their plantations. The proportion that uses them ranges between 22% and 38%. Technology in the coffee sector tends to be confined to social media and instant messaging, constraining its potential to improve efficiency and productivity. Also, only some growers have a digital payment system, which can make business transactions more difficult. There is no use of financial digital tools (fintech services). This obstructs access to financing and other resources for growth and innovation in the sector.

Given that the ability of producer MSMEs to market their coffee depends on their ability to transform it for final consumption, either using their own infrastructure or that of collective facilities, ICTs open up great opportunities. The pandemic evinced the usefulness of ICTs in keeping commercial and productive dynamics going on. Moreover, the foray of small producers and cooperatives into e-commerce and direct-to-consumer sales has intensified. This trend is driven by changes in the preferences of consumers, who seek healthy products and are more aware of issues such as sustainability and fairness. Consumers now value local, traditional hand-made products, local knowledge and practices. Thus, they seek products that meet these conditions.

ICTs can help improve production, implementing digital devices and tools to develop precision agriculture, with the aim of improving irrigation systems, optimising the use of natural resources and caring for the environment. They can also be used to implement traceability systems that allow coffee growers to document the good practices they apply in their production processes and, thus, qualify for certifications. Traceability can also help them to make visible cultural elements or artisan practices embedded into the production process and to differentiate their products, increasing their opportunities to market them to international consumers.

ICTs may also help growers to calculate the costs of agricultural inputs and other factors of agricultural production in order to better estimate the price at which they should sell their products to make sure that agriculture is a profitable activity for small producers.

The capacity of MSMEs to profit from e-commerce is determined by endogenous elements, such as digital skills, marketing and data analysis, and exogenous factors, such as the financial and territorial inclusion of rural areas and the quality of the telecommunications, transport and electricity infrastructure. It also depends on how difficult it is to export industrialised agricultural products.

D. Causes and consequences of the gaps

The structural gap in the coffee value chain originated in the colonial period and was widened by globalisation and market liberalisation. Colonial mercantilism, the post-colonial cronyism of political-economic elites and the liberalisation of the coffee markets have entrenched a centre-periphery model that has changed very little since coffee cultivation began in Central America. This model produced rigid governance of the coffee value chain. Thus, people engaged in coffee growing, especially on a small scale, have little visibility and power.

External tariff and non-tariff barriers have been established that hinder the importation of coffee-derived products on any of the postproduction steps on which coffee can be sold (for instance, roasting, grinding and packaging). Developed countries protect their industries and multiply and complicate the requirements that exports of producing countries must meet. Domestically, there is little progress in the transition to innovation-based economies and traditional productive sectors, such as agriculture, have weak ties with innovation. In addition, coffee-producing countries have focused their strategies on improving production, with little exploration of other links that could add greater value.

Although innovation has the potential to allow producers along the chain to scale towards links that add greater value, this transition has not been observed in the coffee sector since it requires an enabling environment that contributes to institutional capacities and public policies. Some larger companies and consolidated cooperatives have ventured into preproduction (fertilisers) and postproduction (industrialisation and commercialisation) links; these are exceptional cases and not a national strategy for the sectoral transformation of the production model. Some consequences of this gap are the following:

- Producing countries are confined to the production link, and little value is added in the pre- and postproduction stages.
- Prices paid to producers depend on the volatility of international markets and the prices set by large buyers. Pricing has been disconnected from the production process.
- Reducing costs and increasing productivity are insisted on as measures to improve the income of coffee growers while ignoring the governance of the value chain and the increasing external requirements to meet high socioenvironmental standards.

- Atomisation of producers and market concentration in the pre- and postproduction links.
- Deep information gaps on international markets and their dynamics.
- Poverty, abandonement of the activity, weak generational relay, and migration.
- Invisibility of coffee growers, especially of small-scale producers.
- Social washing and greenwashing

In terms of the capacity of companies to profit from innovation to upgrade, the main gaps between MSMEs and large companies occur in financing and diversification, both of which are deeply interrelated. Upgrading to postproduction links requires high investments in infrastructure and logistics, storage and packaging, technology, market exploration and analysis and access to research and development. However, small-scale coffee growers still face challenges in obtaining financing for cultivation and harvest. They lack insurance against the effects of climate change and disasters, and they have practically no access to venture capital.

In contrast, larger companies are more capable of diversifying along the chain and generating linkages with other industries. For example, many large companies collect the production of small coffee growers, participate in the processing of coffee, and export to importing companies. Besides, they can sell their coffee in the local market by creating brands, entering supermarkets, opening coffee shops, and promote tourism.

Four main causes that generate these gaps can be identified at the systemic level. First, support strategies for MSMEs are scattered and have little sectoral focus. In other words, the policies to promote MSMEs tend to be general for all small producers, so they do not consider their orientation (subsistence or dynamic) or the specificities of the sector in which they are inserted. Second, innovation strategies are not linked to traditional sectors like agriculture.

A large gap exists between developing and developed countries in terms of public spending and the promotion of careers in farming. Third, the research and development activities carried out in academic centres are not bound to the needs of the productive sector. Finally, the traditional financial system has undergone few transformations to facilitate the inclusion of MSMEs, especially by offering products that adapt to their characteristics and needs. In the case of coffee-growing MSMEs, the seasonality of the harvest (once a year) and the period required before coffee bushes bear fruit (between three and four years) tend to be ignored. Besides, there are few instruments for financial protection against the effects of climate change and natural disasters on plantations, which are highly susceptible to changes in climate conditions. Together with these conditions, rural areas continue to face gaps in their access to basic telecommunications, electricity, water and sanitation infrastructure.

As enterprises, MSMEs face difficulties in managing their business and their plantations, which makes it difficult for them to access the traditional financial system and build innovation strategies for upgrading or diversification purposes. Perhaps the main cause is the poverty experienced by some coffee growers due to the low income they receive from their crops. This means that an important segment depends on cash to keep its operations and families afloat, so they make short-term decisions. Therefore, small family-owned businesses have fewer resources and time available to undertake innovation activities and recruit specialists that perform them. Though small growers recognise the importance of digital transformation and innovation, they have little capacity to incorporate existing technologies into the day-to-day operation of the business. This is compounded by the disconnection between prices set in derivatives markets and the production process, which causes many coffee growers to operate at a loss. Some consequences of this gap are the following:

- Devaluation of agricultural work and migration of young people.
- Multiplication of intermediaries that exploit the voids in government support and the weaknesses of MSMEs, making the production process more expensive and positioning themselves as gatekeepers of certain links.
- Difficulty in establishing long-term growth and innovation strategies.
- Asymmetric competition and low bargaining power.

- Lack of knowledge and disconnection of the processes that take place in pre- and postproduction links.
- Poor traceability of the value chain down to the production link.

Despite the diversity of barriers faced by MSMEs, this study found that associativity allows small growers to overcome many of these challenges. Associated MSMEs have greater access to financing, quality inputs, and research and development. However, the quality of the association also matters, so it is necessary to know its level of formality and the type of participation of its members in decision-making.

E. Recommendations

The barriers and opportunities described in this chapter seem to indicate that, although innovation takes place in plantations and cooperatives, some conditions either facilitate or hinder the upgrading of MSMEs to the commercialisation link. The governance of the chain and the concentration of players in the postproduction links, the type of national promotion and positioning strategy, the lags experienced by rural areas and the capacities of MSMEs and associations determine the type of participation that coffee-growing MSMEs can achieve.

Innovation and upgrading in the value chain are very complex processes. Consequently, there is no single recipe for success. However, the analysis of the results of this study makes it possible to identify some priority areas for action:

- Strengthening producer associations and cooperatives by improving the quality of governance and transparency and transferring some bargaining and decision-making power to the first links in the value chain.
- Rethinking and strengthening the role of public institutions as key agents in mediating between producing and importing countries. Public institutions should work closer to coffee growers, especially the smaller ones so that they can benefit more from their interventions and programmes.
- Rethinking the approach of current public policies. At this moment, the policy focuses on improving production. Instead, it should understand the key role of producers in global value chains to demand a more even negotiation model and fairer transactions.
- Promoting R&D programmes in the academic sector through public-private partnerships to generate innovation in coffee production and contribute to its resilience against climate change.
- Strengthening a sectoral dialogue between key public and private stakeholders to motivate the development of programmes, regulations and laws that boost the coffee sector in the long term and improve the quality of the participation of small growers so that barriers of entry to importing countries can be reduced.
- Encouraging the financial sector to generate services and products adapted to the needs of small-scale producers in rural areas. Excluded coffee growers should be granted access to credit and insurance, and fintech alternatives should become more inclusive.
- Driving and promoting digitalisation projects in the sector, in partnership with academic institutions and between the private and public sectors and the public sector and cooperatives. Digital solutions that benefit coffee farmers and are sustainable in the long term should be generated. These projects should include training growers in digital skills.
- Promoting trade events to give visibility to coffee, both nationally and internationally. Growers should be encouraged to participate in these events so that they have access to new sales channels and markets.
- Promoting training programmes on legal aspects and sanitary requirements at both the national and international levels. Training should cover information on markets and management and financing of plantations. It should also include possible marketing strategies and the upgrading or diversification of activities and products as strategies for innovation.

- Creating public awareness with a comprehensive approach to sustainability and long-term social responsibility. The committed and supportive participation of all stakeholders along the value chain, including the most vulnerable sectors, such as women and young people, should be encouraged.

