OPPORTUNITIES FOR BOOSTING output, employment and value chains

Economic report on Central America, Mexico, Panama and the Dominican Republic

COORDINATORS:
Arnoldo López Marmolejo, Carlos Eggers Prieto and Marta Ruiz-Arranz

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INDICE

EXECUTIVE SUMMARY 4

CHAPTER 1
International economic context 6

CHAPTER 2
Boosting Value Chains 24

CHAPTER 3
Exports and Their Value Chains 43

CHAPTER 4
Boosting Competitiveness and Diversification in CAPARD and Mexico 54

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EXECUTIVE Summary

In 2021, the region comprising Central America, Panama, and the Dominican Republic (CAPARD) managed to reverse somewhat the downturn in economic activity it had experienced during the COVID-19 pandemic. In 2022, there was a slowdown in the global economy as a result of Russia's invasion of Ukraine and rising inflation and interest rates, one that is expected to continue into 2023. In this climate, CAPARD proved slightly more resilient in 2022 thanks to the recovery of the tourism sector and rise in agricultural exports. However, the region is set to follow a downward trend in 2023 in the wake of weaker global demand and higher interest rates.

It is important to remember that this region is still experiencing some of the aftereffects of the pandemic and in several countries the total number of people employed remains below its pre-pandemic level. While poverty did fall in 2021, the improvement was slight and the level of poverty that year was actually higher than before the pandemic.

Headline inflation in the region, particularly food inflation, rose in 2022. This was largely as a result of the surge in international commodity and energy prices, a rise driven by disruptions in global supply. Though inflation in the region is expected to slow during 2023, it will remain towards the top of the target range and, in some cases, even above it. As for the impact of international prices on the balance of trade, these have affected the economies of Latin America and the Caribbean in diverse ways, with some even benefiting from the price hikes. However, in the case of CAPARD and Mexico, the net effect on their trade balance is estimated to be negative, albeit only slightly.

In response to rising inflation, monetary policy rates were raised to levels, in some cases, as high as around 10%. The pass-through to bank lending rates to the private sector has been negligible; however, if this were to intensify, it could result in increased delinquency due to the high proportion of floating-rate debt. Meanwhile, in financial markets, the war and sense of global slowdown have led to periods of global risk aversion that have been reflected in a sharp increase in sovereign interest rate spreads in emerging economies, including Mexico and most CAPARD countries.

This combination of lower growth and higher interest rates and prices—particularly food prices—poses a challenge for the region when it comes to poverty and food security. The response of governments is crucial if there is to be coordinated action to address these challenges, revive the economy, and restore the progress made in the region's development.

Against this backdrop, this report examines the production structure of the countries of the region in order to pinpoint strategies for economic recovery, job creation, and export diversification. In this way, public policy responses will be able to take into account the specific characteristics of each sector.

Chapter 2 of the report looks at how increased production in the agroindustry, construction, and tourism sectors is particularly important for reactivating the economy due to the significant volume of inputs they demand from other sectors. The chapter discusses other sectors which, thanks to their network of links with the rest, can also serve to drive the economy. It also outlines potential actions aimed at promoting the various sectors.

There are other sectors that play a key role as suppliers to the rest of the region. Indeed, the largest suppliers within it are the financial services, retail trade, and professional services sectors, which is why it is important to continue to strengthen regulatory and competition aspects of these, as well as their human capital formation.

Similarly, there are certain sectors whose production chain has a high domestic component, either through employment, capital or locally produced intermediate inputs. Financial, education, and health services are above average for the economy in this respect, primarily due to the high use of labor and capital in their production processes. In contrast, agroindustry relies on a higher proportion of local inputs in its production chain. This is significant because all these sectors are less affected by disruptions to international supplies, such as those currently occurring.

Lastly, providing services in the education, health, and tourism sectors requires significant involvement of labor in the production chain, so increasing output in them has a particularly strong impact on the wage bill. In this post-pandemic setting of health systems under increased pressure, a decline in tourist activity, and an education divide caused by lockdowns that shows no sign of narrowing, boosting activity in these sectors would have the added benefit of greatly impacting employment and wages.

Chapter 3 offers a more detailed analysis of the production structure of those sectors responsible for the greatest share of exports. The sectors in question are estimated to have a higher demand for inputs than the rest of the economy does. This is the case for most of the economies analyzed, including those of the CAPARD region. Consequently, shocks to international demand will have a greater impact on the production structure than shocks to domestic demand. Therefore, in order to dampen the effects of volatility in international demand, it is particularly important to diversify exports. It is worth noting that exports of agricultural goods are less volatile than other exports. In light of this and due to the region's comparative advantages in agro-industrial production, Chapter 3 includes a series of recommendations aimed at increasing value added in this sector. Lastly, the chapter looks at how larger, better-educated countries with a comparative advantage in agricultural products and commodities have a higher share of local output in their exports, which is a public policy objective that governments can influence.

Finally, Chapter 4 reports on the performance of international trade in Mexico and CAPARD over time and looks at specific product opportunities for diversification. Specifically, it looks at various countries and how they could achieve greater export sophistication and greater diversification in terms of the destination of their exports. The chapter also discusses some of the trading advantages of the region (such as its proximity to complex global production chains in the U.S.) and cost advantages, which are significant for manufacturing. The textile industry could draw on these advantages as a means to achieve greater development, as could sectors producing more complex goods, such as machinery, electronic equipment, and chemical products. The chapter concludes by suggesting a series of more complex products that the region could diversify into based on its comparative advantages. It presents various country-specific examples for categories such as textiles, machinery, medical products, and electronic parts, as well as other manufactured goods. Lastly, the report takes a look at the need to advance in innovation and infrastructure in order to become more competitive in international markets.

CHAPTER 1

INTERNATIONAL economic context

CHAPTER 1

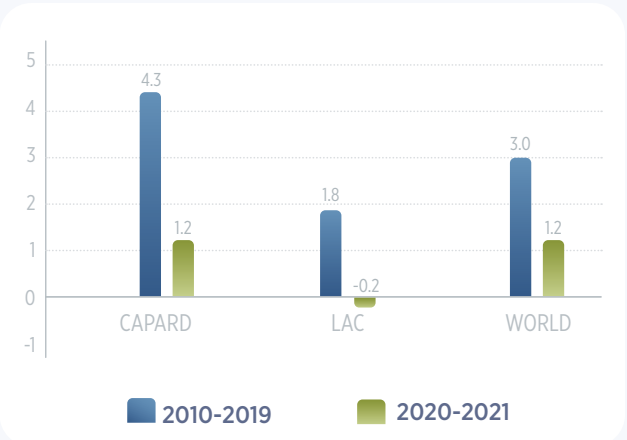
INTERNATIONAL economic context

Carlos Eggers Prieto, Arnoldo López Marmolejo
and Marta Ruiz-Arranz

In the years leading up to the pandemic, the region that comprises Central America, Panama, and the Dominican Republic (CAPARD) was recording economic growth rates above the average for Latin America and the Caribbean (LAC) and indeed the world (see Figure 1.1). Together with the financial and price stability of the time, this economic growth proved beneficial for development by bringing about a significant reduction in poverty rates (IADB, 2020).

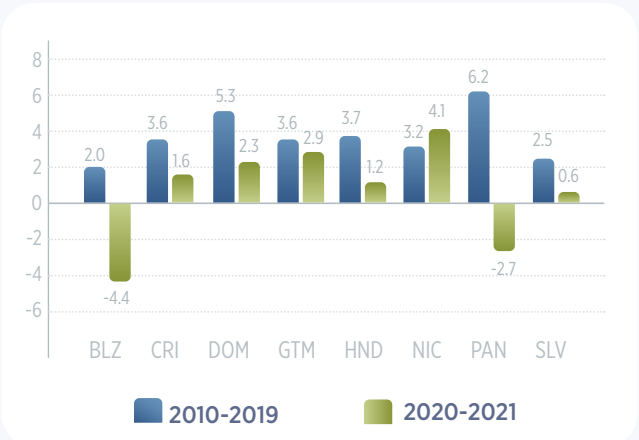
However, the COVID-19 pandemic and subsequent year of recovery meant that CAPARD countries were unable to maintain these higher rates. Between 2020 and 2021, growth in the region barely managed to keep up with that of the rest of the world (both averaging 1.2%). In fact, only Nicaragua managed to maintain a growth rate close to its pre-pandemic average (see Figure 1.2).

FIGURE 1.1. Average real GDP growth 2010–2019 and 2020–2021: CAPARD, LAC, and the World



Source: World Bank Open Data.

FIGURE 1.2. Average real GDP growth 2010–2019 and 2020–2021 by CAPARD country

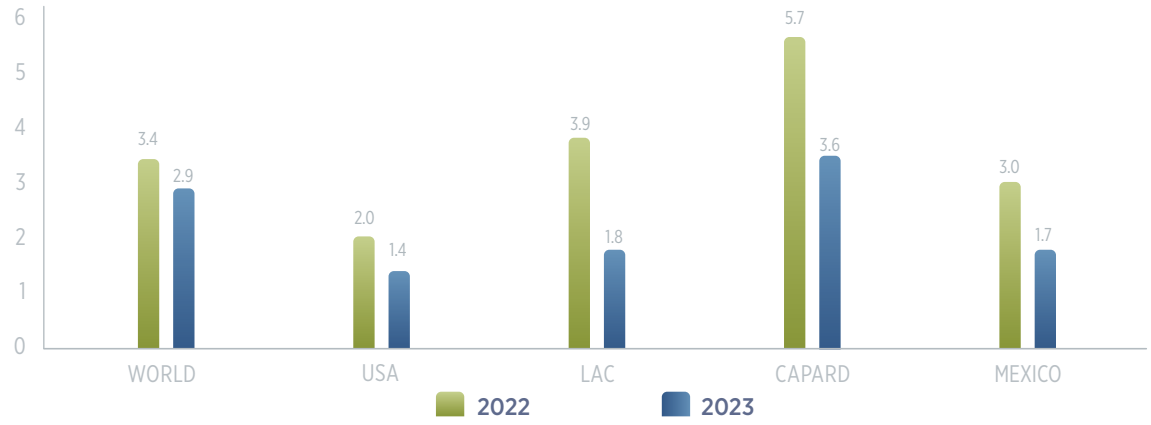


Source: World Bank Open Data.
Note: International Organization for Standardization (ISO) country codes.

In 2022, global growth was below what had been initially forecast due to Russia's conflict with Ukraine and rising inflation and interest rates. U.S. growth in 2022 is estimated to have been 2.0% and worldwide growth 3.4% (compared to the start-of-year estimates of 4.0% and 4.4%, respectively). Against this backdrop, LAC, CAPARD, and Mexico are estimated to have grown by 3.9%, 5.7% and 3.0%, respectively, in the same year. Growth in the CAPARD region has proved more resilient thanks to the bounce-back of tourism and increased agricultural exports. As a result, by October 2022 formal employment in the countries of the region was back to its pre-pandemic level (February 2020), having grown 5.1% in CAPARD[1] and 4.9% in Mexico during the period. Nevertheless, in some countries total employment remains below its pre-pandemic level, which suggests that workers may be exiting the labor market (see IADB COVID-19 Labor Observatory).

In 2023, global economic growth is expected to continue on a downward path. More specifically, it is estimated that the U.S. will grow by 1.4% and the world by 2.9%. At the same time, CAPARD is forecast to expand by 3.6% and Mexico by 1.7%.

FIGURE 1.3. Projected GDP growth for 2022 and 2023



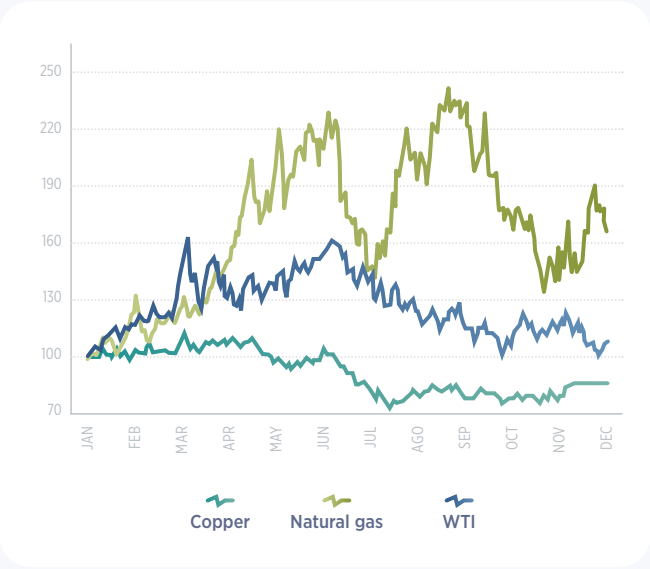
Source: *World Economic Outlook* (IMF, January 2023) and national surveys.

As a consequence of Russia's conflict with Ukraine, international energy and food prices rose sharply in the first half of 2022, followed by a slight slowdown in the second half of the year. By December 2022, the price of gas was 65.4% higher than it had been at the start of the year and that of crude 6.76% higher. Both these figures are less than the equivalent figures for June of 129% and 61%, respectively. As for foodstuffs, the international price of corn, wheat, and rice in December was up 10.3%, 0.1%, and 23.3%, respectively, on what it had been in January. In June, the same prices stood at 34%, 44%, and 19% higher, respectively (see Figures 1.4 and 1.5).

In the vast majority of countries around the world, the surge in international prices has been reflected in a sharp rise in inflation. The IMF (2022) revised upwards its 2022 forecast for global inflation from 7.4% to 8.8% and from 4.8% to 6.5% for 2023. This outlook suggests that while global inflation may have peaked by the third quarter of 2022, it will remain high through 2023. Meanwhile, the Food and Agriculture Organization has warned of the risk of food shortages in 2023 as a result of the conflict in Ukraine and of the threat that hunger poses to stability (FAO, 2022).

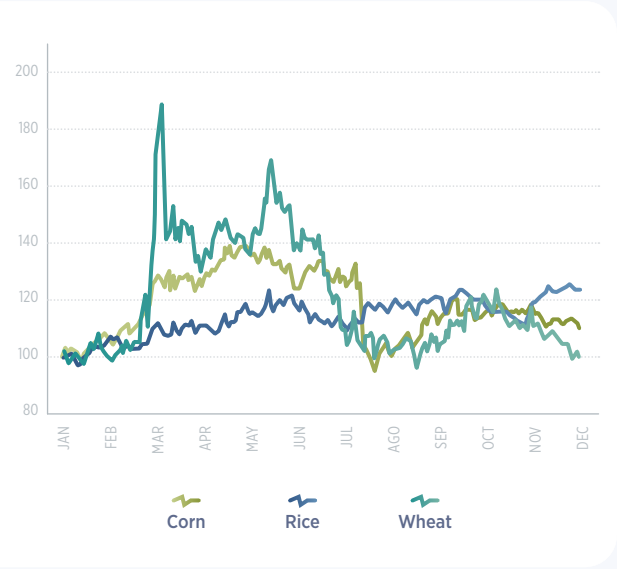
1 Based on a sample comprising Costa Rica, El Salvador, Nicaragua, and the Dominican Republic.

FIGURE 1.4. Commodity prices (January 2022 = 100)



Source: Calculations based on Bloomberg data.

FIGURE 1.5. FOOD PRICES (JANUARY 2022 = 100)



Source: Calculations based on Bloomberg data.

In this vein, food and drink price inflation in CAPARD increased sharply in 2022. In several countries of the region, the year-on-year change in the price of these products at mid-year stood at over 15% (see Figure 1.6).

The combination of rising food prices and higher energy prices resulted in a substantial increase in headline inflation in the region. In a number of countries, headline inflation rose above the 10% level by mid-2022 (see Figure 1.7). The last quarter of the year saw a slight easing thanks to lower energy prices.