F. Final considerations

Moving into the distribution and trade stages of the value chain will be determined by the governance of the coffee value chain, the importance that Central American countries give to production and the capacities of MSMEs, which are limited at present. However, the continuous improvement of the quality of regional coffee, changes in consumer behaviour and digital transformation open up opportunities to overcome challenges and find spaces to enter into trading. Three recurring themes appeared while preparing this study. All three, associativity, financing and diversification, highlight the opportunities to profit from innovation for upgrading towards coffee commercialisation. These strategic areas must be facilitated by promotion policies devised and implemented by public, private, public-private and academic institutions that provide the tools that the sector needs for lift-off.

Associativity is the axis for innovating in all aspects of coffee trading and for surmounting the obstacles described in this chapter. At the productive level, associativity promotes product and process innovation, allows groups of small producers to reach the necessary volumes for the commercialisation of their coffee to be profitable, facilitates access to inputs and productive infrastructure and promotes technical assistance. Associations lubricate the business process. They handle procedures imposed by national and international authorities and the requirements set by buyers, helping MSMEs to comply. They create brands and manage relationships with consumers, give clout to group bargaining and advocate with the public sector for improved procedures and requirements. The associations also facilitate access to funds for production and covering basic family needs. They also have resources for investment and financial protection, which allows small producers to take risks. Associations have budgets to innovate, make changes in their production practices, benefit from public programmes, and increase growers' resilience to economic crises or environmental issues that could affect their income. Associations facilitate collective innovation, promote social and professional cohesion and strengthen the self-esteem of growers.

However, to perform these functions, associations must be well governed and properly formalised. Therefore, it is important to promote actions that allow associations to continually improve. Academic literature and interviews with experts indicate that, in some cases, associations must improve in some aspects, such as the transparency of their administrative processes and the effectiveness of their management. Work still has to be done before they represent all its members and their relevance, objectives, and scope are made clear to all of them. These improvements will help to increase the trust that small producers place in associations since not all of them care to join one, even though associativity is one of the main vehicles to boost the sector. To build trust, associations should build appropriate channels of communication with their members, potential or actual, and state the results and benefits they earn for those who join them.

Access to funds is another essential requirement for carrying out any type of innovation on coffee plantations and for entering into new links. However, existing financial products are not adapted to the needs and characteristics of coffee farmers since they do not recognise the seasonality of the harvest, put little emphasis on innovation and generate exclusion of rural areas and other groups, such as women and indigenous communities. Apart from the role that associations can play in overcoming this barrier, the national strategy to promote the sector must have an adequate financing component. Likewise, the scope of the strategy will determine the type of financing that is needed. For example, a strategy focused on production will consider issues such as inputs and infrastructure, while a strategy for upgrading or positioning the country will consider resources for R+D+i, marketing and digital transformation.

Proper financial management also depends on the business and financial skills of companies and associations. Each producer should be accountable for the profitability of his plantation, the niches he selects for specialisation and his plans for the season. In other words, the producer has the double function of growing coffee and managing his business, especially if he seeks to enter into

commercialisation. Thus, it is necessary to strengthen the business savvy of growers on issues such as basic information about the plantation, revenue and expenditure control and price information.

Finance is also a critical element in increasing the sector's resilience to the effects of climate change and natural disasters. For example, the rust disease and drought in the Central American Dry Corridor have had devastating effects on the production and incomes of coffee-growing families. Despite the growing awareness of these impacts in the sector, efforts to promote greater financial protection, especially among small producers, are still too meek. Government and associations play a central role in creating and facilitating access for small producers to services such as agricultural insurance, parametric insurance, emergency funds and other resources to move towards more resilient and sustainable production practices. For this reason, producers must be made aware that they need to create emergency funds, and action plans should be developed for this to have an impact at the level of associations and the domestic financial sector.

International commercialisation involves complex processes and requirements. And although they are actually solved by companies or associations, government support would facilitate their entry and participation in new markets and links. Other financial products such as guarantees, bonds and factoring must be provided to associations and small producers.

Diversification is the third key aspect of commercialisation. Most of the success stories of associations of small coffee growers show two types of diversification. One is the diversification of buyers. Most associations sell a large part of their production to a single buyer and allocate the other part, mostly very small batches of premium coffee, to speciality coffee niches. While it is important to recognise that selling in large volumes to few buyers provides certainty and reduces operating costs, direct sales could bring better prices and larger profits, although they require significant investments in technology and logistics. This strategy would require improving the type of financing available, addressing rural poverty and closing the deep gaps that rural areas face in education, health, and infrastructure.

Another kind of diversification occurs when growers prepare agricultural inputs and launch activities for tourists. They also enter the retail market or use coffee manufacturing cosmetics or pastries. Both approaches to diversification promote income stability and involve significant innovations. They also shed light on other opportunities to profit from diversification as commercialisation. Much of the diversification begins on the farm, for example, through sustainable production practices, such as growing timber that gives shade to coffee bushes. These forms of production make it possible not only to position coffee in speciality niches but also to diversify sources of income for producers.

To generate larger incomes and boost small production units through diversification, they must be associated with other links in the chain. This is especially true of roasting, which facilitates linking to commercialisation, the next step on the chain. However, large transnational corporations have taken hold of these links and raised high barriers to entry. These corporations are also in a position to shape demand and have established relations with roasters and large buyers. Thus, they also control the bargaining power of producer countries and their companies, especially considering the size of the Central American production.

Therefore, the decision to upgrade to postproduction links must be agreed upon among all participants in the chain, public, private and academic, since it implies entering into a complex governance. For this reason, a national strategy for the sector must be devised. This strategy must establish the growth objectives for the sector and indicate on which links it seeks to participate so that appropriate support is provided. Having specialised and professional government institutions that provide support to companies and associations has proven to be of the utmost importance, as these institutions often can also negotiate better conditions for a country's growers. Any marketing strategy must recognise the importance of R+D+i and market intelligence, as well as coordination with other areas on the national agenda, such as tourism and gastronomy, the digital economy, the bioeconomy, climate change, and disasters.

Finally, domestic and Latin American markets offer unexplored opportunities for trading coffee. Before trying these markets, it is important to analyse aspects such as consumption levels, absorption capacity, the stability of trade relationships, and the price and quality ranges desired by consumers. To build new markets, it is also necessary to educate consumers.

Apart from these three strategic areas, digital transformation is considered a cross-cutting element that can facilitate the entry of small producers and associations into commercialisation. At the productive level, digital tools help to improve the productivity and sustainability of farms through the use of artificial intelligence, the Internet of Things and the automation of processes. They also facilitate the creation of collaborative spaces for innovation and access to alternative financing. Finally, digital tools allow producers to approach consumers through e-commerce sales and communication channels. Even more importantly, they improve the transparency and traceability of processes and income distribution along the chain, thus providing greater visibility to the innovations that take place between a coffee farm and a cup of coffee.

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Chapter XVI
Sustainability gaps in the Dominican Republic's tourism clusters Puerto Plata and Ciudad Colonial

Jennifer Alvarado
Lissette Gil

Introduction

Tourism is an economic sector with considerable potential for contributing to development when it is based on environmental, sociocultural and economic sustainability (Peralta, 2022). Tourism has been identified as an activity that can help reach the 17 Sustainable Development Goals (SDGs), particularly those related to decent employment, climate action and aquatic and terrestrial life (ECLAC, 2020). However, recent economic, societal and biological crises created by the COVID-19 pandemic have made clear how vulnerable and unresilient this sector is and how many changes it needs before it can recover.

According to WTO, guidelines for sustainable tourism may apply to all kinds of tourism and destinations. Long-term sustainability is based on the equilibrium between managerial, environmental, sociocultural and economic dimensions. The managerial dimension consists of constant monitoring of a given territory; a coordinated and operational structure must supervise the destination's performance in all the dimensions of sustainability. The environmental dimension considers the optimal use of resources while preserving essential ecological processes and conserving natural resources and biodiversity. The sociocultural dimension implies that local communities' cultural heritage and traditional values must be respected and preserved and that multicultural understanding and tolerance must be promoted. The economic dimension must guarantee feasible economic activities favouring the fair distribution of socioeconomic benefits among all participating actors. All these dimensions of sustainable tourism must produce a high level of satisfaction in tourists in order to preserve supply and demand practices (WTO/UNEP, 2006).

Several international tourism destinations have implemented strategies targeted at sustainable development in past years. These strategies stem from a measurement plan that relies on indicators to determine the impact of tourism. Over the past five decades, the Dominican Republic has developed a successful model for the tourism business that has placed it in a leading position for international tourist arrivals among the islands of the Caribbean. The country has achieved this without a strategy for sustainable tourism.

This study proposes a set of indicators to be used as a guide for two tourism destinations in the Dominican Republic: Ciudad Colonial Santo Domingo and Puerto Plata. Both are at different stages of their life cycles and lack strategic planning and integral management. This research contributes to the analysis of the dimensions of sustainability in both tourism clusters, adapting the sustainability indicators proposed by the Global Sustainable Tourism Council (GSTC) to the country's context and applying them to the selected destinations. The results were then analysed, identifying the gaps in each dimension.

This exercise is a first methodological approximation to measure these indicators. Its implementation faced challenges related to the availability and systematisation of information. Such challenges taught lessons to be incorporated into a second exercise, which is currently being carried out for the other six tourism clusters in the Dominican Republic.

This chapter is structured as follows: First, it presents the methodological framework to analyse sustainability gaps in the selected clusters. Second, it proceeds to examine the gaps in each sustainability dimension of those clusters. Third, it reviews its challenges and lessons learned and provides public policy recommendations. And fourth, it presents general conclusions.