FIGURE 1.6. Year-on-year price inflation: Food and drink

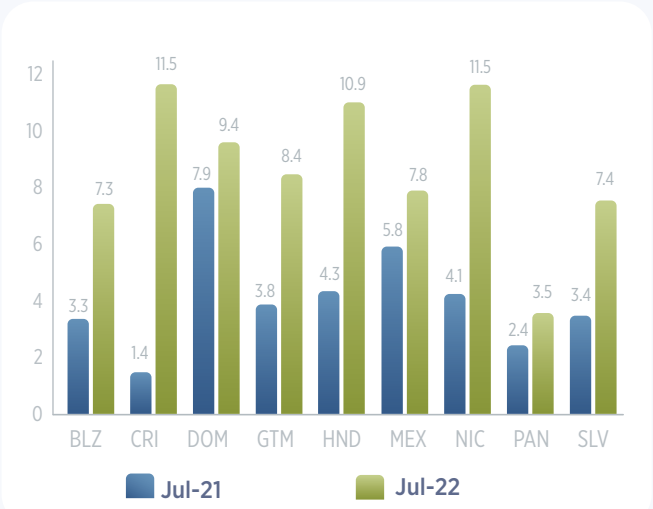
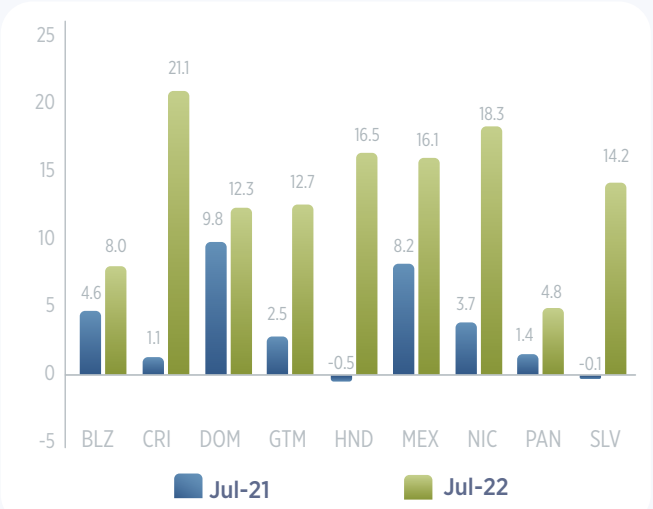


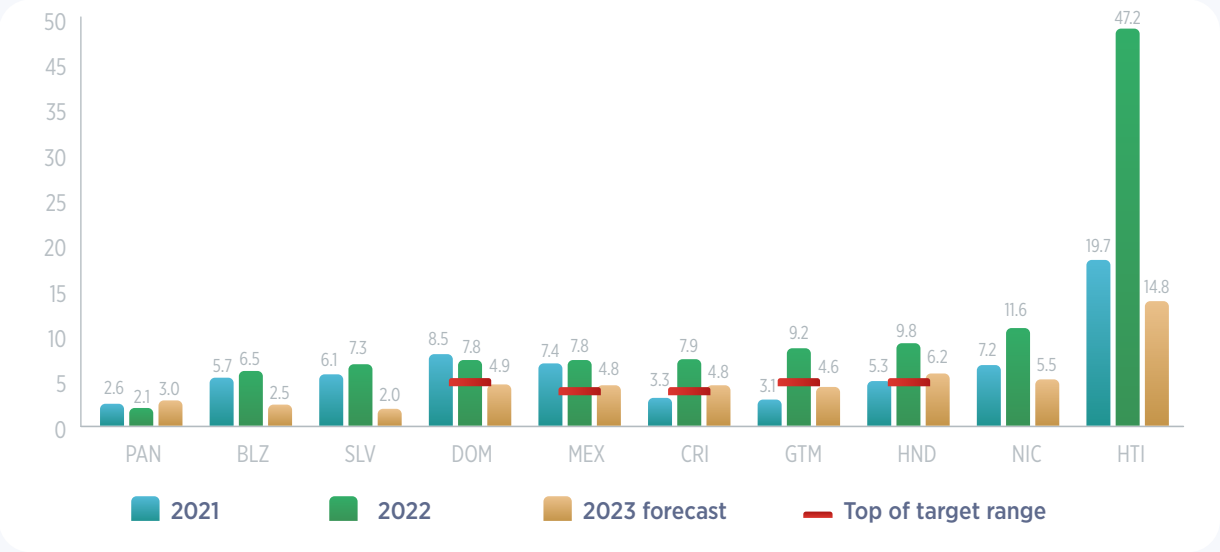
FIGURE 1.7. Year-on-year price inflation: Headline



Source: Central American Monetary Council and central banks.

While inflation is expected to continue to ease in 2023, the fall is expected to be gradual and in several countries it is expected to be closer to, or even above, the top end of the central bank's target range.

FIGURE 1.8. Consumer price inflation and 2023 forecast



Source: Central banks for December inflation and World Economic Outlook (IMF, October 2022) for 2023 forecast.
Note: The most recent data for Belize is from November, and for Haiti from October.

In this context, it would be useful to identify the source of the inflationary pressures countries face and the effect of these, which in turn will enable us to determine the effectiveness of different policies at mitigating price rises. To a certain degree, the increase in inflation in the countries of the region may stem from the same source, particularly in the current climate of rising international energy and food prices, though there will be other factors specific to each country that will also be driving inflation locally. With this in mind, we perform a statistical exercise to break down the deviation of inflation from its historical average into a single component common to all the countries analyzed and another specific to each country.[2]

Given that the annual inflation rate for food and other goods and services in 2022 was significantly higher than its 2008–2019 average, we analyze both food inflation and non-food inflation. In the case of food inflation, our estimates suggest that most of the deviation from the historical average is due to a factor common to all countries and that this common component is strongly correlated with the international price of wheat and corn, as shown in Figure A1.3 of the Appendix. As for non-food goods and services, the common factor in inflation is also dominant, albeit to a lesser extent, and in this case highly correlated with the international price of crude (see Figure A 1.4 of the Appendix).

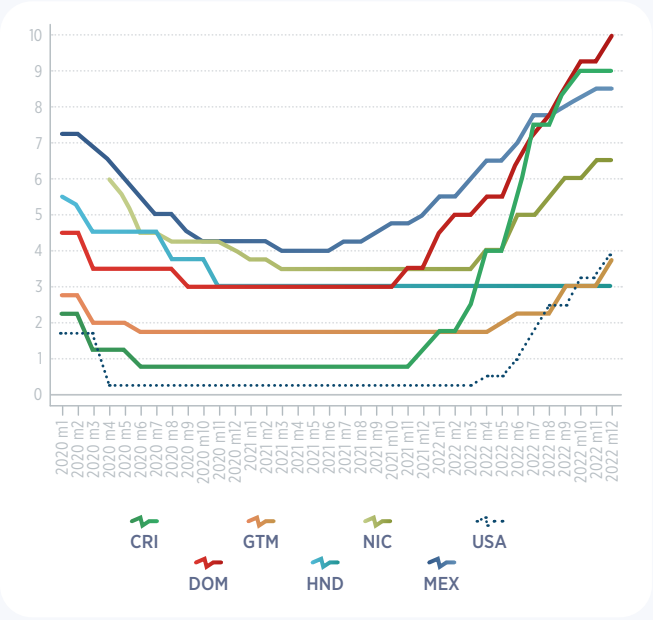
2 The Appendix provides a description of the dynamic factor model used and presents the results by country.

The CAPARD region and Mexico are both open economies in terms of trade and finance, so a greater aversion to global risk and a situation of higher interest rates could result in tighter financing conditions. At the same time, increases in international food and commodity prices are reflected in the balance of trade, as will be explained later.

Financial Channel

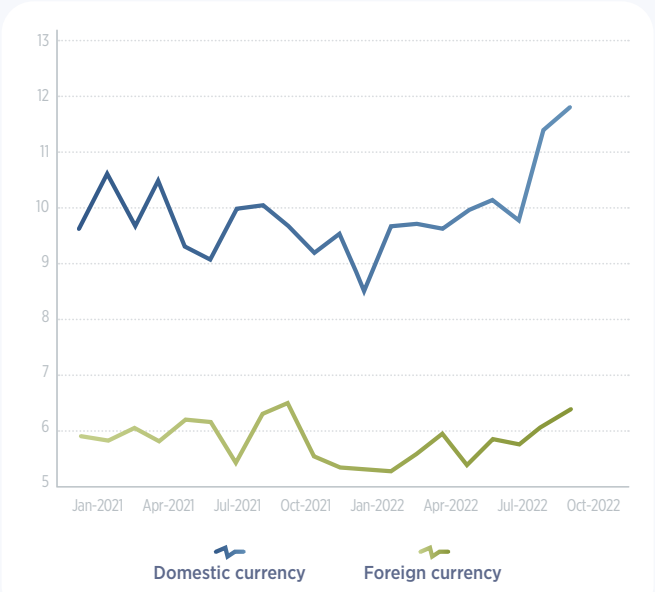
In response to rising inflation, the region's central banks have reacted with sharp hikes in monetary policy interest rates. These increases have coincided with a rise in the U.S. monetary rate (see Figure 1.9). In several countries of the region, the monetary interest rate went from its lowest historical level to a rate approaching the rate of inflation, bringing them closer to a neutral monetary stance. However, the pass-through of this rise in bank lending rates to the region's private sector has been low in both domestic and foreign currency (see Figure 1.10).

FIGURE 1.9. Monetary policy reference rate



Source: Central American Monetary Council.
Note: Data corresponds to start of each month.

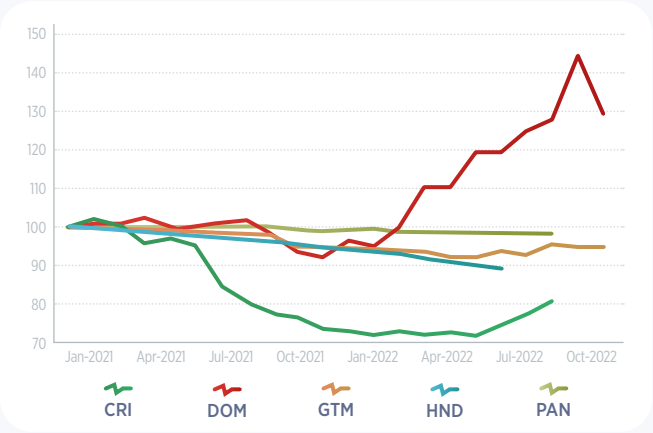
FIGURE 1.10. Average CAPARD bank lending rate: Domestic and foreign currency



Source: Central American Monetary Council.

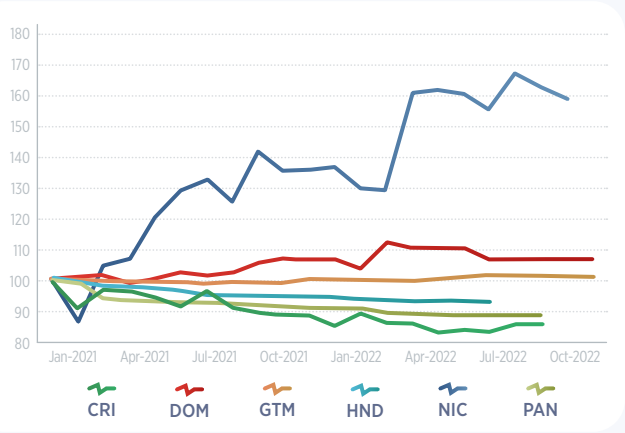
If we look at the various components of bank lending, we see that in most countries there were no major changes in housing loan interest rates. In contrast, the trend in Costa Rica has been downward since January 2021, while in the Dominican Republic rates have been rising since January 2022 (see Figure 1.11). A similar pattern can be seen in the rate for consumer loans (Figure 1.12), which has remained stable in most countries. In Costa Rica, Honduras and Panama, the rate has actually fallen slightly since January 2021, while in Nicaragua it has risen.

FIGURE 1.11. Nominal lending rate for housing loans (Domestic currency, January 2021 = 100)



Source: Central American Monetary Council

FIGURE 1.12. Nominal lending rate for consumer loans (Domestic currency, January 2021 = 100)



Source: Central American Monetary Council

A number of central banks in the region have conducted stress tests based on a rise in interest rates and concluded that while a substantial hike in interest rates would not threaten the solvency of the banking system, it would increase the delinquency rate of borrowers (see BCCR, 2022, 21; BCN, 2022, 8; BCRD, 2022, 95). The immediate pass-through would occur through higher repayments on variable rate loans, then in reduced affordability of new loans, both fixed-rate and variable-rate. In several countries of the region, most loans in the financial system are priced at floating rates.[3] It is estimated that in the CAPARD region, a 100 basis-point increase in the domestic currency lending rate would result in a 0.2% reduction in the balance of the private sector loan portfolio.[4]

Meanwhile, government debt is put under pressure when there is an increase in its floating-rate debt (which is linked to inflation) and by new financing needs. Most government debt in the countries of the region is issued at fixed rates. For example, 69% of all central government debt in Costa Rica and 64% in Mexico in 2022 is issued at fixed rates. Inflation-linked bonds also account for a moderate share (e.g., in Costa Rica they constitute 7% of central government debt and in Mexico 21%).

As for financing requirements, in order to refinance maturities and cover public deficits, it will be necessary to turn to the markets. According to the IMF, fiscal deficits in the region in 2023 will be similar to those of 2022, ranging from 1.8% of GDP in Nicaragua to 5.6% of GDP in El Salvador (IMF, 2022). In this respect, investors seem to rank countries differently according to their level of public debt, among other variables. This was first observed in eurozone countries in June, when those with the highest debt-to-GDP ratio recorded the greatest increase in their sovereign spreads in the wake of Russia's conflict with Ukraine (see Figure 1.13). In response, the European Central Bank announced it was to implement a liquidity facility to avoid interest rate fragmentation among its member countries. In emerging countries, this pattern appears to be only just emerging (see Figure 1.14), and the considerable variability in rate increases seems to be down to local factors.

3 A number of studies (see Rubio, 2011 and 2019) suggest that when the proportion of floating-rate loans is high, it is worth considering adopting macroprudential policies, such as a countercyclical loan-to-value limit.

4 This is based on the estimated effect of the interest rate on bank loans to the private sector calculated in López-Marmolejo (2021, 43). Specifically, the interest rate coefficient in column 2SLS of Table A 2.1 and a 100 basis-point increase from the 2020 simple average of the weighted average domestic currency lending rate in CAPARD of 11%.

FIGURE 1.13. Increase in 10-year bond interest rates since the onset of the Ukraine crisis and level of public debt in 2021: Europe

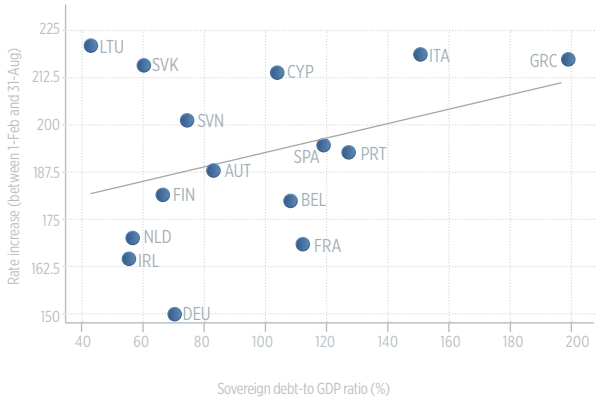
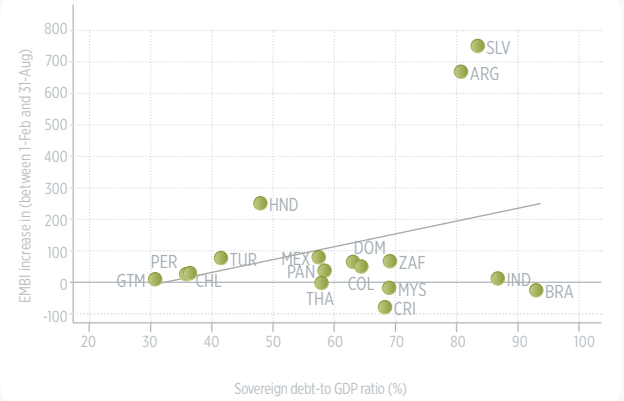


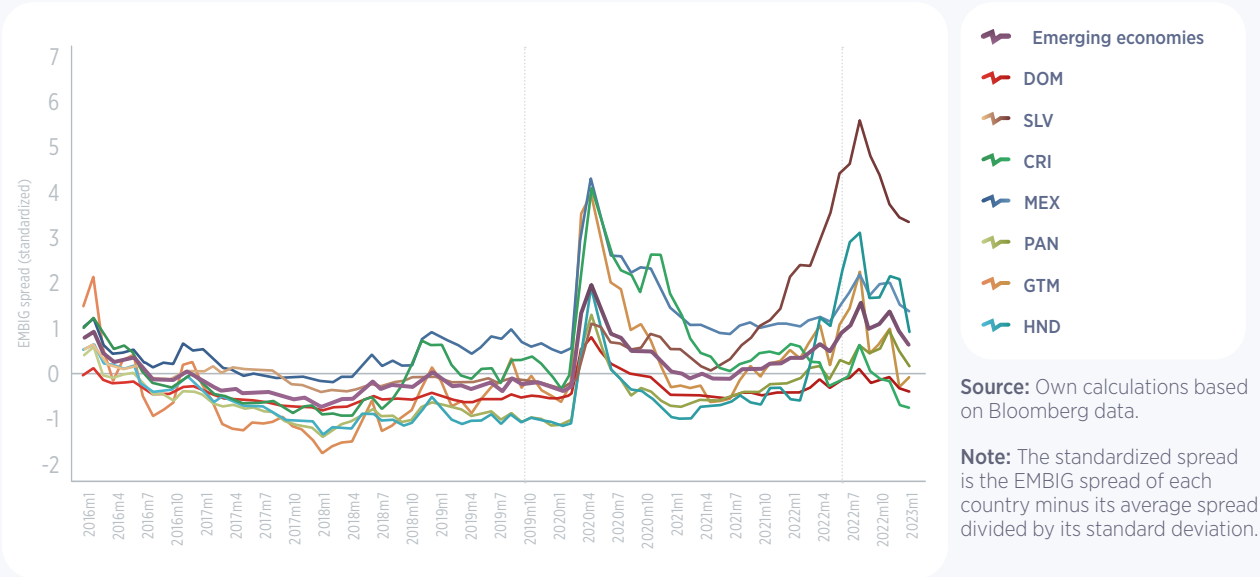
FIGURE 1.14. Increase in interest rates since the onset of Ukraine crisis and level of public debt in 2021: Emerging economies



Source: Calculations based on Bloomberg and IMF data.
Note: Rate increase between February 1 and August 31, 2022.

However, it is important to remember that some emerging economies recorded increases in their interest rate spreads in previous periods of global risk aversion, as occurred during the COVID-19 pandemic. This perception of market risk slowly turned around over the next two years, until the outbreak of Russia's war against Ukraine, when spreads began to rise once again. In general, spreads in the CAPARD region have followed a similar path to those of other emerging economies (see Figure 1.15).

FIGURE 1.15. EMBIG spreads

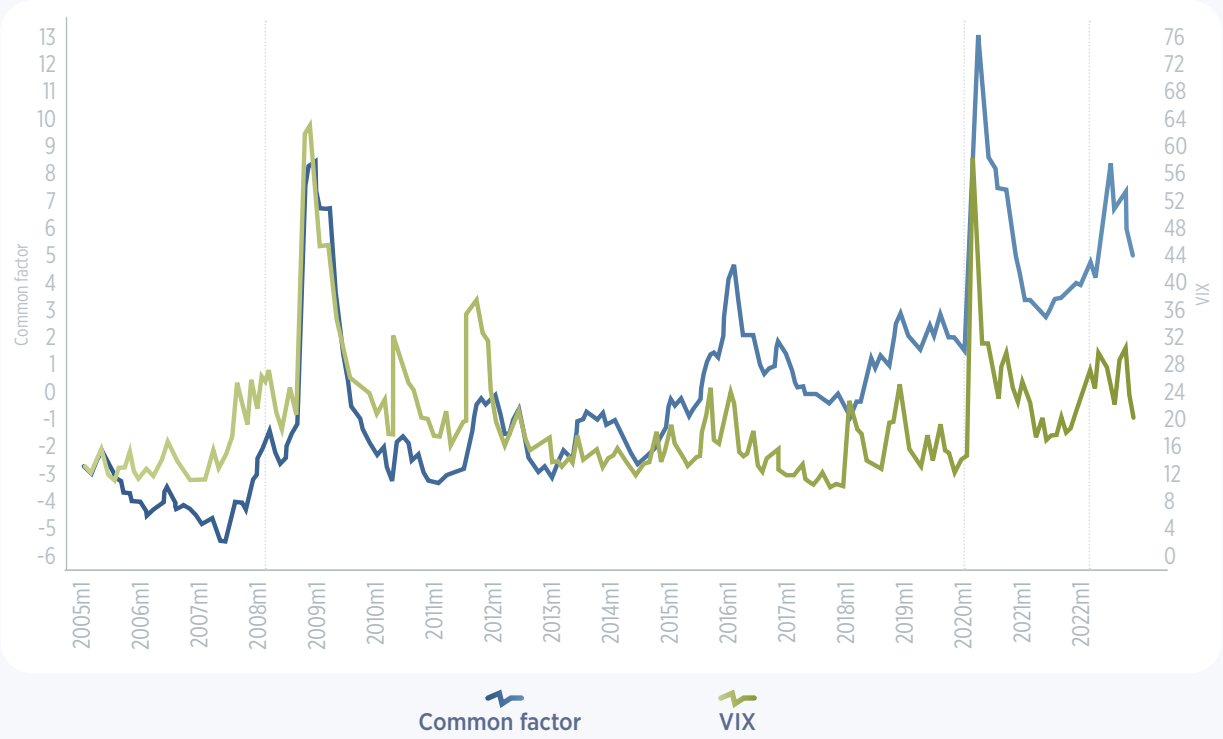


Source: Own calculations based on Bloomberg data.

Note: The standardized spread is the EMBIG spread of each country minus its average spread divided by its standard deviation.

The behavior of interest rate spreads cannot be explained by international factors alone; there are domestic factors in each country that contribute to its increase or decrease, depending on their effect on the perception of risk. In order to break down these factors, we split the deviation of each country's spread from its historical average into two components: a factor common to all emerging economies and a country-specific one.[5] By estimating this decomposition for emerging economies, we are able to identify a common factor. It is worth noting that this common factor behaves similarly to the VIX volatility index, which is used as a proxy for global risk aversion (see Figure 1.16). To be precise, the correlation between the common factor and the VIX index is 0.6. This suggests a close relationship between the difference between sovereign interest rate spreads in emerging economies and their historical averages and global risk perceptions.

FIGURE 1.16. Common factor and VIX index

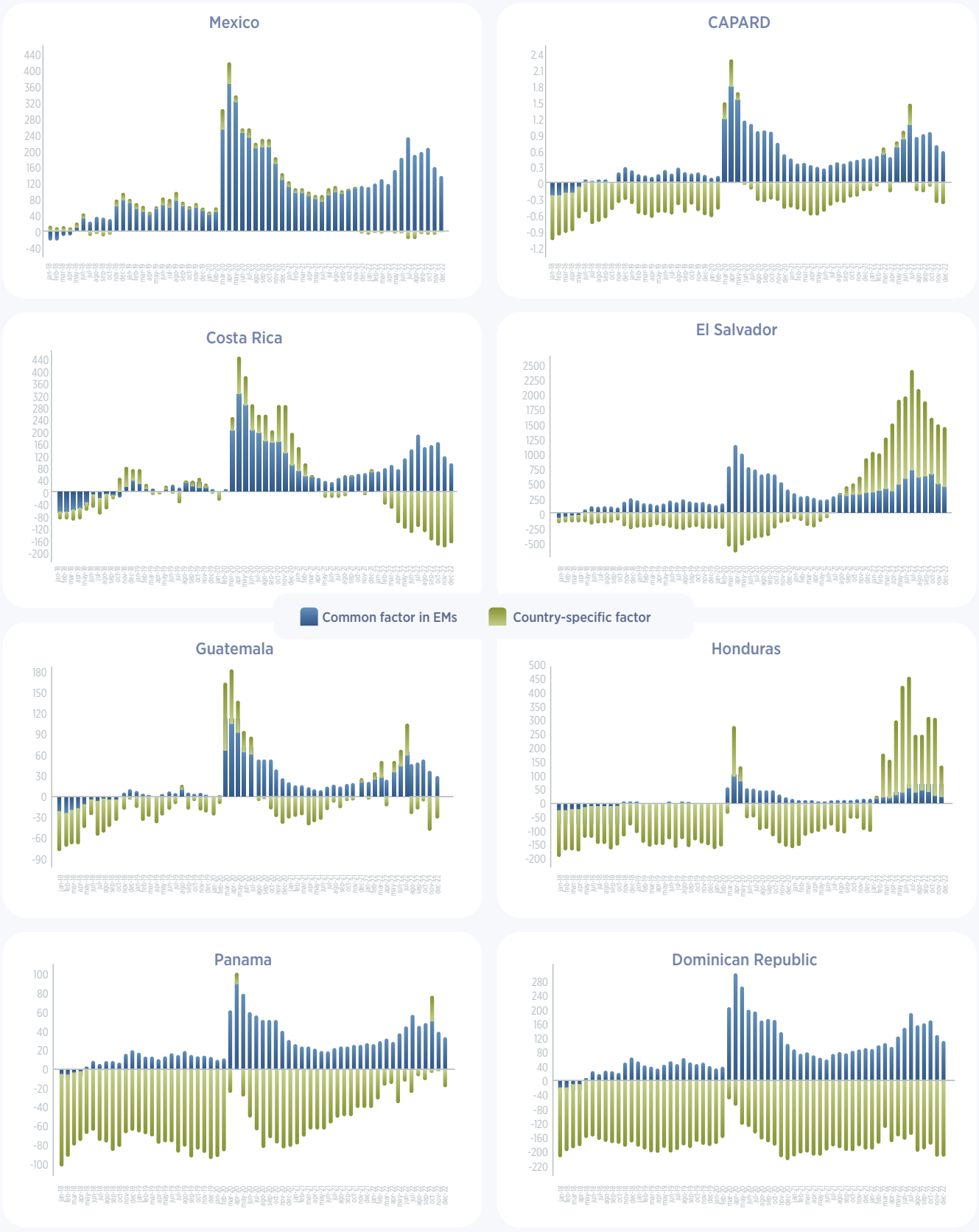


Source: Own calculations based on Bloomberg data.

The common factor is the predominant factor in the spread increase in most CAPARD countries and in Mexico in 2022 (see Figure 1.17). In the case of country-specific factors, the results suggest that their contribution has been growing in recent months, particularly in El Salvador and Honduras. This contrasts with Costa Rica, where these factors have led to a narrowing of the gap.

5 We estimate a dynamic-factor model. The model's dependent variable is the difference between the EMBIG spread, $S_{i,t}$, of country i in period t and the country's average spread, S_i. In the model, this variable is explained by a factor common to all countries, F_t, which affects each one differently. Hence, the equation to be estimated is $S_{i,t} - S_i = \beta_i F_t + \varepsilon_{i,t}$, *where* $\varepsilon_{i,t}$ is the residual of each country, which is understood to be the country-specific component. Lastly, since F_t is an unobservable variable, the model assumes that F_t follows an AR(1) process and it is estimated using the Kalman filter. The historical average is calculated based on the daily data available for each EMBIG country for the period 2005 to 2022. For more details on this methodology, see the Appendix.

///FIGURE 1.17. Difference in EMBIG

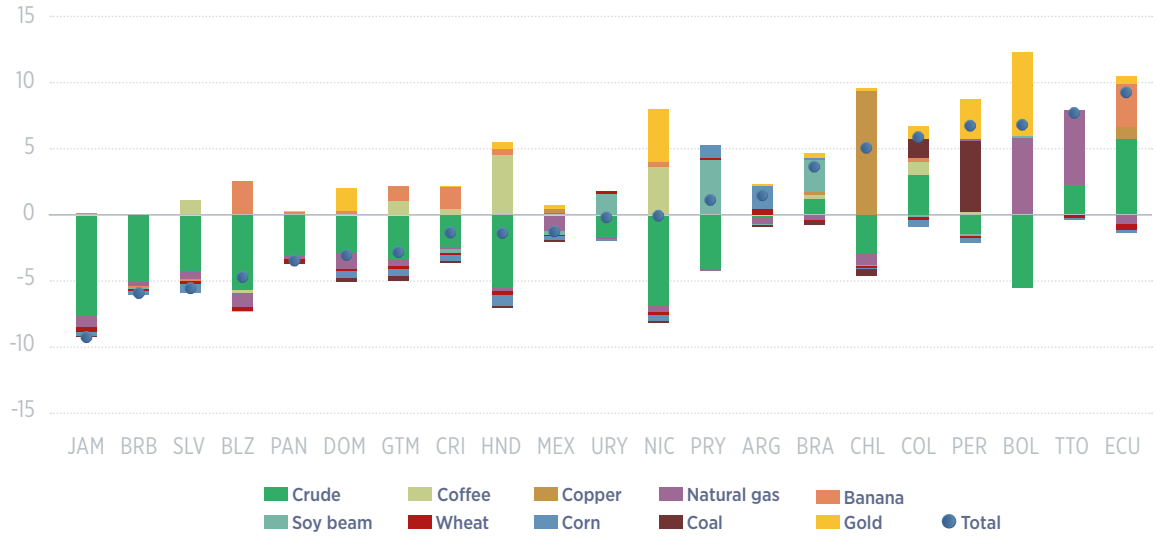


Source: Own calculations based on Bloomberg data.
Note: For CAPARD, each country's spread is standardized, and the simple average shown.

Trade Channel

In general, the LAC region is a net exporter of foodstuffs, though the situation is mixed when it comes to energy. As for commodities in the aggregate, around half of the countries show a trade deficit and half a surplus. The deficit is usually due to imports of energy products, primarily petroleum products. This can be seen in CAPARD countries and, to a lesser extent, in Mexico. The trade balance-to GDP ratio disaggregated by commodity is shown in Figure 1.18.

FIGURE 1.18. Net commodity exports in 2021 (% of GDP)

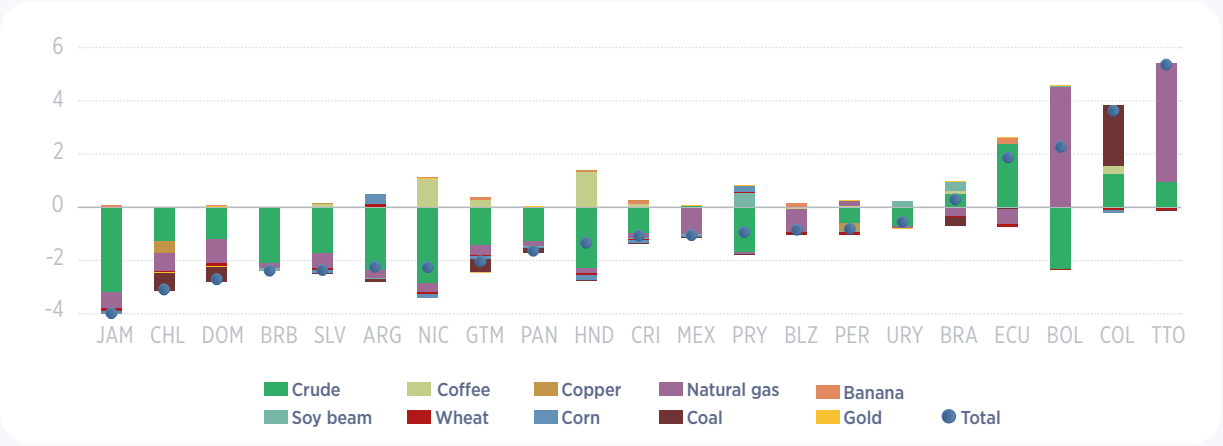


Source: Compiled by authors based on UN Comtrade data
Note: Data for 2021 or 2019 depending on availability.

The surge in prices previously described affected the balance of trade between countries differently depending on their individual trade balance for each foodstuff and commodity. Hence, the rise in their prices can have either a favorable or unfavorable net effect in each country. In CAPARD countries, the change in the international price of food and commodities in 2022 had a negative impact, primarily because of petroleum products, corn, and wheat. We estimate an average effect of -2% of GDP for the year, and close to -1% of GDP in Mexico. Figure 1.19 shows the estimated effect of prices on the balance of trade by foodstuff and commodity as a percentage of GDP, based on the assumption that the quantities of imports and exports remain constant.[6] The graph shows that of LAC countries, CAPARD economies were among those where the effect on the trade balance was negative, this despite a favorable rise in the price of coffee; the main reason for this was the increase in the price of crude.

6 In order to make an accurate projection, we would need to estimate the supply and demand elasticities for each product in each country. However, for the purpose of cross-country comparison, the assumptions made in the exercise do not affect the qualitative results. The calculation is made taking the average price for 2021 as the base price for each product and the average price for 2022.