A. Methodological framework

The method used to analyse the sustainability gaps in tourism clusters of the Dominican Republic is based on a design with a set of indicators stemming from the GSTC criteria. The GSTC started as a coalition of 32 associates, initially assisted by the Rainforest Alliance, the United Nations Environmental Programme (UNEP), the United Nations Foundation and WTO. Its goal was to procure worldwide sustainability standards and good practices and to seek a common understanding regarding the minimum that could be aspired to for the sustainability of tourism destinations (GSTC, 2022).

The first GSTC criteria were developed in 2008. They included four pillars: effective planning of sustainability, maximisation of social and economic benefits for local communities, reduction of negative impacts on cultural heritage and reduction of negative impacts on the environment. These criteria were received well by the environmental sector, government authorities, international organisations and leaders of the private sector.

The most recent version of the GSTC criteria, published in 2019, recovers the four dimensions of sustainability: (i) managerial, (ii) socioeconomic, (iii) sociocultural and (iv) environmental. The managerial dimension consists of constant monitoring of a given territory; a coordinated and operational structure must supervise the destination's performance in all the dimensions of sustainability. The socioeconomic dimension is related to the involvement of the local population in developing tourism destinations. The cultural dimension refers to the sustainable uses of a tourism destination's cultural heritage. Finally, the environmental dimension emphasises the optimal use of environmental resources (see table XVI.1).

Table XVI.1
Sustainability dimensions of the Global Sustainable Tourism Council (GSTC) criteria

Dimensions	Sub-sections
Sustainable management	- Management structure and framework - Actor engagement - Management of pressure and change
Socioeconomic sustainability	- Contribution by local economic benefits - Social well-being and impact
Cultural sustainability	- Protection of cultural heritage - Visits to cultural sites
Environmental sustainability	- Conservation of natural heritage - Resource management - Management of waste and emissions

Source: Prepared by the authors, on the basis of Global Sustainable Tourism Council (GSTC), "GSTC Destination Criteria. Performance indicators and SDGs", Washington, D.C., 2019.

The criteria were designed for different settings (urban and rural, beach and mountain, among others) and considered both small and large destinations. In addition to providing basic guidelines for destinations wishing to become more sustainable, the criteria can serve as a starting point for government and non-government programmes to create norms for sustainable tourism. Besides strengthening the universal principles and practices of sustainable tourism, the GSTC promotes sustainable tourism products, services and certifications.

The principles promoted by the GSTC have become a global proposal that spreads good practices among destinations and actors in the tourism sector. The GSTC methodologies, manuals and criteria to measure sustainable tourism focus on the managerial dimension. Only recently, most of the principles suggested by international agencies to characterize sustainable tourism did not include this dimension.

This study's methodology considers 131 indicators, of which 31 correspond to the managerial dimension, 39 to the socioeconomic dimension, 26 to the sociocultural dimension and 35 to the environmental dimension (see the complete list in the annex of this chapter). The indicators were divided into a monitoring plan that proposes three consecutive three-year stages to enable its application. In other words, the incumbent institutions should apply this method progressively and systematically.

The geographic unit of application consists of tourism destinations, or clusters, as they are called in the Dominican Republic. According to WTO, a tourism destination is a basic unit of analysis. It is a physical space with or without administrative and/or analytic boundaries where visitors can spend the night. It includes products, services, activities, and experiences along the tourism value chain (GSTC, 2019).

Collecting statistical data for a tourism destination implies multiple challenges since national statistics offices often generate information by administrative divisions, such as provinces, counties, departments or states, yet the limits of a tourism destination may or may not fall within these boundaries, and they entail another kind of territorial division on their own. Only some countries have official agencies that collect information for destinations. Tourism ministries are usually in charge of this task.

The data gathered by tourism ministries also have their limitations because the information is collected by sector (usually related to the contribution of tourism to GDP, employment, international arrivals, the expenditures made by visitors, the occupation of hotel rooms and the average length of stays) without considering the sustainability dimensions of the tourism sector. Therefore, our methodology seeks to promote a better collection of information in the territory of the destinations.

Our study adapts the GSTC criteria to consider specific characteristics of the country and the places it examined. However, it tries to maintain the balance of the sustainability criteria. The aspects considered in each dimension and stage are shown in table XVI.2.

This methodology uses primary and secondary sources of information. Primary sources are interviews with key actors in the sector and the destination, whereas secondary sources include available official statistics and government reports and papers.

A challenge posed by the information sources used in this study is that data were not consistently available for all indicators. This is an area of opportunity for other studies, which may try to fix a standard for the periodicity of data collection and the type of information sources, among other aspects. The information collected in this study is exploratory and consists of quantitative and qualitative data. This study also evaluated sustainability from a tourism service supply perspective and the impact of tourism on the population and the environment; this enriched our analysis and implied overcoming challenges regarding data collection.

Table XVI.2
Adaptations of GSTC criteria to the proposed methodology to study tourism clusters in the Dominican Republic

Dimensions	Aspects by stage		
Management	Stage 1	-	Management structure
	Stage 2	-	Strategic planning
	Stage 3	-	Social articulation
Socioeconomic	Stage 1	-	Investment, employment and VSMEs
	Stage 2	-	Socioeconomic approach and social well-being
	Stage 3	-	Economic impact and social well-being
Cultural	Stage 1	-	Conservation of cultural heritage
	Stage 2	-	Local engagement in cultural activities
	Stage 3	-	Support to cultural enterprises
Environmental	Stage 1	-	Water, wastewater and solid waste management
	Stage 2	-	Energy, transportation, tourism and conservation
	Stage 3	-	Conservation areas and environmental education

Source: Prepared by the authors, on the basis of Global Sustainable Tourism Council (GSTC), "GSTC Destination Criteria. Performance indicators and SDGs", Washington, D.C., 2019.

After collecting data on each indicator, they were placed in a table of assessment thresholds to visualize their progress according to dimension (see table XVI.3). The results were analysed in one matrix per dimension to be easily viewed.

Table XVI.3
Interpretation table and matrix by dimension

1	Does not comply
2	Unsatisfactory performance
3	Improvable performance
4	Good performance
5	Excellent performance
N/A	Does not apply

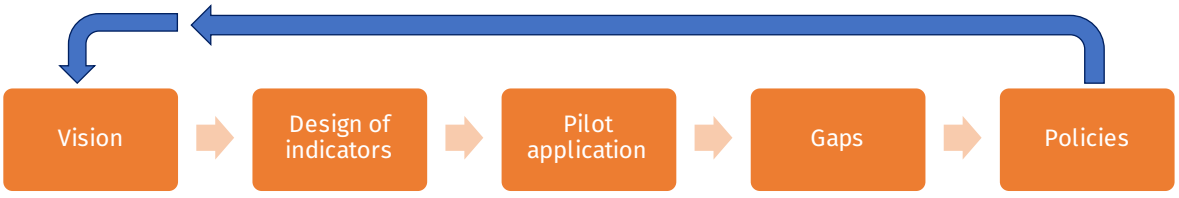
Source: Prepared by the authors.

The proposal intends to improve the management of the country's tourist destinations, an objective supported by the Ministry of Tourism of the Dominican Republic (MITUR). To that end, it considers the four GSTC sustainability dimensions and the development and evolution cycles of the destinations while suggesting that the indicators be applied progressively and be clear, rigorous, attainable, credible, comparable, representative and applicable.

In this stage, the methodology was tested on two pilot clusters: Puerto Plata and Ciudad Colonial Santo Domingo. MITUR selected the destinations. Both are mature destinations with a destination management office and infrastructure such as airports and seaports. They implement innovation programmes and work within the productive regional chains of the Secretariat for the Economic Integration of Central America (SIECA). Tourism in Puerto Plata offers sun and beach, culture and nature. Ciudad Colonial Santo Domingo attracts urban tourism with its culture and history.

Information for each sustainability indicator was collected for both destinations. This information helped identify gaps in each sustainability dimension and analyse their causes and consequences, eventually leading to recommendations for public policy to diminish or close those gaps. These recommendations should support planning in the pilot destinations. As for other Dominican tourism clusters, data collection, if regularly performed, could help monitor progress and areas of opportunity regarding sustainability (see diagram XVI.1). The findings of this research are shown in the sections below.

Diagram XVI.1
Dominican Republic: process of the methodology to analyse the sustainability gaps in tourism clusters



Source: Prepared by the authors.

B. Analysis of tourism clusters in the Dominican Republic

1. Puerto Plata

Puerto Plata is the capital of a province that goes by the same name. It is a destination with intense tourism activity of the sun-beach-culture-nature kind. Its development started in the 1970s when the Department for the Development of Tourism Infrastructure (INFRATUR) of the Central Bank of the Dominican Republic (BCRD) backed initiatives to invest in tourism there. Playa Dorada was the first planned touristic endeavour of the country. Puerto Plata saw steady development of tourism activity until the 1990s. However, demand slowed when products and services reached the peak of their life cycle and other tourism destinations like Punta Cana-Bávaro-Macao boomed.

By 2019, there were 8,300 hotel rooms in Puerto Plata, which amounted to 10% of available rooms in the country (MITUR, 2021a). Recent records count about 12,852 hotel rooms (Prodominicana, 2022). It has one international airport and two seaports for cruise ships. In 2019, 204 cruise ships docked at its ports and in 2021, 198,209 tourists arrived at its airport. Tourists accounted for 6.4% of the national arrivals of non-residents to the airport. For cruise ship passengers, the percentage represented 58.8% of the total. Visitors mainly came from the United States, Canada, the Russian Federation, France and Argentina (MITUR, 2021a).