FIGURE 1.19. Effect of international price rises on the balance of trade in 2022 (% of GDP)

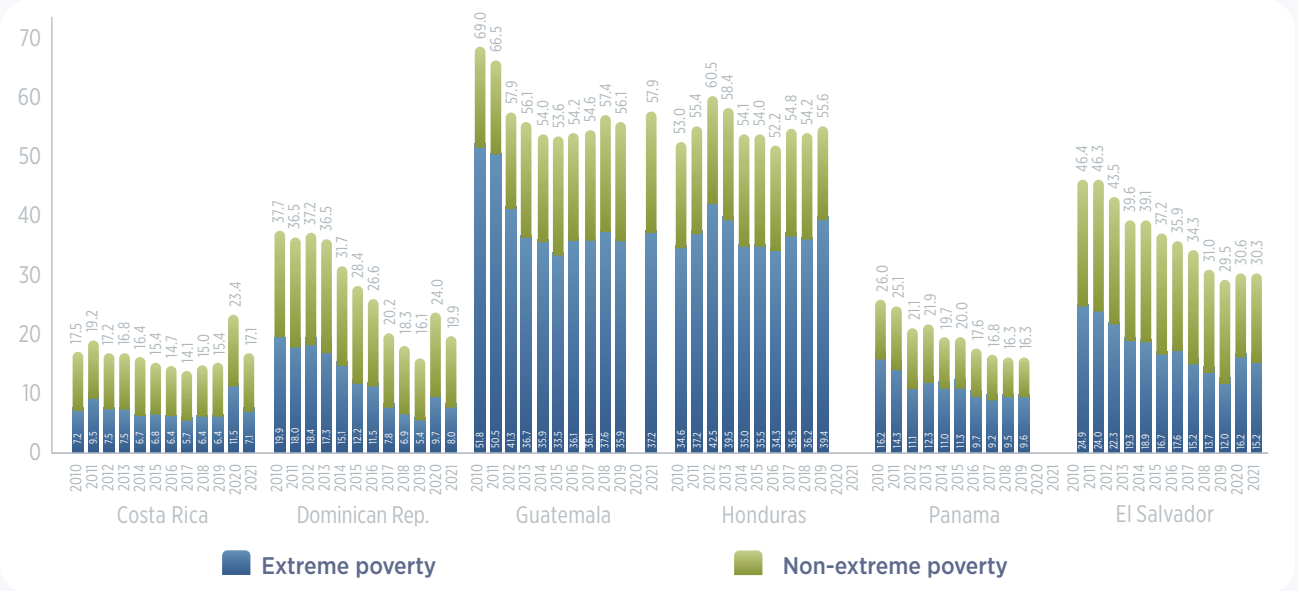


Source: Own calculations based on UN Comtrade and Bloomberg price data.
Note: Most recent data available as of December 6, 2022. We assume that the last recorded price is maintained throughout the remainder of 2022.

Poverty and Food Security

During the 2010s, economic growth in the region generally brought significant progress in terms of poverty reduction. Between 2010 and 2019, notable cases of this include El Salvador, Panama, and the Dominican Republic, particularly the latter, which cut its poverty rates by more than half. Despite this, the economic slump and job destruction caused by the pandemic undid this improvement to a certain extent, resulting in a significant rise in the poverty rate during 2020. In 2021, the economy recovered, and while poverty levels were lower compared to 2020, in several countries they remained above their pre-pandemic level (see Figure 1.20). Increases in the cost of basic household food baskets in 2022 are expected to make it difficult to reduce the poverty rate and may even cause it to rise.

FIGURE 1.20. Percentage of population living in poverty



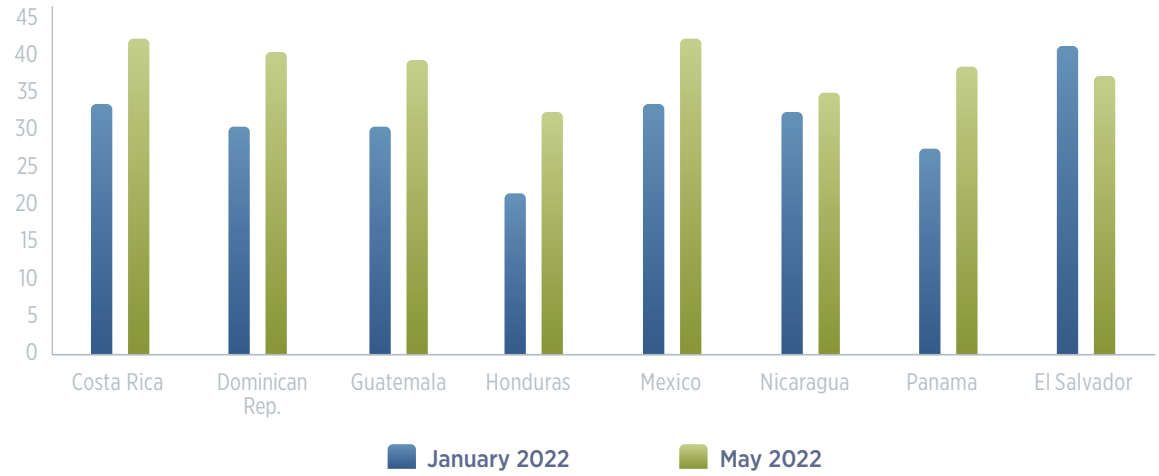
Source: Own calculations based on household surveys.

Note: Households in extreme poverty are those whose total per capita income is below US$ 3.1 per day at purchasing power parity (PPP), while households in non-extreme poverty are those whose total per capita income is between US$ 3.1 and US$ 5 per day at PPP.

As a result of the COVID-19 crisis, the countries of the region began to experience higher rates of food insecurity (dating back to the earliest available data). The FAO estimates that the prevalence of moderate and severe food insecurity as a percentage of the population in Belize, Costa Rica, El Salvador, Guatemala, and Honduras in 2021 was 42.3%, 15.9%, 46.5%, 55.9%, and 49.9%, respectively.

As a result of rising prices, the number of households worried about being able to afford basic necessities increased substantially in the first half of 2022 (see Figure 1.21). Around 40% of households in CAPARD countries report that their main concern is being able to meet their basic needs.

FIGURE 1.21. Main household concern in 2022: Cost of meeting basic needs/Not being able to make ends meet



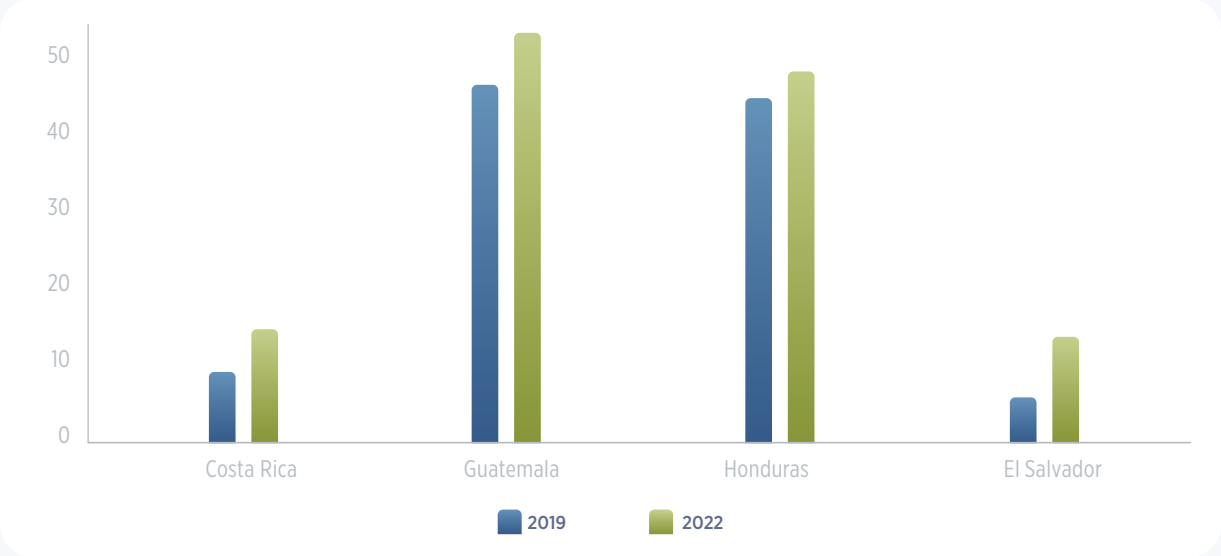
Source: CID Gallup. Surveys for January and May 2022.

In response to this, governments have taken steps to mitigate the rise in food insecurity. In general, the region has eliminated or temporarily reduced taxes on staple foods, made cash transfers to low-income households, introduced a range of price controls, provided subsidies to producers of certain staple crops and introduced gas price subsidies, as well as reaching agreements with the private sector to curb the rise in the price of a number of basic commodities. Spending on such measures in the countries of the region is estimated to be around 1.2% of GDP. The packages of measures vary greatly from one country to the next, ranging from 0.1% of GDP in Costa Rica to 1.3%-1.8% of GDP in El Salvador, Honduras, Nicaragua, and the Dominican Republic, and 2% of GDP in Mexico.[7] The greatest share of spending has been on energy subsidies, primarily for gasoline.

In spite of these efforts, rising food prices have had an impact on food insecurity. The estimated percentage of the population whose income is less than the cost of the basic food basket (BFB) in 2019 and 2022 (after adjusting the basket to take into account the recent rise in food prices) shows an increase in this period.

7 For more details of the measures and patterns of food insecurity in the region, see IADB (2022).

FIGURE 1.22. Percentage of the population whose income is less than the cost of the basic food basket (2019 and 2022)



Source: Own calculations.

Note: For this exercise, we consider all monetary, non-monetary, labor, and non-labor household income reported in the respective household surveys. We take the cost of the BFB in mid-2019 and use the 2019 surveys to calculate the percentage of households with incomes below that cost. We perform the same calculation for 2022 using the 2021 surveys and the most recent cost of the BFB (November for Costa Rica and Guatemala, and October for El Salvador), except in the case of Honduras, for which we use the 2019 survey adjusted for the country's rise in nominal incomes between 2019 and 2022, and BFB cost data from 2021, adjusted for year-to-date food inflation up to November 2022.

In sum, the economic climate of the region is characterized by growth that is expected to be lower than the historical average and by rising food insecurity. This adverse environment for households underscores the urgent need to focus on initiatives aimed at boosting household incomes in the countries of the region by revitalizing output and employment. With a view to identifying strategies for raising output, Chapter 2 highlights those sectors where the capacity to boost national output and employment through the latter's demand for goods and services from other sectors of the economy is particularly significant. Chapter 3 examines local participation in global value chains and discusses a number of strategies aimed at promoting them. Lastly, Chapter 4 discusses a number of strategies and sectors that could help bring about greater trade diversification in the region.

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APPENDIX 1.1

Decomposition of Inflation

To break down inflation into a factor common to all economies and a country-specific one, we use a dynamic factor model in which the deviation of inflation in period t from the average rate in sector s of country i depends on a factor specific to that sector, F^s, though common to all countries, and a residual ε, which is the country-specific component. Hence, the econometric model for inflation in one sector in one country is given by the following equation:

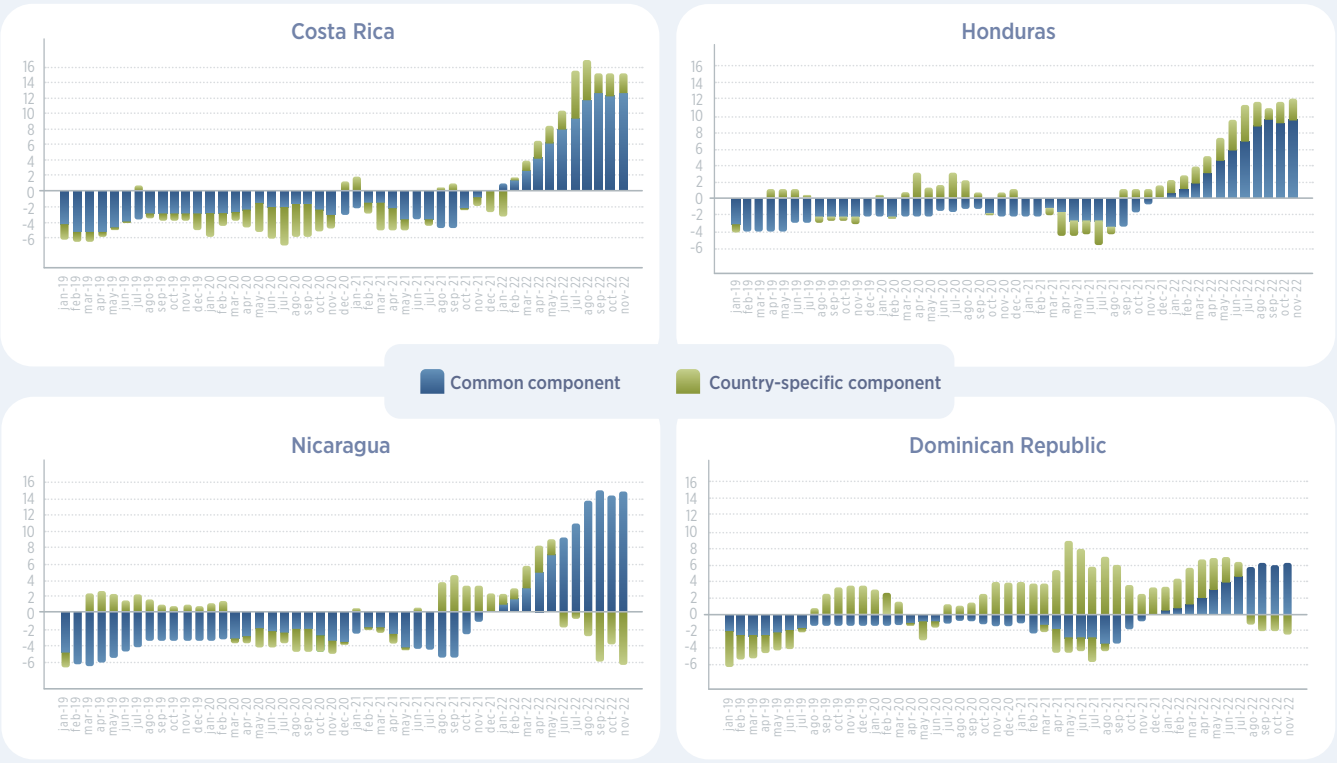
$$\pi_{s,i,t} - \pi_{s,i} = \underbrace{\beta_{s,i} F_t^s}_{\text{Factor común}} + \varepsilon_{s,i,t}$$

For the factors, we assume a VAR(1) process, and as they are not observable, we obtain them using the Kalman filter. In this case, we use two sectors: food (A) and non-food (N). Due to the availability of data for this disaggregation, we analyze Honduras, Nicaragua, Costa Rica, and the Dominican Republic. Thus, the system of equations is as follows:

$$\begin{pmatrix} \pi_{A,\text{CRI},t} - \bar{\pi}_{A,\text{CRI}} \\ \pi_{N,\text{CRI},t} - \bar{\pi}_{N,\text{CRI}} \\ \pi_{A,\text{DOM},t} - \bar{\pi}_{A,\text{DOM}} \\ \pi_{N,\text{DOM},t} - \bar{\pi}_{N,\text{DOM}} \\ \pi_{A,\text{HND},t} - \bar{\pi}_{A,\text{HND}} \\ \pi_{N,\text{HND},t} - \bar{\pi}_{N,\text{HND}} \\ \pi_{A,\text{NIC},t} - \bar{\pi}_{A,\text{NIC}} \\ \pi_{N,\text{NIC},t} - \bar{\pi}_{N,\text{NIC}} \end{pmatrix} = \begin{pmatrix} \beta_{A,\text{CRI}} & 0 \\ 0 & \beta_{N,\text{CRI}} \\ \beta_{A,\text{DOM}} & 0 \\ 0 & \beta_{N,\text{DOM}} \\ \beta_{A,\text{HND}} & 0 \\ 0 & \beta_{N,\text{HND}} \\ \beta_{A,\text{NIC}} & 0 \\ 0 & \beta_{N,\text{NIC}} \end{pmatrix} \begin{pmatrix} F_t^A \\ F_t^N \end{pmatrix} + \begin{pmatrix} \varepsilon_{A,\text{CRI},t} \\ \varepsilon_{N,\text{CRI},t} \\ \varepsilon_{A,\text{DOM},t} \\ \varepsilon_{N,\text{DOM},t} \\ \varepsilon_{A,\text{HND},t} \\ \varepsilon_{N,\text{HND},t} \\ \varepsilon_{A,\text{NIC},t} \\ \varepsilon_{N,\text{NIC},t} \end{pmatrix}; \quad \begin{pmatrix} F_t^A \\ F_t^N \end{pmatrix} = \begin{pmatrix} \phi_{A,A} & \phi_{A,F} \\ \phi_{F,A} & \phi_{F,F} \end{pmatrix} \begin{pmatrix} F_{t-1}^A \\ F_{t-1}^N \end{pmatrix} + \begin{pmatrix} \mu_{A,t} \\ \mu_{N,t} \end{pmatrix}$$

We calculate the deviation of inflation from its 2008-2019 average. The graph containing the results of the decomposition of both components is shown below:

///FIGURE A1.1. Deviation of food inflation from its historical average by common and country-specific component



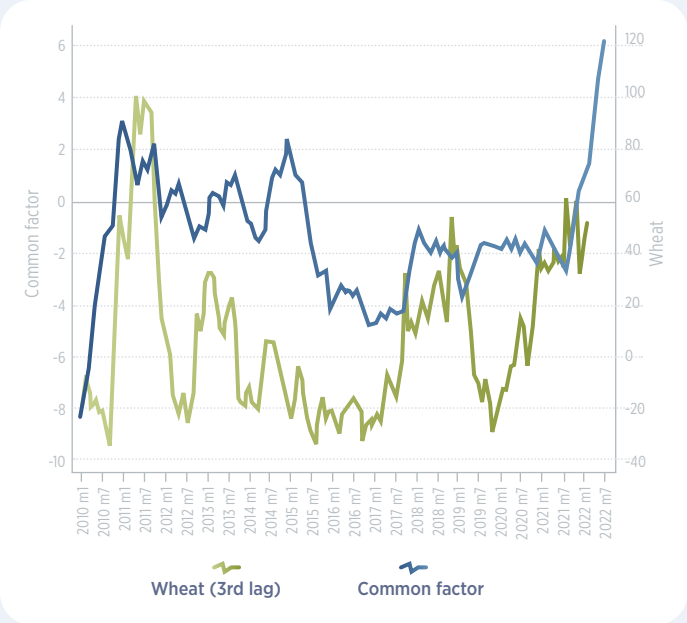
Source: Own calculations based on Central American Monetary Council inflation data.

///FIGURE A1.2. Deviation of non-food inflation from its historical average by common and country-specific component

Source: Own calculations based on Central American Monetary Council inflation data.

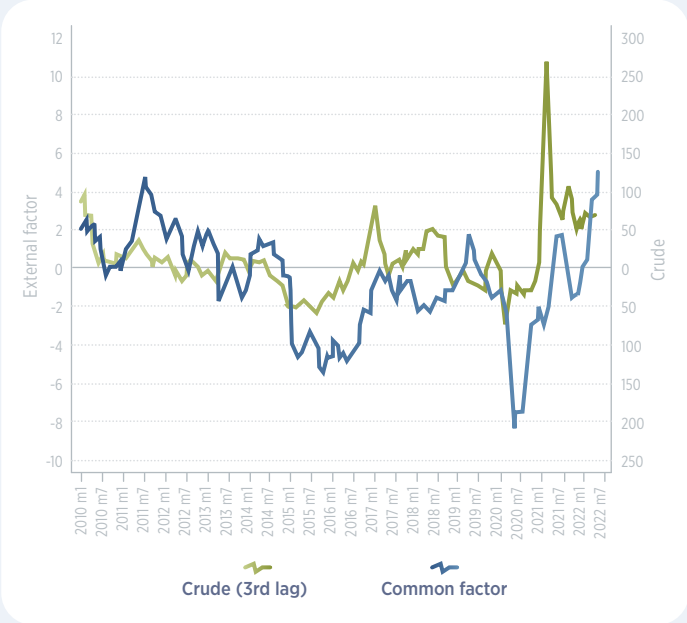
Though the common component is unobservable, in both cases it is highly correlated with international commodity prices. The common factor in food inflation has a correlation with the price of wheat and corn of 0.63 and 0.48, respectively, while the common factor in non-food inflation has a correlation of 0.48 with the international price of crude. The following graphs show the close link between the common factor and international prices previously described with respect to food and non-food inflation.

FIGURE A1.3. Common factor in food inflation and annual change in the international price of wheat



Source: Own calculations based on Executive Secretariat of the Central American Monetary Council (SECMCA) inflation data and Bloomberg price data.

FIGURE A1.4. Common factor in non-food inflation and annual change in international crude prices



Source: Own calculations based on Executive Secretariat of the Central American Monetary Council (SECMCA) inflation data and Bloomberg price data.

CHAPTER

2

BOOSTING
value chains

CHAPTER 2

BOOSTING Value Chains

Carlos Eggers Prieto and
Arnoldo López Marmolejo

At a time when the international economy is characterized by adverse conditions and limited fiscal space, identifying those productive sectors that have the greatest capacity to boost other sectors of the economy could provide an important source of input for designing a strategy aimed at reviving economic activity and creating new jobs.

To identify these sectors, we estimate the effects that an improvement in output by sector can have on the rest of the economy in the countries of Central America and the Dominican Republic. An increase in output in a particular sector can have a spillover effect on other sectors of the economy due to linkages in the supply of intermediate goods[8] needed for production. To estimate these effects, we conduct an analysis of the input-output matrices of each country. An input-output matrix encapsulates the production structure of an economy, thus making it possible to gauge the aggregate impact of a change in a specific activity on the production network as a whole.[9]

The impact each sector has depends on a range of factors, such as the extent to which that sector's production network is interconnected, whether or not domestic supply sectors have an international competitive advantage, and the factors of production (i.e., capital and labor) used in producing domestic output. Accordingly, countries whose sectors are more closely interconnected than those elsewhere and whose supply sectors are more internationally competitive and have an availability of domestic capital and labor (making them less dependent on imports) will benefit more from an improvement in any one sector.

Furthermore, intersectoral linkages can have a magnifying effect—one that may account for a significant share of aggregate economic fluctuations (Foerster et al., 2011 and Acemoglu et al., 2012)—and are key to understanding the response of the overall economy to shocks from a specific sector, for example, due to an increase in its productivity (Caliendo et al., 2018).

8 Intermediate goods refers to the goods and services required in the production of other goods.
9 The input-output matrices available are El Salvador, 2005; Costa Rica, 2011; the Dominican Republic, 2012; and Guatemala and Honduras, 2013.

To provide context, section one describes the relative weight of different sectors in the output of the various countries of the region, as well as how these sectors have performed since 2020, when the COVID-19 pandemic first hit the region.

Section two looks at those sectors that have the greatest impact on the aggregate of the countries of the region when their output increases.

Similarly, there are certain sectors that are key to the production chain: industries whose production is geared towards providing intermediate goods and services for a significant number of sectors and which enables these to proceed with subsequent stages of production. Section three takes a closer look at these. Identifying such sectors is important in order to ensure the proper functioning of production chains. Policies aimed at making these sectors more efficient could have a major impact on the rest of the economy.

Analyzing the linkages within production networks also enables us to identify those sectors where improving output helps boost value-added creation in the economy as a whole. Developing these sectors could help generate greater value added and better-quality employment in the domestic production network, which in the medium term would foster greater economic growth and development. Accordingly, section four includes an analysis of the sectors that generate the highest value added and the largest wage bill (i.e., the total amount received by workers as a result of their labor and earnings).

2.1. Production structure and recent production performance by sector

Table 2.1 shows the relative weight of individual sectors in the output of the countries analyzed in the region, where it can be seen that the agricultural sector is particularly important (accounting for between 5.5% and 11.6% of output, depending on the country). The biggest contributor to output is the manufacturing sector. For example, agroindustry accounts for 51% of manufacturing in Guatemala, 43% in Costa Rica, 45% in El Salvador, and 51% in the Dominican Republic. Another important sector is retail trade, hotels, and restaurants, which accounts for between 13% and 20% of output. The construction sector has a weight of between 6% and 13%.

TABLE 2.1 Relative weight in gross output by sector

SECTOR	CRI	DOM	GTM	HND	SLV
Agriculture, livestock, forestry, and fisheries	7.2	5.0	11.6	9.7	5.9
Mining	0.2	3.7	1.3	0.8	0.2
Manufacturing	25.2	19.2	24.5	34.0	25.6
Electricity, gas, and water	2.4	3.9	2.9	3.2	4.6
Construction	8.6	13.1	6.1	6.0	6.1
Retail trade, hotels and restaurants	13.3	16.4	20.3	14.1	16.3
Transportation, warehousing, and communications	6.3	9.2	6.8	7.1	10.0
Finance, insurance, real estate, and business services	22.4	10.7	14.6	12.5	17.8
Community, social, and personal services	14.4	18.6	12.0	12.5	13.5

Source: Own calculations based on the input-output matrices of each country.

In the wake of the COVID-19 pandemic, the closure of economies to contain the spread of the virus led to a fall in output in virtually every sector in each country. This being the case, the most resilient sector in several countries of the region (including El Salvador and Guatemala) was the agricultural sector, whose production returned to pre-crisis levels in almost all cases. As far as recovery is concerned, the most notable sector in Costa Rica and, to a lesser extent, Guatemala was manufacturing. In the first case, this was probably influenced by the medical devices sector, one that also performed well in the other countries, along with agroindustry. The latter sector appears to be returning to pre-crisis levels in all of the countries analyzed. In contrast, the tourism sector has yet to recover, and in El Salvador and Honduras, the construction sector continues to lag behind.

FIGURE 2.1. Index of economic activity by sector and country (January 2020 = 100, seasonally adjusted series)

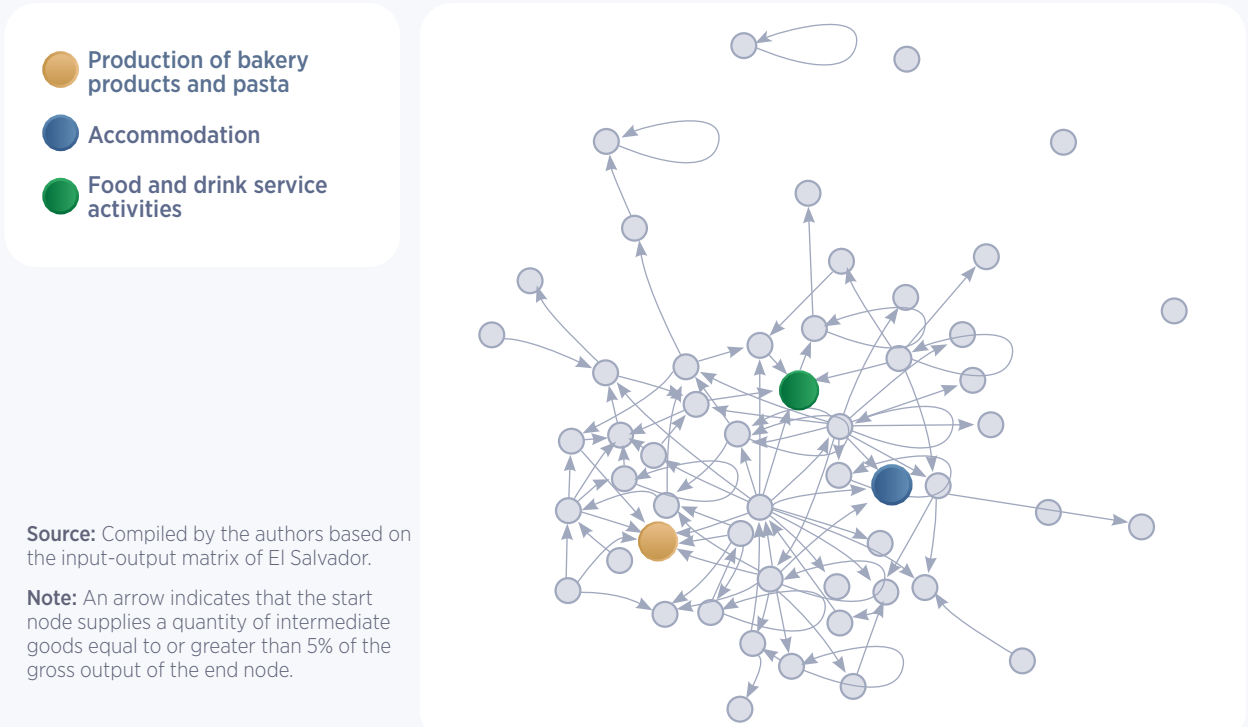
Source: Based on data from the Executive Secretariat of the Central American Monetary Council.

2.2. Sectors that boost total domestic output

The analysis of the impact of an increase in the output of each sector on the aggregate of the economy is based on the methodology of Leontief (1944), a summary of which can be found in the Appendix. In this specific case, we estimate the increase in the gross output of all sectors of the economy when the gross output of each individually increases by one unit (of the currency and unit of measurement used in the input-output matrix of the country concerned). This increase is often referred to as the 'multiplier,' in this instance of gross output. Gross output comprises the total output of a given sector, including both end- and intermediate-use output. This is used to quantify the spillover or backward linkage effect of a sector upstream in the production chain. This spillover effect initially occurs as a result of the direct demand for intermediate goods in a sector (the direct effect), then subsequently the demand that the production of those goods creates in other sectors (the indirect effect).

The industries with the biggest multipliers are those with a higher relative demand for domestic intermediate goods. Figure 2.2 shows an example of a production network, in this case El Salvador's. Each node represents a productive sector, while the arrows indicate the flows of intermediate goods (as a percentage of gross output). The line starts at an initial node that supplies a quantity of intermediate goods equal to or greater than 5% of the gross output of the end node (i.e., the one the arrow points towards). This means that the weight of the intermediate goods from the start node in the output of the end node (the target or demand node) is considerable. The nodes that have the most arrows pointing towards them are those that demand products from the most sectors. For example, the three highlighted nodes—tourist accommodation services, food services, and the bakery and pasta agri-business sector—have arrows pointing to them from five sectors.

FIGURE 2.2. El Salvador's production network: Demand sectors



Source: Compiled by the authors based on the input-output matrix of El Salvador.

Note: An arrow indicates that the start node supplies a quantity of intermediate goods equal to or greater than 5% of the gross output of the end node.

It would aid economic recovery if the sectors that provide a major boost to domestic output were to grow, such as those shown in Figure 2.2 for El Salvador. There is a positive relationship between the size of the gross-output multiplier and the level of use of domestic intermediate goods. Table 2.2 shows three sectors whose multipliers were among the highest in each country and whose weight is highly significant in the economies of the region: agroindustry, construction, and tourism. For example, the multiplier of 1.82 for agroindustry in Costa Rica means that every 1-colon increase in that industry's output will generate a 1.82-colon increase in total output, taking into account the industry's relationship to other sectors of the economy within the production process. Agroindustry has a weight of 10.9% in the country's total gross output. Across the region, the weight of this sector ranges from 9.7% of output in the Dominican Republic and Honduras to 12.4% in Guatemala. The weight of tourism in these economies is significant at around 4% of output, peaking at 6.6% in the Dominican Republic; meanwhile, construction ranges from 6% of output in Honduras to 13.1% in the Dominican Republic.

TABLE 2.2 Gross-output multipliers and weight by sector

SECTOR	Costa Rica	El Salvador	Guatemala	Honduras	Dominican Republic
Gross-Output Multiplier					
Agroindustry	1.82	1.72	1.77	1.76	1.75
Construction	1.60	1.44	1.69	1.52	1.58
Tourism	1.69	1.74	1.79	1.68	1.55
National average	1.42	1.44	1.47	1.42	1.43
Percentage of Total Gross Output					
Agroindustry	10.9	11.5	12.4	9.7	9.7
Construction	8.6	6.1	6.1	6.0	13.1
Tourism	4.2	4.3	4.1	3.4	6.6

Source: Input-output matrix of each country, most recent available data.

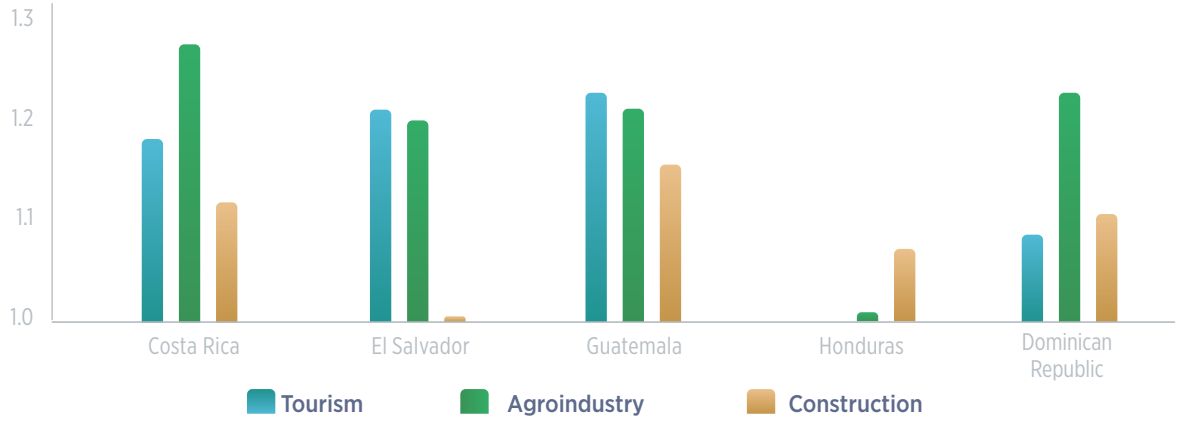
Notes: In Honduras, agroindustry means agricultural products, while tourism includes retail trade and hotels and restaurants (for want of a more disaggregated breakdown of the sectors).