Projects have been launched in Puerto Plata, managed by the Puerto Plata Tourism Cluster and the Ministry of Tourism and supported by the United States Agency for International Development (USAID), the Multilateral Investment Fund (FOMIN), the Inter-American Development Bank (DB) and the Japan International Cooperation Agency (JICA). Noteworthy attractions along the shoreline are the cableway, the Ocean World Marina complex, the Veintisiete Saltos de Damajagua national park, the San Felipe fort, Loma Isabel de Torres and several golf clubs, such as Playa Dorada, Los Mangos, Playa Grande and others (MITUR, 2021a).

Table XVI.4 shows the rankings of indicators for each dimension analysed for Puerto Plata. A significant number of indicators are displayed with “does not apply” next to them. That means they could not be measured in that destination because the information was unavailable, nonexistent or was not disaggregated as required. This situation mainly occurred in the managerial and environmental dimensions, in which there were no data for over 45% of the indicators, showing the size of the task ahead for these two dimensions. Most indicators with available information showed good or improvable performance, while some exhibited unsatisfactory or very low performance; a few had excellent performance.

Table XVI.4
Puerto Plata: indicator ranking by dimension

Ranking	Description	Management		Socioeconomic		Sociocultural		Enviromental	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
1	Very low performance	5	16.1	5	12.8	2	7.7	2	5.71
2	Unsatisfactory performance	5	16.1	4	10.3	8	30.8	3	8.57
3	Improvable performance	3	9.6	6	15.4	6	23.1	7	20.00
4	Good performance	3	9.6	14	35.9	3	11.5	6	17.14
5	Excellent performance	1	3.2	5	12.8	0	0.0	1	2.86
N/A	Does not apply	14	45.1	5	12.8	7	26.9	16	45.71
Total		31	100.0	39	100.0	26	100.0	35	100.00

Source: Prepared by the authors.

a) Managerial dimension

The first stage in the management structure has the most significant number of indicators that could be quantified given the available information. Half of these indicators were rated with excellent or good performance. The other half received very low and unsatisfactory marks. The indicators for strategic planning mostly show very low and unsatisfactory performances. For social articulation, most indicators have very low and improvable performances (see table XVI.5).

Table XVI.5
Puerto Plata: ranking of indicators for the managerial dimension

Ranking	Description	Stage 1 Management structure	Stage 2 Strategic planning	Stage 3 Social articulation	Total
1	Very low performance	1	1	3	5
2	Unsatisfactory performance	3	2	0	5
3	Improvable performance	0	0	3	3
4	Good performance	3	0	0	3
5	Excellent performance	1	0	0	1
N/A	Does not apply	3	8	3	14
Total		11	11	9	31

Source: Prepared by the authors.

Gaps in management were identified, the most significant being that no single agency is charged with managing the territory and consolidating the results achieved by other State agencies, the private sector, the communities or other actors. Instead, several entities manage tourism, namely MITUR, the Puerto Plata Tourism Cluster, the Northern Association of Hotels, Restaurants and Tourism Businesses, the Playa Dorada Hotels and Condos Association, the Sosual Hotels and Restaurants Association and the local Chamber of Commerce.

There is no single destination management organisation, and the staff is not trained in destination management. MITUR provides courses and workshops. There is no specific market intelligence system for the destination. However, SITUR and the Puerto Plata Sustainable Tourism Unit (a joint venture with JICA) collect data on the community. At this time, the destination has no strategy to promote tourism. Also, there is no specific strategy to develop tourism in Puerto Plata. Therefore, issues such as sustainability, climate change and incorporation of SDGs are not being addressed. An indicator plan is also lacking. However, MITUR restructured the Vice-Ministry for Destination Management to bolster local management of the country's destinations.

MITUR is mainly responsible for monitoring the quality standards for tourism services and disseminating information about issues such as tourism and safety. However, the Ministry carries out its planning through an institutional operations plan and its regional offices, although horizontal participation could improve. Regarding plans for risk reduction, there is a specific plan to mitigate crises in the different links of the tourism value chain, but it is outdated. Furthermore, there are no plans to create awareness and provide training to face risks, including climate risks. Overall, no information was found for several indicators in the managerial dimension. The information does not exist or is dispersed among several actors, thus revealing considerable gaps in this dimension (see table XVI.6).

Table XVI.6
Puerto Plata: major managerial gaps

Dimensions	Gaps
Management structure	- Lack of an operation scheme with multidisciplinary capabilities for managing the territory. - Lack of staff trained in management destination. - No apparent interest in creating a Destination Management Organisation with integral management.
Strategic planning	- A common strategy for promoting tourism development in the destination is required.
Articulation among sectors	- Though important steps have been taken to articulate the sector, many links in the value chain are not sufficiently integrated into planning processes.

Source: Prepared by the authors.

b) Socioeconomic dimension

The socioeconomic dimension has the most indicators among the dimensions under analysis. The first stage indicators regarding investment, employment and SMEs present the best rankings since most received good performance marks. Second-stage socioeconomic indicators have a positive assessment, with most ranging between good and excellent performance. Finally, most third-stage indicators on the impact of tourism on the economy and social well-being received marks of improvable or unsatisfactory performance (see table XVI.7).

Table XVI.7
Puerto Plata: ranking of indicators for the socioeconomic dimension

Ranking	Description	Stage 1 Investment, employment and SMEs	Stage 2 Socioeconomic approach and social well-being	Stage 3 Economic impact and social well-being	Total
1	Very low performance	3	2	0	5
2	Unsatisfactory performance	2	0	2	4
3	Improvable performance	4	0	2	6
4	Good performance	10	3	1	14
5	Excellent performance	3	1	1	5
N/A	Does not apply	3	2	0	5
Total		25	8	6	39

Source: Prepared by the authors.

The gaps in the socioeconomic dimension are created by the lack of a defined strategy to work through the regeneration process of tourism as a whole. Regarding education services available to the local population, it is patent that the tourism programmes are not innovative and do not respond to new market trends. Though some projects promote integrating communities into the destination's economy, the participative governance of the value chain still needs to strengthen the participation of community groups through discussion forums and development workshops.

The data available for this dimension are similar to the managerial dimension. The information available for several indicators was outdated or lacked the level of disaggregation required for the territory. This situation poses a great challenge and shows that this issue is still incipient (see table XVI.8).

Table XVI.8
Puerto Plata: main gaps in the socioeconomic dimension

Dimensions	Gaps
Investment, employment and SMEs	- Lack of a defined integral strategy that works together with the tourism regeneration process in Puerto Plata.
Socioeconomic approach and social well-being	- Tourism education programmes do not respond to new market trends.
Economic impact and social well-being	- The leading decision-making groups in the tourism industry are reluctant to include community groups that are part of tourism's value chain.

Source: Prepared by the authors.

c) Sociocultural dimension

Rankings for the sociocultural dimension are the lowest compared with the other three dimensions. The rankings in table XVI.9 indicate that the three stages of this dimension have mostly improvable and unsatisfactory performances. The information for the cultural dimension proves that some measures are being implemented to preserve tangible cultural heritage, specifically cultural-historical monuments. This is not the case with intangible cultural heritage; the rescue, appreciation and preservation of Puerto Plata's traditions, music, customs and cuisine is a pending task.

Most conservation actions focus on visitors. Creating awareness among the local communities is marginal. Better promotion of local cultural treasures would transform communities into active actors in conserving cultural heritage. If its cultural heritage is to last many generations, activities that recognise its origins and roots must rescue the historical memory of Puerto Plata (see table XVI.10).

Table XVI.9
Puerto Plata: ranking of indicators for the sociocultural dimension

Ranking	Description	Stage 1 Conservation of cultural heritage	Stage 2 Local engagement in cultural activities	Stage 3 Support to cultural enterprises	Total
1	Very low performance	1	1	0	2
2	Unsatisfactory performance	2	3	3	8
3	Improvable performance	2	2	2	6
4	Good performance	2	1	0	3
5	Excellent performance	0	0	0	0
N/A	Does not apply	3	2	2	7
Total		10	9	7	26

Source: Prepared by the authors.

Table XVI.10
Puerto Plata: main gaps in the cultural dimension

Dimensions		Gaps
Conservation of cultural heritage	-	No public policies for the conservation of the intangible cultural heritage.
Support to cultural enterprises	-	Lack of measures to rescue the historical memory of Puerto Plata and its appropriation by younger generations.
Local engagement in cultural activities	-	No plan for creating awareness of cultural heritage in local communities.

Source: Prepared by the authors.

d) Environmental dimension

The environmental dimension has the most indicators that do not apply to the destination or could not be quantified because of the challenges posed by collecting specific and disaggregated information. However, the quantifiable indicators from all stages were placed between 3 and 5, in other words, between improvable, good and excellent performance rankings (see table XVI.11). According to the information collected for Puerto Plata, the water consumption of residents and visitors is high, but the water supply is deficient and presents shortages. As for wastewater management, Puerto Plata's hotels use secondary water treatment systems and marine outfalls. Some hotels reuse this water for irrigation. The final disposal of solid waste in dumps represents considerable economic and environmental challenges that have created multiple local conflicts.

As for alternative energy sources, Puerto Plata has implemented some measures to produce wind and sun power. However, self-production and the sale of energy have reported limitations. The promotion of alternative transportation is still budding. Only the major city in the county has bicycle lanes along the seawall. As for conservation measures taken by the tourism sector, some initiatives promote respect for biodiversity, and some tourism businesses conduct reforestation or enforce the closed season for fishing or hunting.

Finally, 15% of Puerto Plata's territories are inside the Protected Areas National System (SINAP), yet the impact caused by tourism activities in this system is not currently monitored. Activities to give local and foreign tourists environmental education are necessary (see table XVI.12).

Table XVI.11
Puerto Plata: ranking of indicators for the environmental dimension

Ranking	Description	Stage 1 Water, wastewater and solid waste management	Stage 2 Energy, transportation, tourism and conservation	Stage 3 Conservation areas and environmental education	Total
1	Very low performance	2	0	0	2
2	Unsatisfactory performance	1	0	2	3
3	Improvable performance	3	3	1	7
4	Good performance	3	1	2	6
5	Excellent performance	0	1	0	1
N/A	Does not apply	8	3	5	16
Total		17	8	10	35

Source: Prepared by the authors.

Table XVI.12
Puerto Plata: main gaps in the environmental dimension

Water, wastewater and solid waste management	- High water consumption. Consumption is not measured, and no programmes exist to create awareness. - There is no system to increase the purity of treated wastewater through secondary systems that allow potential reuse. - Solid waste management is a challenge for the province.
Energy, transportation, tourism and conservation	- There are limitations to the self-production and sale of renewable energy. - Few policies promote alternative transportation. - Tourism businesses lack initiatives to conserve biodiversity.
Environmental information and education	- There is no programme to monitor the impact of tourism on the natural protected areas of Puerto Plata. - Reinvestment of revenues from tourism in natural protected areas depends on the needs at a national level. - SINAP has no environmental interpreters that improve the experience of visitors and contribute to the environmental education of local and foreign tourists.

Source: Prepared by the authors.

2. Ciudad Colonial de Santo Domingo

Ciudad Colonial Santo Domingo is a 1-km^2 historic downtown area. Its walls protect Renaissance-style government buildings from when the New World was first colonised. Tourism there is primarily cultural-historical. The city was founded six years after Christopher Columbus first arrived in 1492, and it holds the first hospital, university, customs office and cathedral of the Americas. The city was declared a cultural heritage of humankind by UNESCO.

One of the major airports of the country operates there. In 2021, Las Américas Airport received 30%, or nearly 2 million, of all visitors in the country (Prodominicana, 2022). In 2019, the city had about 4,000 hotel rooms or 5% of the nation's total. Different segments of visitors travel to the city, including the passengers on cruise ships that dock at the Santo Domingo seaport. In 2019, 153 cruises anchored at that port. The seaport has two ultramodern terminals: Don Diego, near Ciudad Colonial, and Sansouci, closer to Faro de Colón and Los Tres Ojos. Visitors mostly hail from the United States, France, Argentina, Canada and the Russian Federation (MITUR, 2021b).

With the Inter-American Development Bank (IDB), Ciudad Colonial implemented an international cooperation project for promoting tourism in Santo Domingo and a similar project for supporting tourism education nationwide. The Santo Domingo Tourism Cluster executed a plan to integrally revitalise Ciudad Colonial. This project received funds from FOMIN, MITUR and the Vice-Ministry for SMEs. Its tourist attractions include beaches, a lookout park, Chinatown, the first cathedral in America, the Columbus lighthouse, the National Aquarium, the MAR museum, the Blackfriar's convent, Ozama fortress, Plaza de la Cultura, Alcázar de Colón, the Casas Reales Museum, Sans Souci and Don Diego terminals and national parks, such as the Ozama wetlands park, La Caleta underwater park and Cueva de Tres Ojos (MITUR, 2021b).

Table XVI.13 shows the indicator rankings for each dimension analysed for Ciudad Colonial. All indicators could be quantified for the managerial dimension, and over half showed good and excellent performance. Most indicators could be measured for the socioeconomic and sociocultural dimensions. The former mainly had a good performance, whereas most indicators in the latter rated unsatisfactory

and improvable performance. Regarding the environmental dimension, 20 indicators read "does not apply", of which eight were discarded because they correspond to conservation areas, but Ciudad Colonial has no ecosystems or protected natural areas since it is downtown. The other 12 indicators could not be measured due to insufficient available information. As in Puerto Plata, the environmental dimension presented the greatest challenges for measurement, which shows how much work still lies ahead. Most of the implemented indicators received improvable performance marks.

Table XVI.13
Ciudad Colonial de Santo Domingo: indicator ranking by dimension

Ranking	Description	Management		Socioeconomic		Sociocultural		Environmental	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
1	Very low performance	7	22.6	6	15.4	3	11.5	2	5.7
2	Unsatisfactory performance	0	0.0	10	25.6	1	3.8	2	5.7
3	Improvable performance	7	22.6	10	25.6	5	19.2	7	20.0
4	Good performance	10	32.3	8	20.5	9	34.6	3	8.6
5	Excellent performance	7	22.6	1	2.6	3	11.5	1	2.9
N/A	Does not apply	0	0	4	10.3	5	19.2	20	57.1
Total		31	100	39	100	26	100	35	100

Source: Prepared by the authors.

a) Managerial dimension

As a tourism destination, Ciudad Colonial is a priority for the Dominican Republic. The managerial dimension is proof of this since its first-stage positions ranked the best, revealing mature management structure initiatives. However, there is still work to be done to consolidate the first-stage developments and pull them through the second and third stages, which have indicators with very low performance (see table XVI.14).

Table XVI.14
Ciudad Colonial: ranking of indicators for the managerial dimension

Ranking	Description	Stage 1 Management structure	Stage 2 Strategic planning	Stage 3 Social articulation	Total
1	Very low performance	0	2	5	7
2	Unsatisfactory performance	0	0	0	0
3	Improvable performance	4	1	2	7
4	Good performance	4	4	2	10
5	Excellent performance	3	4	0	7
N/A	Does not apply	0	0	0	0
Total		11	11	9	31

Source: Prepared by the authors.

Ciudad Colonial de Santo Domingo has several public and private entities that have developed actions related to territorial management. Nevertheless, institutional dispersion is detected, with no single institution articulating and organizing interventions. In other words, there is no destination management. The destination has a standing strategic plan, but it has yet to be successfully executed because no agency manages it. Therefore, a specialized entity is needed to raise tourism competitiveness

and visitor satisfaction. This entity should be able to move all the interinstitutional wheels and cogs. It should also be able to monitor the destination's performance through indicators and aim at creating the foundations of social participative processes.

Regarding social articulation, the international cooperation programmes prove that efforts have been made to incorporate the resident society and different actors into the tourism value chain. However, the integration process still needs systematisation, as several parties have a say in its implementation (the county, MITUR, the Culture Ministry and the Tourism Cluster) (see table XVI.15).

Table XVI.15
Ciudad Colonial de Santo Domingo: main managerial gaps

Dimensions	Gap
Management structure	- Institutional dispersion. No specialised entity manages the destination.
Strategic planning	- Changes in government structures pose challenges to progress. - There is a strategic plan, yet it is out of touch with the involved sectors.
Social articulation	- The implementation of integration programmes is inconsistent.

Source: Prepared by the authors.

b) Socioeconomic dimension

Table XVI.16 shows the rankings for the three stages of the socioeconomic dimension. The first stage has the highest evaluations, with one-third of the indicators showing good and excellent performance. The second stage mostly has indicators with improvable performance, while the third stage's indicators have very low and unsatisfactory performances.

Table XVI.16
Ciudad Colonial: ranking of indicators for the socioeconomic dimension

Ranking	Description	Stage 1 Investment, employment and SMEs	Stage 2 Socioeconomic approach and social well-being	Stage 3 Economic impact and social well-being	Total
1	Very low performance	4	0	2	6
2	Unsatisfactory performance	5	2	3	10
3	Improvable performance	5	5	0	10
4	Good performance	7	0	1	8
5	Excellent performance	1	0	0	1
N/A	Does not apply	3	1	0	4
Total		25	8	6	39

Source: Prepared by the authors.

The investment, employment and SME indicators show that public and private investment increased due to international cooperation programmes. Private investment grew with funds provided by local and foreign capital. The number of SMEs and employment levels also grew. Despite the positive indicators, in recent years, historic residents have abandoned Ciudad Capital due to negative externalities of tourism, such as noise, traffic, gentrification, land use regulations, massive numbers of visitors and increased crime. Some social integration actions have been executed to slow these processes. Though insufficient, these actions seek to favour territorial integration and appropriation through social networks. For example, the Ciudad Colonial Association of Owners and Residents organized one.

Regarding the socioeconomic approach and social well-being, the collected data show that private investment has tried to develop a diversified supply of tourism businesses and that tourism infrastructure has been improved using public funds. The drinking water supply, waste management and renewable energy policies are still in poor condition at the destination. Though there have been some improvements in how the destination looks and is organized, Ciudad Colonial still needs to push social well-being actions forward.

This dimension's third stage evaluates the social integration process and the participation of the community in development processes. Ciudad Colonial's residents are proactive when it comes to defending the place where they live. The State has supported their initiatives through institutions charged with the destination's management processes (the county and the Ministries of Culture and Tourism). However, problems still need close examination to protect the residents from the negative impacts of tourism development (see table XVI.17).

Table XVI.17
Ciudad Colonial de Santo Domingo: main gaps in the socioeconomic dimension

Dimensions	Gap
Investment, employment and SMEs	- Ciudad Colonial is a destination designed for tourists rather than residents. Traffic, noise and lack of parking space are challenges for the city.
Socioeconomic approach and social well-being	- There are no conditions fostering residents' awareness that conserving the intangible cultural heritage of Ciudad Colonial is part of their well-being.
Economic impact and social well-being	- There is no systematic plan for mitigating the impact of economic development on the lifestyle and life quality of the residents. - There is no platform for residents to help make decisions about the destination.

Source: Prepared by the authors.

c) Cultural dimension

The indicators for the sociocultural dimension show that some work has progressed in Ciudad Colonial. The rankings for the three stages stand at the higher end of the table, and most reveal good performance. However, more work is still needed to improve the indicators that received lower marks. Most belong to the last two stages (see table XVI.18).