Figure 2.3 shows the ratio of the multiplier of these sectors to the average multiplier of each country concerned. We use the average multiplier of the country's sectors for comparison purposes. It is clear that most of these sectors produce a boost between 7% and 30% greater than the average of all sectors of the economy.[10] In the Dominican Republic, these sectors are responsible for generating around 20% more output than the average of all sectors of the economy.[11] In Costa Rica, agroindustry shows a boost of around 30% higher than the average, similar to tourism in El Salvador, where the latter sector that has the largest effect there (followed by agroindustry). In Guatemala, tourism and agroindustry have a similar effect, with a boost almost 20% above the average of all sectors in the country combined.

10 With the exception of tourism and, to a lesser extent, agroindustry in Honduras, due to the fact that there is less disaggregation in these sectors, which makes it impossible to measure their individual contribution more precisely.

11 In the case of the Dominican Republic, the results are consistent with a recent study by its central bank (BCRP, 2020), which suggests that the industries with a relative demand for intermediate goods higher than the average of other industries are the food industry, construction, retail trade, accommodation, and food and beverage services, and drink and tobacco product manufacturing.

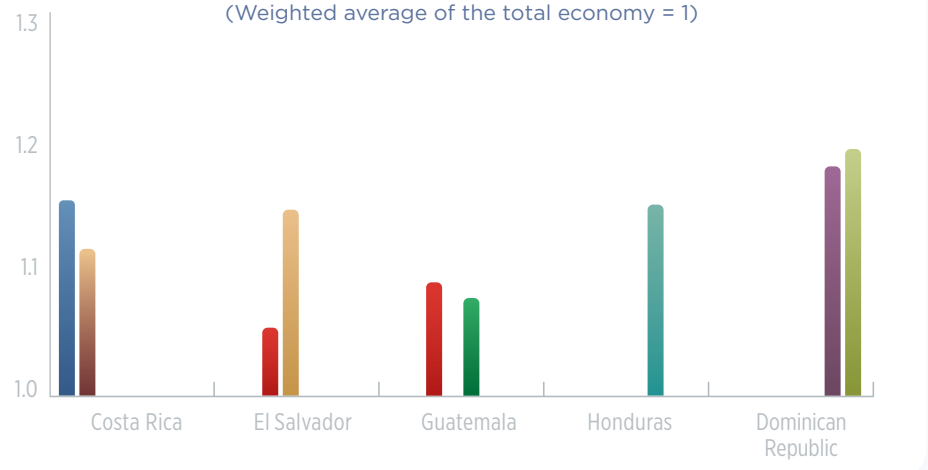
FIGURE 2.3. Gross-output multiplier index: Common sectors (Weighted average of the total economy = 1)



Source: Own calculations based on the input-output tables of each country.

It is important to note the other sectors in each country that also have a significant effect on gross output. Figure 2.4 shows what these are in each case, specifically the ratio of the sector multiplier to the average multiplier in each country. In Costa Rica, non-metallic mineral products (such as bathroom furniture, bricks, tiles, glass, cement, concrete, and the like) and wood and wood products have an effect more than 10% greater than the average (1% and 0.6% of gross output). Note that non-textile manufacturing in this country has a multiplier 6% higher than the economy average and is also highly diversified. In El Salvador, the sectors that stand out are livestock and textiles (2.4% and 6.3% of gross output). In the case of Guatemala, it is livestock, crops, and textiles (3.2%, 7.4%, and 2.6% of gross output); in Honduras, manufacturing, and in the Dominican Republic, water and energy, and telecommunications (3.9% and 1.9% of gross output). Though these figures are modest, the impact of these sectors is considerable.

FIGURE 2.4. Gross-output multiplier ratio: Other sectors of note



Source: Own calculations based on the input-output tables of each country.

Recommendations

- The agroindustry sector has created a local value chain that provides a substantial boost to the rest of the economy, which is why it would be wise to continue to help improve its productivity. Investing in public goods helps achieve this, for example, investing in irrigation infrastructure, phytosanitary programs, improved access to technical and market information, agricultural research and innovation, and financial products to protect against climate risk.

- It would also be useful to work on regionally driven support policies that could be harnessed to achieve synergies between different countries in, for example, construction, regional infrastructure or regional complementary tourism, including regional archaeological and ecological tourism tours and beach tours. In regard to regional infrastructure, the Inter-American Development Bank (IADB) has been collaborating on redeveloping the Pacific Corridor highway network and its primary regional corridors by investing over USD 1 billion in financing and technical cooperation. It has also backed investment in border infrastructure to help facilitate regional trade. Between 2015 and 2022, it funded projects aimed at modernizing infrastructure, equipment, and border control processes in Nicaragua, Costa Rica, and Panama to the tune of USD 254 million.

- One element worth bearing in mind when it comes to construction is public sector infrastructure projects. These bring additional benefits such as making other sectors more competitive by reducing distribution costs, in addition to the major social benefit. These are often used by a large number of citizens, help create development hubs, and provide access to public services. Therefore, it would be a good idea to work on developing a portfolio of priority national infrastructure projects and carry out feasibility studies on these, and ultimately be ready to start construction on them as soon as funds become available and/or there is a need to boost the economy in order to offset a sudden shock. Brichetti et al. (2021) estimate that CAPARD will need US$189 billion of infrastructure investment in the transport, water and sanitation, digital connectivity, and energy sectors if it is to meet the Sustainable Development Goals (SDGs).

- Compared to the other sectors with high multipliers, it is worth noting that the textile sector has the potential to diversify into more sophisticated products, new markets, and more sustainable products (becoming bluesign certified, for example).

- In the medium term, there could be investment in training, financing, or public goods to support the development of the agri-food, intermediate manufacturing, and footwear sectors through the creation of an institutional delivery mechanism (a fund, a development bank, etc.).

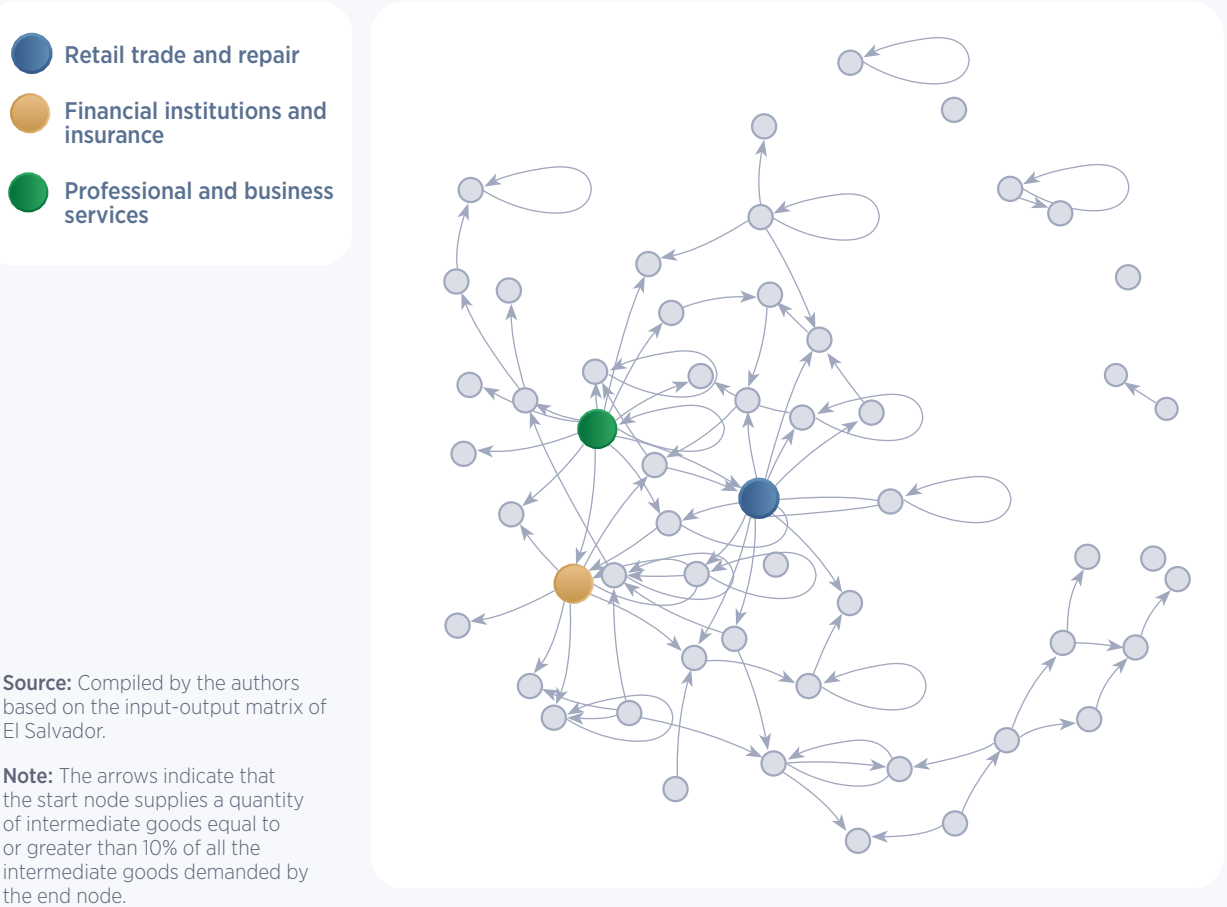
- It is also particularly important to identify and eradicate any “bottlenecks” affecting each of the sectors, such as delays at border crossings, high transport costs, and lack of cold-chain capacity, so as not to hamper their development.

- In several countries of the region, the sectors that have the greatest effect on the aggregate of the economy (i.e., the greatest multiplier) are agroindustry, construction, and tourism, so it would be worthwhile for countries in the region to share their success stories in their efforts to promote these.

2.3. Enabler sectors within the production networks of domestic systems

It may be that there are certain sectors which, on their own, are not major players within the country's economic structure yet which nevertheless play an important role in the productive system by feeding into a large group of production chains. These sectors can therefore be regarded as enablers of the productive system and their proper functioning is vital for the domestic production system. To illustrate this graphically, we show the production network of the flow of intermediate goods as a fraction of their total. Figure 2.5 shows El Salvador's production network, but in this case calculated as a percentage of all the intermediate goods supplied. As before, each node represents a productive sector, though now the arrows start at an initial node that supplies a quantity of intermediate goods equal to or greater than 10% of all the intermediate goods demanded by the end node it points towards. The purpose of this is to identify those sectors that supply to a significant number of other sectors. The figure of 10% of intermediate goods enables us to set a threshold that can be plotted on the graph to indicate the supply of a modest yet significant proportion of intermediate goods to the end sector. The nodes that have the most arrows springing from them are those that supply a significant portion of the intermediate goods used in various sectors, as is the case with the three highlighted nodes (i.e., retail trade and repairs, financial services, and professional and business services).

/// FIGURE 2.5. El Salvador's production network: Percentage of intermediate goods



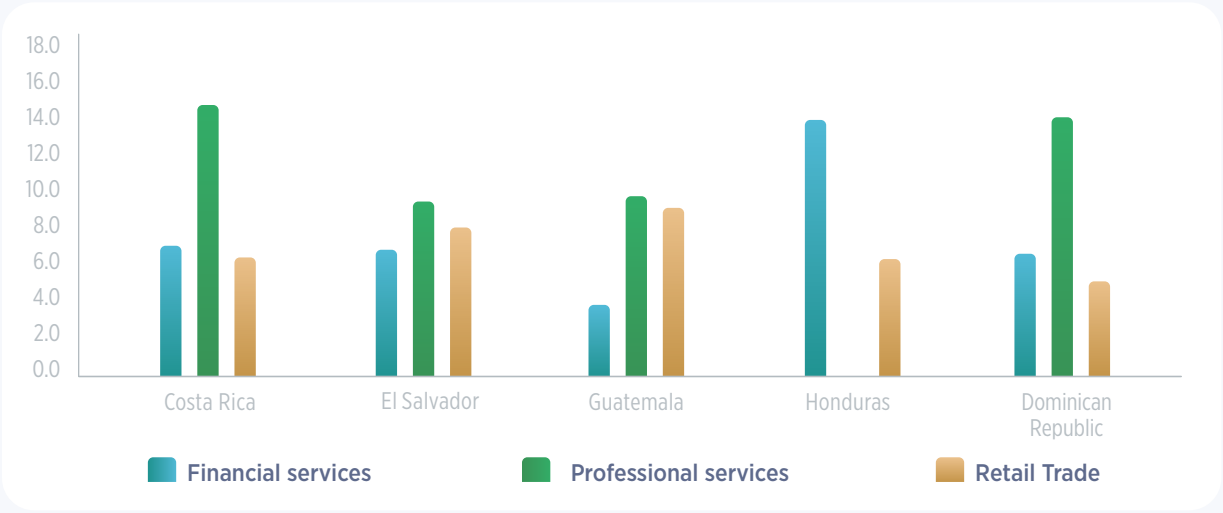
Source: Compiled by the authors based on the input-output matrix of El Salvador.

Note: The arrows indicate that the start node supplies a quantity of intermediate goods equal to or greater than 10% of all the intermediate goods demanded by the end node.

In order to identify the most important sectors in the supply of intermediate goods, we calculate the outdegree,[12] which measures the average percentage of intermediate goods each sector supplies to other sectors. For example, in Costa Rica, the financial sector supplies an average of 7.8% of the intermediate products demanded by other sectors. The sectors with the highest outdegree to other sectors tend to be the same in all countries of the region, these being: financial services, professional services, and retail trade. In the Dominican Republic and the countries of Central America, an average of 7% of all intermediate goods consumed by the productive sectors are supplied by the financial services sector, 13% by the professional services sector, and 8% from the retail trade sector (see Figure 2.6 for the percentages by country).

Furthermore, there are some sectors that have a high outdegree in certain countries, such as the non-textile manufacturing sector in Guatemala (10.5%), general manufacturing in Honduras (17.9%), and energy and water (6.4%) in the Dominican Republic.

FIGURE 2.6. Outdegree



Source: Own calculations based on the input-output matrix of each country.

Notes: In Honduras, financial services includes both financial and business services, while retail trade also includes hotels and restaurants. In Guatemala, the manufacturing sector does not include apparel.

Recommendations

- Work is needed to develop a financial sector with an efficient payment, deposit handling, and credit delivery system, and to ensure complementary business services have access to the kind of high-quality professional services they need, and also to provide a commercial distribution system that is not only broad in scope but one that operates competitively. For these sectors to function properly, there needs to be a multisectoral effort within the public sector. For a start, there needs to be adequate financial regulation and oversight; high-quality, broad-based professional education, and measures to encourage investment and competition in the retail distribution sector.

12 The details of how this is calculated can be found in the Appendix.

- As for financial regulation, it is important to ensure competitive conditions and both macroprudential and micro-prudential policies in order to guarantee financial stability.[13]

- In professional services, technical and Science, Technology, Engineering, and Mathematics (STEM) skills should be developed.

- In the professional services sector, Business Process Outsourcing (BPO) and call center services have proved to be one of the main service export sectors in the region. At the global level, this sector has maintained its level of growth and remained robust throughout the pandemic. The countries of the region have the potential to diversify into higher value-added solutions (for instance, document management and software applications).

2.4. Domestic factor-intensive sectors

The value added of a good or service is that portion of output contributed by local capital and labor factors (i.e., the gross value of the output minus the intermediate goods consumed), which can be regarded as the direct component. In turn, the supply of local intermediate goods generates value added through the use of capital and labor minus the intermediate goods, and so on and so forth, which we can call the indirect component. In this way, value added accumulates along the chain, provided the intermediate goods are sourced domestically. In other words, within the overall production chain the portion of output that corresponds to value added is higher when the chain is more reliant on domestically sourced factors of production, i.e., labor, capital, and locally produced intermediate goods. That is why labor-intensive sectors such as education and health have a high share of value added directly. There are other sectors that have a high share because they demand local intermediate goods. A case in point is agroindustry, which is the manufacturing sector with the highest reliance on locally sourced intermediate goods, and therefore the one with the largest share of value added along the chain.