Table XVI.18
Ciudad Colonial: ranking of indicators for the sociocultural dimension

Ranking	Description	Stage 1 Conservation of cultural heritage	Stage 2 Local engagement in cultural activities	Stage 3 Support to cultural enterprises	Total
1	Very low performance	0	2	1	3
2	Unsatisfactory performance	0	0	1	1
3	Improvable performance	3	1	1	5
4	Good performance	4	3	2	9
5	Excellent performance	2	0	1	3
N/A	Does not apply	1	3	1	5
Total		10	9	7	26

Source: Prepared by the authors.

The conservation of the cultural heritage of the first city in America has been a constant priority for the government and the people of the Dominican Republic. In the last 50 years, many laws and regulations have been passed that focus on better care for the best-known monuments in the city's historic centre. However, some interventions have not been adequately supervised, and some monuments within the city walls have not been considered for intervention. Regarding local engagement in cultural activities, there is no formal programme for creating cultural or historical awareness among Ciudad Colonial de Santo Domingo residents. It is vital to appreciate the value of the cultural heritage of Ciudad Colonial to promote a sense of belonging and, as a result, gain allies for its care and conservation.

Ciudad Colonial offers historical content based on its 16th-century buildings. Visitors could enjoy the site's cultural content if unique experiences were bonded to its historical legacy. To this end, it is necessary to develop an innovative cultural animation programme that boosts the travel experience while educating residents, business owners, employees and visitors (see table XVI.19).

Table XVI.19
Ciudad Colonial de Santo Domingo: main gaps in the cultural dimension

Dimensions		Gap
Conservation of cultural heritage	-	The information about cultural heritage is scattered, hindering improvement initiatives and investment in historic buildings.
Local engagement in cultural activities	-	There is no informative programme to create awareness among residents.
Support to cultural enterprises	-	There is no programme to directly support cultural enterprises that promote cultural animation.

Source: Prepared by the authors.

d) Environmental dimension

In Ciudad Colonial, there are no ecosystems or natural areas under conservation. Thus, the indicators for this dimension focus on the efficient use of natural resources. As shown in table XVI.20, there are pending tasks for all the stages in the environmental dimension. However, most are in the first stage, which deals with water and waste management.

Table XVI.20
Ciudad Colonial: ranking of indicators for the environmental dimension

Ranking	Description	Stage 1 Water, wastewater and solid waste management	Stage 2 Energy, transportation, tourism and conservation	Stage 3 Conservation areas and environmental education	Total
1	Very low performance	2	0	0	2
2	Unsatisfactory performance	1	0	1	2
3	Improvable performance	3	3	1	7
4	Good performance	2	1	0	3
5	Excellent performance	0	1	0	1
N/A	Does not apply	8	3	9	20
Total		16	8	11	35

Source: Prepared by the authors.

Regarding drinking water, over 80% of businesses and homes are connected to government services (CAASD). However, supply is deficient due to a lack of maintenance and fluctuations in water reservoirs caused by the dry season. Also, no programmes create awareness among users about the efficient use and reuse of water. Concerning solid waste, there is a county recycling initiative, but it needs to be complemented with environmental education initiatives to change consumption habits in residents and tourists.

In recent years, the businesses of Ciudad Colonial have made some effort to use renewable energies, which is a noteworthy starting point that could be strengthened with special policies that benefit the destination's residents and businesses. A large percentage of hotels keep sustainability policies. Nonetheless, very few have sustainability certifications. As for alternative transportation, though many means of transport are now available, the residents report a lack of sustainable mobility. The third stage emphasizes the need for an environmental education programme that promotes the efficient use of resources and a change in the consumption habits of residents and visitors (see table XVI.21).

Table XVI.21
Ciudad Colonial de Santo Domingo: main gaps in the environmental dimension

Dimensions	Gap
Water, wastewater and solid waste management	- Deficient water supply system unable to meet demand. - Lack of awareness programme for the rational use of water. - Lack of rainwater collection or wastewater reuse programmes. - Lack of individual meters for water consumption. - Lack of an effective wastewater treatment system. - Lack of an articulated environmental plan applied to all management levels and targeted at all population segments.
Energy, transportation, tourism and conservation	- Incentives for renewable energies not widespread in Ciudad Colonial. - Lack of sustainable mobility in the area Air pollution, noise and parking problems due to traffic. - No plans to create pedestrian zones.
Environmental information and education	- Lack of an environmental education programme targeted at improving the use of resources and the change of consumption habits.

Source: Prepared by the authors.

C. Challenges and lessons learned

The implementation of the Sustainability Indicators Plan in two tourism destinations of the Dominican Republic faced challenges when collecting data for the 131 indicators included in the four dimensions established by the Global Sustainable Tourism Council (managerial, socioeconomic, sociocultural and environmental). Puerto Plata and Ciudad Colonial de Santo Domingo were chosen for the pilot study because they are mature tourist destinations that, through their development, have been intervened by the national and foreign public and private sectors. These destinations have gone some way toward generating, applying and validating the data used to measure the proposed indicators. Although studies and data were found, most of the collected information was obsolete, out-of-date and not always comparable between the destinations.

The 131 indicators were applied at both destinations. Most challenges arose from gathering quantitative data to measure each indicator and, thus, create a baseline from which to perform future performance measurements and comparisons. The lack of information was pervasive throughout the

process. Data did not exist; when they did, they were mixed up or outdated. Therefore, some indicators could not be measured, and approximation techniques had to be used.

As for the lessons learned, the indicators must be adjusted to better adapt to and fit the destination where they are applied. The information voids must be filled. A better way to classify the results according to performance, indicator applicability and missing data remains to be found. Our findings have refined the indicators, and specialists have validated them to carry on this work at other destinations. Table XVI.22 presents the similarities, differences and lessons learned from the implementation process for the monitoring plan at both destinations.

Table XVI.22
Puerto Plata and Ciudad Colonial: comparison of results of the implementation of the monitoring plan

	Similarities	Differences	Lessons learned
1	Both are mature destinations.	Puerto Plata is a destination sought for its sun, beach, nature and culture. Ciudad Colonial is a historical and cultural destination.	The indicators must be adjusted to the reality of each destination. For instance, many indicators for the cultural dimension do not apply to Ciudad Colonial, which has no protected natural areas.
2	Both destinations need interventions in order to improve.	Ciudad Colonial improved its management due to the IBD tourism observatory and the strategic tourism development plan.	Use the Ciudad Colonial Tourism Observatory as a means to obtain market intelligence.
3	For both destinations, MITUR interventions have proven important.	Investments in socioeconomic aspects. Community work has progressed in Ciudad Colonial, but the integration in decision-making processes must improve.	MITUR led the design of the land use plan in Ciudad Colonial. This regulation is strictly observed because the city is declared a Cultural Heritage of Humankind.
4	Private investment in both destinations increased, together with improvement and reactivation processes.	Puerto Plata received support from JICA and MITUR to diversify its options through a community tourism project.	Initiatives such as Cibao's sustainable community tourism initiative.
5	At both destinations, the government has made considerable investments in infrastructure.	Puerto Plata bet on renewable energy (wind).	Puerto Plata significantly improved its road and sea entry points and built two new ports for cruise ships.
6	Both destinations have problems with their water supply.		
7	Both destinations have solid waste management problems.	Ciudad Colonial launched a primary classification programme.	Ciudad Colonial runs the REVIME-CA programme to classify waste.
8	At both destinations, the private sector participated in the improvements.	In Puerto Plata, the private sector organisations are greatly divided.	The Puerto Plata Cluster leads the sector's organisations.
9	Both destinations created development committees.	In Ciudad Colonial, the public sector is more divided.	Puerto Plata held round tables for discussion among public and private sector institutions: Tourism and Safety.

Source: Prepared by the authors.

Despite this study's complexity, it made some headway into the holistic measurement of the sustainable development of Puerto Plata and Ciudad Colonial, based on 131 indicators in four dimensions. The baseline reflects each destination's current situation, emphasizing progress and identifying areas of opportunity where their performance may improve. It also sets a precedent to promote using measurement as a tool to evaluate how they evolve in the medium term.

D. Public policy recommendations

This study implemented the indicators of the monitoring plan for Puerto Plata and Ciudad Colonial, thus identifying managerial, socioeconomic, sociocultural and environmental gaps in both tourism destinations. This section presents public policy recommendations to help overcome obstacles and take advantage of the identified opportunities (see tables XVI.23 and XVI.24).

Table XVI.23
Puerto Plata: public policy recommendations by dimension

Dimensions	Premises	Public policy recommendations
Management	Management of the destination should be in the hands of a single independent entity. Planning must be undertaken by conscientious leadership that motivates broad participation through transparent actions that favour the destination's well-being and, hence, that of its communities and the private sector. Planning must consider the key aspects that create resilience in a destination when facing several risks that may impact the territory.	1. Install technical staff that specializes in destination management. 2. This destination's management office should initially be financed with 80% public funds. The other 20% should come from the rest of the local actors to motivate participation and transparency in the sector. These proportions could change progressively until equal contributions or the office's financial independence is reached. 3. The destination's management office should promote the design and implementation of a tourism development strategy created with local actors' broad and effective participation. 4. The destination's management office should be in charge of the tourism observatory to guarantee the quality of collected information and its use without political ends. 5. The destination's management office should promote updating a land use plan applicable to tourism and the regulations that its observance may require.
Socioeconomic	Innovate tourism education and training programmes. Create opportunities to integrate communities into the tourism supply.	1. Analyse the technical education programmes offered by polytechnic schools and INFOTEP. 2. Update the education programmes with new guidelines for international tourism. For example, institutions need to train tourism destination managers. 3. Include current development models in the tourism education programmes. 4. Destination management is part of the value chain concept in the tourism sector, which links different actors, products and services together. Therefore, analysis and decision-making should consider the participation of all the chain's links.
Sociocultural	Residents are a vital destination element and should be considered in any tourism development strategy.	1. Create a detailed catalogue of the destination's tangible and intangible cultural resources. 2. Design and implement a heritage conservation, rescue and appreciation programme. 3. Raise awareness about the value of cultural heritage so that tourism activities can help promote and conserve it, thus strengthening the destination's sense of identity.