To measure how intensive in domestic factors a sector's production chain is, we use what are known as "value-added multipliers." These multipliers can be understood as the value added that is generated by increasing the output of a sector by one unit.

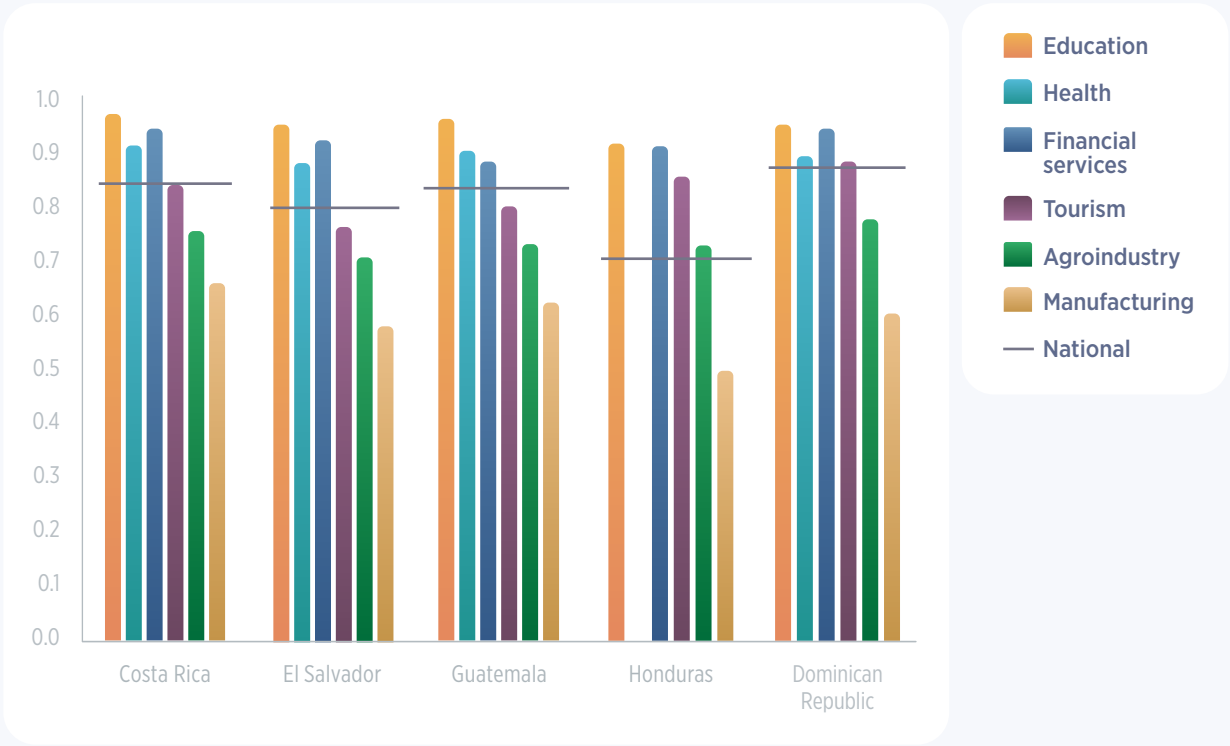
It should be noted that there is not necessarily a correlation between the value-added multiplier and the gross-output multiplier, as while the gross-output multiplier increases solely with the demand for intermediate goods, the value-added multiplier increases as the use of labor and capital increases, provided the intermediate goods used continue to be sourced locally. This means that the second of these multipliers decreases as the use of imported intermediate goods increases along the chain. In the case of the value-added multiplier, a sector that uses no imported intermediate goods anywhere along its chain will have a multiplier of 1. This occurs because the local intermediate goods demanded by a sector are in turn produced using local factors.

The fact that a sector has a low level of imports in its production chain does not mean that it has a high demand for domestic intermediate goods, as labor and capital may be particularly important factors. Therefore, there may be sectors that have a high value-added multiplier and a low gross-output multiplier simultaneously, such as education and health, as we will see later. Consequently, in the economies analyzed in this chapter, the correlation coefficient between the two multipliers is not significantly different from 0.

13 See IADB (2022) for further details of macroprudential policy proposals in the region.

Among the sectors with the highest value-added multiplier in the countries of the region compared to the rest of the economy are education, health, financial services, and real estate services.[14] The value-added multiplier for education in the region averages around 20% higher than that of the economy as a whole, while in the health sector it is 6% higher than the economy average (see Figure 2.7). Financial services and real estate services also have a sizeable multiplier, probably due to the fact that they do not require a large supply of inputs, especially imported ones. The multiplier for the tourism sector is close to the national average, and in Costa Rica and the Dominican Republic slightly higher.[15] The manufacturing sector's is below the national average, which is to be expected given the importance of imported intermediate inputs in the production of these types of products. Though the figure for agroindustry tends to be below the national average, it is generally above that of other manufacturing sectors, reflecting a production chain that is less reliant on externally sourced supplies (except in the case of El Salvador and the Dominican Republic), probably thanks to the region's manufacturing tradition.

FIGURE 2.7. Value-added multiplier



Source: Own calculations based on the input-output matrix of each country.

Notes: In Honduras, the agroindustry sector corresponds to agricultural products; education includes social services (including health); financial services includes both financial and business services; and tourism includes retail trade and hotels and restaurants.

14 As well as the forestry sector in Guatemala and El Salvador.
15 In Honduras, the breakdown also includes the retail trade sector, as well as tourism.

2.5. The wage-bill and employment multiplier

In order to evaluate how the increase in output in a given sector is passed through to the aggregate labor market of the economy, we calculate the wage-bill and employment multiplier that results from an increase in output in that sector. The wage bill is the total amount received by workers for their participation in the system of production and is the result of multiplying the time they work by how much they are paid, to arrive at a measure of their total income from work.

The wage-bill multiplier measures how labor-intensive a production chain is (in terms of how important workers are in it). The use of labor as a factor of production will be less intensive if, for example, capital goods are predominantly important in various links of the production process; if there is limited wage-bargaining power in the sector and in its production network, and if there is limited value added in very similar but high-volume products, such as commodities and agricultural products, and so on.

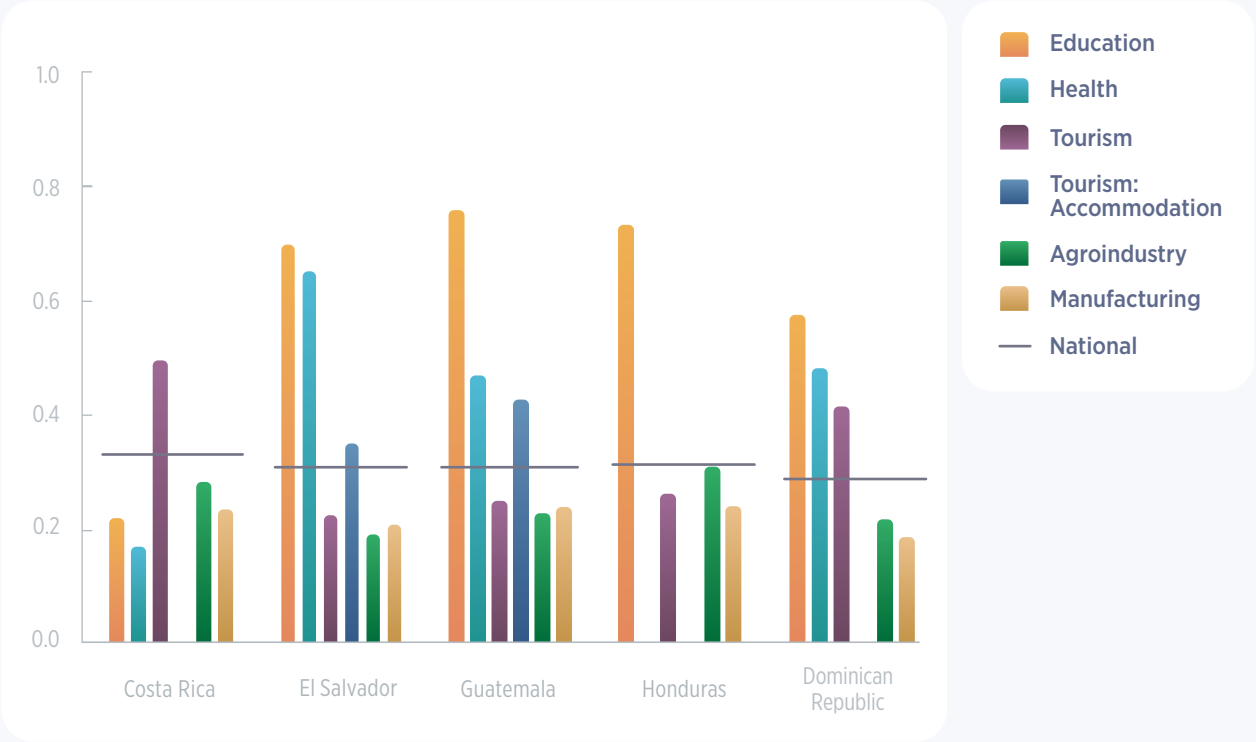
The wage-bill multiplier calculated shows that the effect on labor income of an increase in education sector provision is more than twice the national average in most countries of the region (see Figure 2.8). This effect can also be seen with scientific research (according to data from Guatemala). In health, which is a more capital-intensive sector, the wage-bill multiplier is slightly lower, but averages close to twice that of the economy as a whole, albeit with greater differences between countries.

One sector that stands out in terms of the increase in the total wage bill for the economy is the tourism sector. In Costa Rica and the Dominican Republic, the increase in output in the tourism sector results in a wage bill hike almost 50% higher than the economy average. In the cases of El Salvador and Guatemala, the largest component of the wage bill from the process of providing services is the subsector of tourist accommodation (and the food and drink services subsector therefore a lesser one).

While the financial and real estate sectors have a significant effect on value added, their impact on wage bill growth is modest (in the case of the latter, it is below the average for the economy). In these sectors, the importance of capital in the production process is usually significant, for example in the form of technology in financial sector processes and property in the real estate sector. The agroindustry and manufacturing sectors also rank below average in terms of the wage bill growth generated by each increase in output.

With respect to value chains and improvements in wages, the Responsible Sourcing (RS) program required of suppliers around the world by multinational companies is worthy of note. As a result of the program, minimum standards have been introduced for workers' wages, benefits, and working conditions, as well as other production practices. For Costa Rica, Alfaro et al. (2022) show how this practice has had a positive effect on workers' earnings at supply companies, particularly those of low-wage workers.

///FIGURE 2.8. Wage-bill multiplier



Source: Own calculations based on the input-output matrix of each country.

Notes: In Honduras, the agroindustry sector corresponds to agricultural products; education includes social services (including health); financial services includes both financial and business services; and tourism includes retail trade, and hotels and restaurants.

Another way to analyze the effects of an increase in output in a sector on a country's labor market is by looking at the number of jobs created. Table 2.3 shows the estimated number of jobs created by a US$1 million increase in output[16] (the employment multiplier). Significant differences between countries and sectors are to be expected due to their differences in productivity, prices, proportion of workers in formal and informal employment, employment contributions, taxes, and capital intensity in the sector, and so on.

In almost all cases, the sector that generates the greatest number of jobs when it increases its output by one million dollars is agriculture, forestry, and fishing. However, it should be noted that the same does not occur when it comes to the wage bill, so the gains in this sector would appear to be predominantly in terms of number of workers rather than increased earnings, which seems to be the case in agroindustry, albeit to a lesser extent. Other sectors among the countries of the region that stand out when it comes to employment are tourism, retail trade, and education, which are above the national average in virtually all those we looked at.

16 For the sake of comparability, a common currency is used.

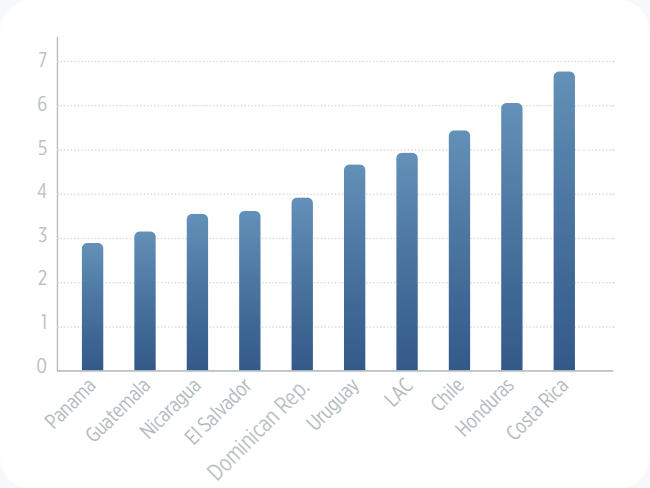
TABLE 2.3 Jobs created following a US$1 million rise in the sector's output

SECTOR	CR	SV	GT	DOM
	Employment Multiplier			
Agriculture, Forestry, and Fishing	63	251	323	133
Agroindustry	41	107	115	61
Manufacturing	24	66	64	27
Construction	42	81	96	44
Retail Trade	69	146	111	97
Education	40	95	116	66
Health	29	72	115	60
Tourism	50	121	150	61
National average	39	91	139	60

Source: Compiled by the authors based on the input-output matrix of each country.

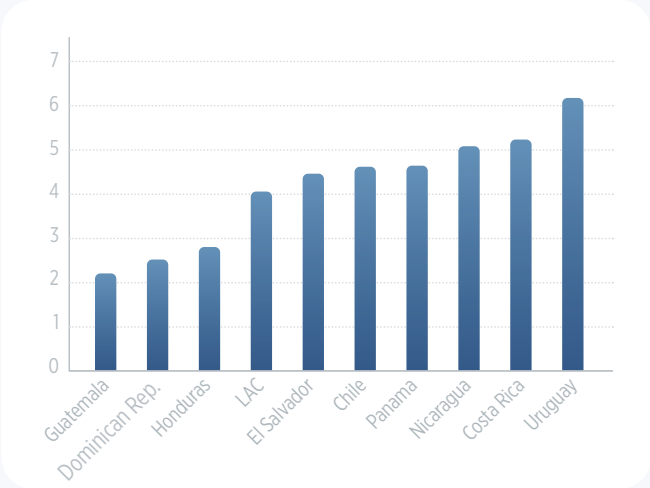
Given the size of the value-added, wage-bill, and employment multiplier for education, it is worth noting that in various countries of the region, public spending on education as a percentage of GDP is below the LAC average (see Figures 2.9 and 2.10) and that of countries with more wide-reaching education systems, such as Chile and Uruguay. The same pattern can be seen in health spending, though with fewer countries below the LAC average.

FIGURE 2.9. Public spending on education as a percentage of GDP



Source: United Nations Educational, Scientific and Cultural Organization (UNESCO). Data at September 2021.

FIGURE 2.10. Public spending on health as a percentage of GDP



Source: World Health Organization (WHO) Global Health Expenditure Database. Most recent available data.

According to the Organization of Ibero-American States (the OEI), the productivity gap in Latin America is strongly linked to education (OEI, 2021). Evidence shows that education generates greater benefits for countries when it includes technological innovation (Doménech, 2008). It is worth remembering that cutting-edge education currently includes highly important science, technology, and research components.

It is also important to bear in mind the negative impact that the COVID-19 pandemic had on children's academic performance as a result of school closures. This was particularly marked among young children and those from vulnerable socioeconomic backgrounds (see Hammerstein et al., 2021 for a comprehensive review of the evidence). For the case of Latin America, Neidhöfer et al. (2021) show how socioeconomic gaps and the persistence of these across generations may have been significantly exacerbated by the pandemic and the closure of schools, the effects of which are longer lasting among more vulnerable sectors, where parents have fewer tools with which to provide a substitute for face-to-face schooling. This disproportionate impact translates into a greater learning lag and a lower likelihood of finishing school among students from lower-income households. Moreover, the results of the study show that Central American countries are among those most affected in Latin America as far as the likelihood of finishing school is concerned.

Recommendations

- Investment in education and health in countries where there is underinvestment in these sectors would help increase both value added and the wage bill in the economy as a whole, while at the same time improving the human capital of the population in years to come. This in turn would benefit the productivity of other sectors through the creation of a more competitive and technically skilled labor force.