Dimensions	Premises	Public policy recommendations
		4. Promote local pride in its cultural heritage, incentivizing the transfer of cultural identity (traditions, folklore, crafts, among others) between generations. 6. Design and implement a local cultural heritage awareness programme for schools and colleges.
Environmental	Create an environmental strategy based on the actual capabilities of the tourism destination.	1. Study the destination's water supply to meet the local demand and understand the needs of the tourism sector. 2. Launch regular campaigns throughout the territory to create awareness about water use. 3. Design and implement specific actions to promote efficient water use. 4. Design programmes to reuse treated water and collect rainwater. 5. Promote land use plans adapted to the territory's circumstances. Draw up regulations needed for their implementation. 6. Create new incentives to use renewable energies. 7. The private sector should effectively apply the existing legislation on conservation. 8. Reinvest the revenues generated by each protected area in their own conservation and management. 9. Incentivize co-management of protected natural areas. 10. Innovate designs for ecotourism services in protected areas to improve the experience of tourists, increase revenues destined for conservation and make the destination more competitive.

Source: Prepared by the authors.

Table XVI.24
Ciudad Colonial: public policy recommendations by dimension

Dimensions	Premises	Public policy recommendations
Management	Given the complexity of Ciudad Colonial, it should be managed by a single specialised, technical entity that considers the needs of a destination that is both a populated city and a tourism destination.	1. Install technical staff that specializes in destination management. 2. This destination's management office should initially be financed with 80% public funds. The other 20% should come from the rest of the local actors to motivate participation and transparency in the sector. These proportions could change progressively until equal contributions or the office's financial independence is reached. 3. The destination's management office should implement the integral plan considering the area's needs. 4. The destination's management office should oversee the tourism observatory to guarantee the quality of collected information and its non-political use.
Socioeconomic	Create opportunities to integrate communities into the tourism supply.	1. Design and implement a citizen's participation platform for decisions concerning the area. 2. Create programmes targeted at improving the quality of life of residents. For example, resident discount coupons could be used at local businesses. 3. Improve public services, especially health services. 4. Keep an updated census of the local population and its composition to identify their needs. 5. Generate community centres and parks for residents to use. 6. Accept the residents' proposal for "referential parking".

Dimensions	Premises	Public policy recommendations
		7. Consider implementing a special tax plan that motivates residents to stay in the area. 8. Support sustainability initiatives such as green roofs and vertical gardens and incentivize renewable energy programmes. 9. Reinforce citizen safety programmes. 10. Publish a monthly bulletin for residents to spread information concerning local development, activities, meetings and other vital issues.
Sociocultural	Ciudad Colonial has a rich historical heritage that may be boosted and complemented by other tourism options.	1. Design and implement a code of conduct for good use and behaviour within the downtown area. Residents, product and service providers and tourists should observe the code to favour harmony at the destination. 2. Design and promote a cultural interpretation programme. Cultural interpreters could perform more functions than guides. They should be able to explain the cultural traits of the 16th century and contrast the lifestyle of those times to the lifestyle of modern residents. For example, Airbnb Experience is a programme based on living an experience from the local point of view, hand in hand with a resident. 3. Design an innovative plan to rescue and appreciate local cultural traditions as part of tourism products. For example, visitors may freely use drinking fountains in Spain. 4. Design, promote and implement an innovative programme for cultural animation that enriches the experience of tourists. The programme should consider all actors along the tourism value chain in Ciudad Colonial.
Environmental	Create an environmental strategy based on the actual capabilities of the tourism destination.	1. Create an environmental education programme for residents that promotes efficient drinking water use. 2. Create a plan to reuse wastewater through an adequate treatment process. 3. Evaluate different options for sustainable transportation in Ciudad Colonial, such as pedestrian zones or bicycle lanes, so that streets and sidewalks may be used for culture and leisure activities. Better mobility would improve the experience of residents and visitors. 4. Create an incentive programme for using renewable energy in homes and businesses. 5. Promote sustainability certifications. These certifications help continuous improvement, as progress in sustainability issues can be followed and monitored through more systematic information.

Source: Prepared by the authors.

E. Conclusion

Over the past five decades, the Dominican Republic has developed a thriving tourism business model and has led the Caribbean islands in international visitor arrivals, becoming an important recipient of direct foreign investment. However, recent economic, social and biological crises have made it clear that the model must transform into something more resilient if the tourism sector is to recover.

International tourism organisations, such as WTO and GSTC, claim that the sector's recovery must be grounded on a sustainable approach comprised of four dimensions: managerial, socioeconomic, sociocultural and environmental. ECLAC proposed 131 sustainability indicators to address those four

dimensions. As a contribution to tourism development in the Dominican Republic, this study measured them in Puerto Plata and Ciudad Colonial, two mature destination clusters.

Sustainability indicators must be adopted to identify gaps in the sector and to implement public policies that improve tourism destinations as a whole. The indicators for each dimension should progress with time, as management structures become more robust and the disciplines needed to systematically follow up on tourism impacts are created. The boom of sustainable tourism responds to a global trend of tourists that seek better experiences and are concerned by their impact on the places they visit. In the Dominican Republic, the trend is reinforced by the government, the private sector and the local communities, which are willing to head towards sustainable tourism. This is good news, though the results show that both destinations still have work to do on the four dimensions of sustainability. Integral actions must be taken that include the participation of all actors along the tourism value chain to break through the existing obstacles.

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Annex
List of indicators

Managerial dimension			
Stage		Indicator	Measurement
Stage 1 Management structure	1	There is an organisation, department, group or committee at the destination that oversees the integral development of tourism.	Yes/No
	2	This organisation, department, group or committee has staff with technical capabilities for managing destinations.	Yes/No
	3	There is a well-known published functional organisational flowchart of this management structure.	Yes/No
	4	The organisation is financed with public, private or mixed funds, or it is autonomous.	Financed/ Autonomous
	5	The organisation, department, group or committee has mapped the actors that make up the local tourism value chain.	Yes/No
	6	The organisation includes local tourism businesses and inhabitants in the decision-making processes.	Yes/No
	7	There is a government plan for orderly land use.	Yes/No
	8	Published laws and regulations enforce the plan for orderly land use, and the tourism sector and community know them.	Yes/No
	9	The destination has local safety organisations (police and fire departments, for example).	Yes/No
	10	The organisation, department, group or committee works with central tourism authorities (MITUR).	Yes/No
	11	The organisation has a market intelligence system that can measure the impact of local and foreign visitors.	Yes/No
Stage 2 Strategic planning	12	The destination promotes a participation strategy that works together with sector actors and the community, and this strategy is carried out by specialised staff.	Yes/No
	13	Statistical data collected by the market intelligence system is used for strategic planning.	Yes/No
	14	There is a strategy to develop tourism at the destination, which was planned together with the community to be implemented in the long term.	Yes/No
	15	The organisation's development strategy considers sustainable development goals.	Yes/No
	16	The strategy to develop tourism is published in digital media and is available to the public.	Yes/No
	17	The destination follows annual operative plans based on the strategy.	Yes/No
	18	The strategy to develop tourism makes explicit reference to sustainability principles.	Yes/No
	19	The strategy to manage the destination takes climate change into account.	Yes/No
	20	Land use regulations and zoning are adapted to the impact of climate change.	Yes/No
	21	The organisation duly informs and educates about climate change issues.	Yes/No
	22	The organisation has established its indicator plan based on its strategic development, climate change and sustainability guidelines.	Yes/No
Stage 3 Social articulation	23	The organisation monitors the quality standards of tourism services.	Yes/No
	24	The organisation socialises with private sector actors and the academic community to promote collective decision-making.	Yes/No
	25	The organisation reviews the results of the annual operative plan and plans ahead for the next planning period, guaranteeing horizontal participation.	Yes/No

Managerial dimension			
Stage		Indicator	Measurement
	26	To improve its performance, the organisation fosters strategic alliances with other agencies.	Yes/No
	27	The organisation seeks GSTC certifications for the destination.	Yes/No
	28	The organisation makes annual revisions of entry points to the destination (roads, airports, seaports) and its infrastructure (water, power, communications).	Yes/No
	29	The organisation publishes a written plan to reduce and mitigate crises that may occur at the different levels of the tourism value chain.	Yes/No
	30	The organisation issues annually-reviewed training and education plans to face natural disasters, health crises, terrorist acts, etc.	Yes/No
	31	The organisation has a system to communicate timely information to different actors (businesses, VSMEs, tourists, communities, other productive sectors, etc.).	Yes/No

Socioeconomic dimension			
Stage		Indicator	Measurement
Stage 1 Investment, employment and SMEs	1	Tourism investment at the destination	Private sector investment at the destination
	2	Foreign tourism investment in destination	Annual USD investments in destination
	3	Local tourism investment in destination	Annual USD investments in destination
	4	Local vs foreign investment volume	Percentage of local investments vs foreign investments in tourism
	5	Local economic income	Per capita income
	6	Direct contribution of tourism	Percentage of contribution to GDP
	7	Total population of destination	No. of inhabitants
	8	Employment	Work/population rate
	9	Direct employment created by tourism	Number of work positions created by the sector
	10	Women working in the tourism sector	Number of women employed by the sector
	11	Formal employment (with contract)	Number of employees with formal employment (contract)
	12	Employees with social security	Number of employees registered in social security
	13	Percentage of women vs men working in the sector	Percentage of employment for women vs employment for men
	14	No. of local tourism VSMEs at the destination (services, providers) based on links in the tourism value chain	No. of local owners of VSMES based on links in the tourism value chain
	15	Production links between local businesses	No. of productive chains
	16	Agriculture suppliers selling to the tourism sector	No. of suppliers at the destination
	17	Productive links between agriculture suppliers and tourism businesses	No. of programmes that help agriculture suppliers meet the tourism demand
	18	Local artisans, artists, designers, etc.	No. of local artisans, artists and designers that work at the destination

Socioeconomic dimension			
Stage		Indicator	Measurement
	19	Training programmes for local entrepreneurs	No. of people with business training
	20	Technical training programme for workers in the tourism sector	No. of tourism training programmes at the destination
	21	Public financing programmes for local tourism VSMEs	No. of VSMEs with financial support from the public sector
	22	Private financing programmes for local tourism VSMEs	No. of VSMEs with financial support from the private sector
	23	Type of existing financing	Type of financing for tourism VSMEs at the destination, either public or private (seed funding, entrepreneurship, growth, innovation, risk, insurance, etc.)
	24	Technical assistance and support programmes for tourism VSMEs at the destination	No. of technical assistance programmes for tourism VSMEs at the destination
	25	Access of VSMEs to ICTs	No. of VSMEs using ICTs
Stage 2 Socioeconomic approach and social well-being	26	Existing training centres at the destination (technical education and higher)	No. of tourism training centres
	27	Tourism training centres at the destination	No. of tourism training centres
	28	Type of education options (virtual or digital) for the tourism sector	Percentage of virtual options and percentage of digital options for the tourism sector
	29	Healthcare centres at the destination	No. of health care centres at the destination that effectively serve the local population and tourists
	30	Fight against the sexual exploitation of girls, boys and adolescents	No. of companies under the CODIGO ECPAT code at the destination
	31	Discrimination-free destination	No. of laws and regulations against discrimination (race, religion, gender, sexual preference, etc.)
	32	Accessibility for all (1)	No. of regulations to favour accessibility of persons with limited capabilities
	33	Accessibility for all (2)	No. of public venues with access for persons with limited capabilities
Stage 3 Economic impact and social well-being	34	Commitment to sustainability	No. of activities for the social inclusion of the population in sustainable programmes
	35	Support to local companies wishing to be more sustainable	No. of programmes to improve operations of local businesses and make them more sustainable
	36	Integration of local businesses in the development process of the destination	No. of local businesses that participate in talks to foster tourism at the destination
	37	Community representation in the development process of the destination	No. of community representatives that participate in talks to develop tourism at the destination
	38	Safety as an element of well-being	No. of local crimes, robberies, assaults/year
	39	Free access of the population to tourist attractions (beaches, swimming pools)	No. of beaches/swimming pools without access restrictions vs total number of beaches/swimming pools

Sociocultural dimension			
Stage		Indicator	Measurement
Stage 1 Conservation of cultural heritage	1	Cultural sites under conservation	No. of sites under management and conservation programmes
	2	Local control of archaeological sites	No. of laws for managing archaeological sites
	3	Control of the number of visitors to cultural heritage sites	No. of sites with an established maximum number of visitors
	4	Promotion of local visits to cultural heritage sites by the local community	No. of local visits to cultural sites
	5	Satisfaction of visitors with the cultural sites at the destination	Percentage of visitors that give positive marks to the destination's heritage sites
	6	Intangible cultural heritage	List of intangible cultural heritage elements
	7	Monitoring of the impact visitors have on the cultural elements at the destination	No. of monitorings (frequency)
	8	Controls on the conservation of cultural elements	No. of rules in the code of conduct for visitors
	9	Site interpretation	Type of formats for interpreting sites (tourist guides, recorded devices, QR codes, printed materials, apps)
	10	Investments in the conservation and management of cultural heritage	Investment in culture vs full budget of destination
Stage 2 Local engagement in cultural activities	11	Awareness of local communities about their cultural heritage	No. of programmes to create awareness of the population about their cultural heritage
	12	Training of local tourist guides/cultural interpreters	No. of local tourist guides/cultural interpreters
	13	Training of local cultural facilitators	No. of local cultural facilitators trained at the destination
	14	Promotion of local cuisine	No. of restaurants serving local traditional cuisine
	15	Promotion of local culture at the destination	No. of local cultural events
	16	Information on cultural events at the destination	No. of advertisements of events in different formats
	17	Rescue of local cultural traditions	No. of research conducted to rescue local traditions
	18	Diversification of the cultural agenda at the destination	No. of cultural events for the local population and tourists
	19	Local participation in local events	Percentage of residents attending cultural events
Stage 3 Support to cultural enterprises	20	Promotion of local cultural enterprises	Percentage of cultural businesses at the destination
	21	Support to local cultural businesses	Percentage of local cultural businesses linked to the tourism sector
	22	Programmes that foster local craftwork	No. of programmes and policies to incentivize local craftwork
	23	Protection of local craftwork	No. of laws and regulations that protect local craftwork from imported craftwork
	24	Training in innovation for craftspersons	No. of artisans trained in new techniques

Sociocultural dimension			
Stage		Indicator	Measurement
	25	Fostering sustainable craftwork	No. of regulations that restrict the use of prohibited materials or endangered species
	26	Control of materials used in craftwork	Plan to penalize the use of prohibited materials (coral, tortoiseshell)

Environmental dimension			
Stage		Indicator	Measurement
Stage 1 Water, wastewater and solid waste management	1	Regular access to water for the population and tourists at the destination	Percentage of households and tourism companies connected to the water system
	2	Regular monitoring of water sources	Cubic meters of water reaching destination / day
	3	Local capability to meet the demand for water	Water supplied through water system vs total consumption (population + tourists)
	4	Efficient water consumption in the tourism sector	Water consumption tourist / day (litres)
	5	Water conservation programme	No. of water-saving regulations and/or voluntary actions
	6	Tourism sector commitment to water conservation	No. of venues with voluntary water-saving policies
	7	Tourism sector commitment to sustainability	No. of places that voluntarily reuse treated wastewater
	8	Wastewater management (secondary and tertiary systems)	No. of households connected to the system
	9	Wastewater management of the tourism sector (secondary and tertiary systems)	No. of tourism businesses with a wastewater management system
	10	Solid waste management	County waste management programme in place
	11	Adequate disposal of waste	No. of waste disposal sites at the destination
	12	Private waste management services	No. of solid waste management services
	13	Tourism sector and solid waste management	No. of companies that classify and recycle waste materials
	14	Programmes for boosting recycling companies	No. of laws that incentivize solid waste handling
	15	Programme to eliminate single-use plastics	No. of tourism businesses that have eliminated single-use plastics
	16	Programme for reducing and/or managing food waste	No. of tourism businesses with policies for reducing and/or managing food waste
Stage 2 Energy, transportation, tourism and conservation	17	Investments in renewable energies at the destination	Percentage of renewable energy produced in destination vs total energy produced in destination (fossil fuels included)
	18	Energy efficiency programmes applied at the destination	No. of programmes that incentivize the use of renewable energies (laws and regulations, financing programmes, tax exemption)
	19	Programmes for energy savings at the destination	No. of businesses with mixed energy or 100% renewable sources

Environmental dimension			
Stage		Indicator	Measurement
	20	Programmes that promote alternative transportation	No. of businesses with alternative transportation
	21	Tourism sector commitment to sustainability (1)	No. of companies that submit ICA on time at the destination
	22	Tourism sector commitment to sustainability (2)	No. of tourism venues with environmental certifications
	23	Tourism sector commitment to sustainability (3)	No. of tourism venues with quality certifications
	24	Tourism sector commitment to conservation	No. of businesses that sponsor an ecosystem or green spot
Stage 3 Conservation areas and environmental education	25	Natural heritage assets at the destination	List of natural heritage sites and assets
	26	Ecosystem conservation programmes	No. of existing conservation programmes
	27	Protected areas	Percentage of territory in the SINAP
	28	Natural areas as part of the tourism supply	No. of natural sites in destination (parks, green belts, etc.)
	29	Tourists visiting protected natural sites	No. of visitors in the protected area
	30	Supervising the impact of tourism on natural sites	No. of supervisions per year
	31	Actions to mitigate the impact of visitors	No. of actions to mitigate the impact of visitors on protected areas
	32	Funds that the sector applies for conservation	Percentage of tourism funds used to reinvest in conservation
	33	Environmental education programmes that make the population aware of their natural treasures	No. of local environmental education programmes
	34	Environmental orientation programmes	No. of environmental orientation programmes targeting tourists
	35	Circulation of environmental information	No. of tourism businesses that provide environmental information on the destination

NEW
NARRATIVES
for rural transformation

In this book, those who search for an equitable and sustainable future will find a valuable collection of methodological proposals, case analyses and recommendations for varied aspects of development. This book is an indispensable tool for decision-makers, researchers, development professionals and anyone interested in inequality issues. When diving into its pages, readers will discover a comprehensive approach based on evidence and endorsed by the experience and knowledge of experts. The book addresses topics ranging from poverty and income inequality to social protection, agriculture, energy, innovation, productivity and investment. It pays special attention to inequality gaps to understand them more fully and precisely.

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