- The substantial number of jobs created in the agricultural sector's production process and to a lesser extent in agroindustry (sectors which are also closely interconnected), and the region's strong tradition of producing such products, would suggest that boosting investment in the sector could yield significant gains for countries. It is important to work to ensure that any gains in these sectors are reflected in wages.

- In the medium term, it would be a good idea to boost tourism, given how important the sector is in terms of value added, wage bill, and employment. Lossio (2022) proposes various courses of action to support the sector, placing particular emphasis on linking it to technological innovation. Meanwhile, Risso (2022) discusses the content of public investment programs in tourism sponsored by the IADB and finds that these have a positive effect on increasing tourism revenues.

- In some countries of the region, it would be beneficial to continue working towards developing greater domestic sourcing in the manufacturing sector. Focusing on the case of Mexico, Filippo and Guaipatin (2021) propose a methodology for identifying strategic sectors, as well as goods and processes with development potential that will help boost the participation of local suppliers in global value chains.

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/// APPENDIX

Leontief Model:

The Leontief model assumes that a constant share of intermediate inputs is required to produce each good regardless of the level of output. If $z_{i,j}$ is the share of output of good j that requires good i as an intermediate input and x_i the final demand for good i, the total output, y_i of good i is given by

$$y_i = z_{i,1}y_1 + z_{i,2}y_2 + \cdots + z_{i,n}y_n + x_i = (z_{i,1} \quad \cdots \quad z_{i,n})\boldsymbol{y} + x_i \Leftrightarrow \boldsymbol{y} = Z\boldsymbol{y} + \boldsymbol{x}$$

$$\Leftrightarrow \boldsymbol{y} = (I_n - Z)^{-1}\boldsymbol{x}$$

Hence, the gross-output vector is a linear function of the final demand vector, which is premultiplied by the Leontief inverse matrix $(I_n - Z)^{-1} \equiv M$. Thus, the change in gross output of good i in response to a change in demand for good j is given by the multiplier $M_{i,j}$. More precisely, a one-unit increase in the demand for j (which is assumed to be passed through to output) increases final output by $M_{i,j}$ units. Lastly, the change in gross output of all goods in response to a change in a good j is simply the sum of the multipliers of j:

$$\frac{\mathrm{d}(\sum_{i=1}^{n} y_i)}{\mathrm{d}x_j} = \sum_{i=1}^{n} M_{i,j}$$

As the price of the goods in the Leontief model is fixed, we can assume that the value of the demand for each production input—which is what we actually see in the data—remains proportionally constant whenever there is a change in output. Thus, we simply use the value of gross output as the quantity of gross output and do the same for domestic and imported inputs. For each productive sector, the matrix considers its total output, how much it pays its employees, and how much it demands from each of the other sectors, differentiating between imported and domestic inputs.

In turn, the value added of good i is a share $v_i \equiv 1 - z_{1,i} - z_{2,i} - \cdots - z_{n,i}$ of gross output: y_i, so the value-added multiplier is

$$\frac{\mathrm{d}(\sum_{i=1}^{n} v_i y_i)}{\mathrm{d}x_j} = \sum_{i=1}^{n} v_i M_{i,j}$$

Similarly, a share of labor w_i is required, thus making the wage-bill multiplier:

$$\frac{\mathrm{d}(\sum_{i=1}^{n} w_i y_i)}{\mathrm{d}x_j} = \sum_{i=1}^{n} w_i M_{i,j}$$

Outdegree:

The outdegree of a sector is its average share of the demand for inputs of the other sectors (including the demand for imported inputs m), and is calculated as follows

$$\frac{1}{n}\sum_{j=1}^{n} \frac{z_{i,j}}{z_{1,j} + z_{2,j} + \cdots + z_{n,j} + m_j}$$

This measure is usually weighted according to the weight of the sector. This is the weighted outdegree. Thus, the average is calculated based on the relative weight of the sector's output in total output:

$$\sum_{j=1}^{n} \left(\frac{y_j}{\sum_{k=1}^{n} y_k}\right)\left(\frac{z_{i,j}}{z_{1,i} + z_{2,i} + \cdots + z_{n,i} + m}\right)$$

CHAPTER 3

EXPORTS
and their value chains

CHAPTER 3

EXPORTS
and their value chains

Carlos Eggers Prieto and
Arnoldo López Marmolejo

Trade integration is a factor linked to a country's economic development (see Sachs and Warner, 1995 and Edwards, 1998). It is important to note that the benefits of trade openness may not necessarily be felt in countries with rigid economies (Freund and Bolaky, 2008) and low levels of per capita income (Calderón et al., 2004 and Fetahi-Vehapi et al., 2015),[17] though this situation can be turned around if the opening up of trade is accompanied by complementary measures aimed at improving education, financial depth, public infrastructure, and governance (Chang et al., 2009).

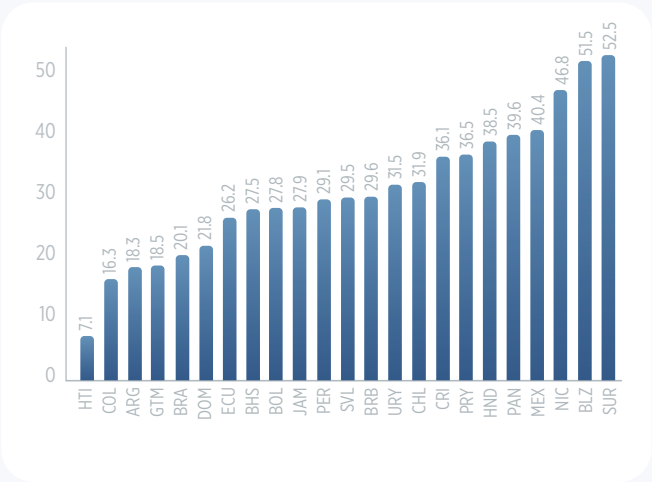
The CAPARD region has been taking steps to consolidate its trade integration with the rest of the world, a fact reflected in exports totaling 20% of its GDP in 2021 and 35% of GDP for imports. The export sector plays an important role in the economic life of the region as a source of output, demand for other intermediate products and services, and domestic employment. This chapter seeks to provide a better understanding of the integration of the export sector with the rest of the economy and examine the implications both of that integration and of the structure of the exports themselves, and on the basis of that analysis, propose policies aimed at strengthening the sector. Understanding the integration of the export sector and the implications of that integration is an essential step in being able to develop strategies to ensure the sector is strengthened by the public sector and private sector alike.

The region's economies vary greatly in terms of volume of exports, ranging from 18% of GDP in Guatemala to 47% in Nicaragua and 52% in Belize (see Figure 3.1). There is also a great deal of diversity in the composition of exports, with significant differences between countries. In the CAPARD region as a whole, agricultural and agro-industrial products account for 20% of exports, textiles 10%, and tourism 26%. The countries with the highest proportion of agricultural and agro-industrial products in their total exports are Honduras, Guatemala, and Nicaragua, with 52%, 40%, and 39%, respectively. In El Salvador and Nicaragua, textiles play an important role, accounting for 32% and 25% of the total. In the case of Costa Rica, Panama, and the

17 The empirical evidence has also been questioned due to disagreements on how to measure trade openness and its endogeneity with other variables (see Rodríguez and Rodrik, 1999; and Wacziarg and Horn Welch, 2008).

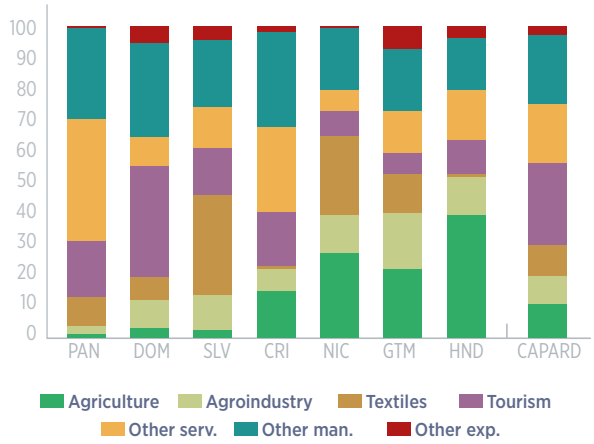
Dominican Republic, external demand for tourism services is particularly important, accounting for 18% of the total in the first two and 36% in the third. Other services are also important in the region's exports (see Figure 3.2), particularly logistics services in Panama and business process outsourcing (BPO) services, including call center services, in various countries of the region.

FIGURE 3.1. Exports-to-GDP ratio (%) (c. 2021)



Source: World Bank.

FIGURE 3.2. Composition of exports as a percentage of total exports in 2019



Source: Own calculations based on UN Comtrade data.

Note: Textile *maquila* exports in Honduras are not reflected in these statistics as they are primarily located in free trade zones.

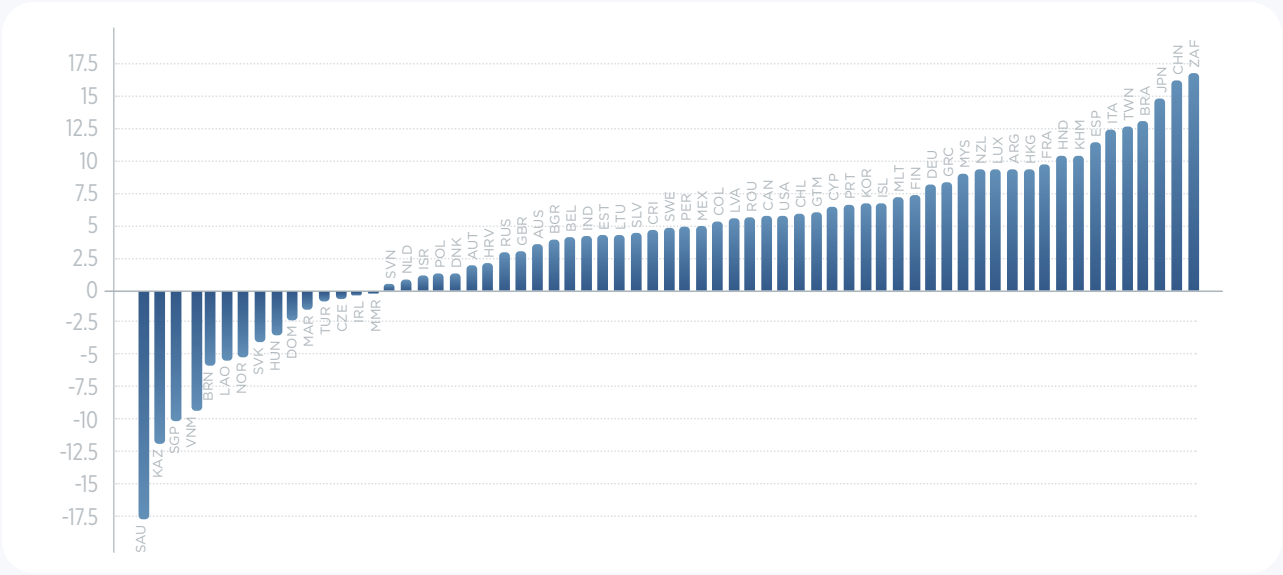
The information from the input-output matrices enables us to analyze the underlying production structure of exports. In the CAPARD region, though also globally, the aggregate export multiplier is higher than the aggregate domestic-demand multiplier. This is because part of domestic demand is dependent on commodities whose production requires relatively few intermediate goods and services (e.g., education, healthcare, and real estate services). In other words, the intermediate inputs produced are geared proportionally more towards exports than towards local demand. This means that for most economies, a change in the demand for exports will have a greater impact on other output than a similar change in local demand would have.

Figure 3.3 shows how much larger (in percentage terms) the export multiplier is compared to all other demand. Zero denotes the domestic-demand multiplier. Thus, a level of 10 indicates that the export sector has an external-demand multiplier that is 10% higher than the domestic-demand multiplier.[18] Among a sample of 65 countries, 50 show a higher export multiplier than that for the rest of the economy. Several countries of the region have a high export multiplier compared to the domestic-demand multiplier, including Honduras, Guatemala, Mexico, and Costa Rica.[19] Around the world, two of the countries with the highest export multipliers compared to the rest of the economy are China and Japan. The differences between countries depend on the demand for local goods and services for each product, the composition of their exports, and their degree of sophistication (higher sophistication usually being associated with a higher level of external inputs).

18 The methodology used to calculate the output multiplier is explained in the Appendix to Chapter 2. The export multiplier is the average of all multipliers, with each sector weighted according to its share in total exports.

19 In the case of the Dominican Republic, its export-sector multiplier is lower than the average for domestic demand due to the low value of the multiplier in the textile and other manufactured products sectors (30% of exports in the input-output matrix). This is in contrast to the high multiplier for the tourism sector (20% of exports in the matrix).

///FIGURE 3.3. Export-sector multiplier as a percentage of the domestic-demand multiplier: International comparison (zero denotes the economy average)



Source: Own calculations based on data from OECD input-output matrices.

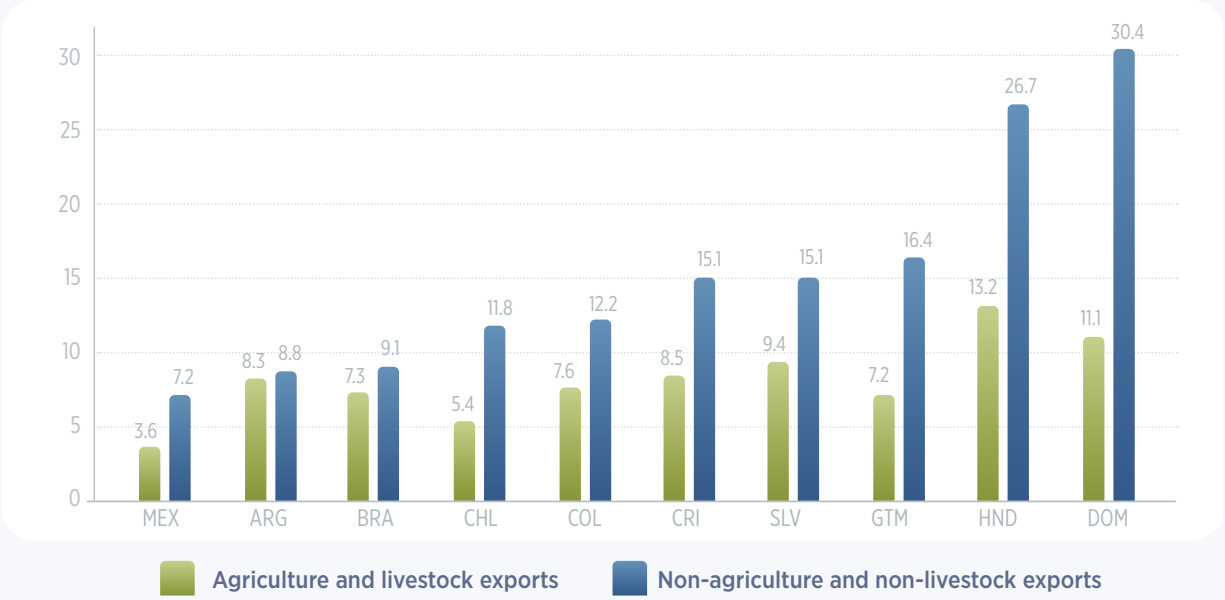
A higher output multiplier for the export sector implies a greater degree of vulnerability of the economy as a whole to the economic cycles of other countries, particularly those that are the source of the demand for the exports. In this way, economies are more vulnerable the more dependent they are on specific countries and specific products. To reduce this vulnerability in open economies, it would be wise for them to diversify their supply of exports. On the subject of volatility, it is worth noting that agricultural exports are less volatile than those of other commodities. Figure 3.4 shows a volatility index[20] for agricultural exports and other exported commodities. In the CAPARD region, as in other LAC economies, this index is significantly lower for agricultural exports and in some actually less than half that for non-agricultural exports.

Given their importance, the lower volatility of agricultural exports is a positive feature of the region's exports, one that helps lessen the impact on overall output of fluctuations in external demand.

As discussed in the previous chapter, agro-industrial output has a high level of productive linkages compared to the economy average, which makes it a key sector for reactivating the economy. Furthermore, the agro-industrial production chain generates a great deal of value added. In the CAPARD region, the agro-industrial sector generates a value added per wage (the ratio of value added to wage bill) 1.6 times higher than the economy average and 1.5 times higher than in the crop sector, which shows how value is added from the transformation process and the capital of the agro-industrial sector. Thus, agro-industrial development provides an opportunity for countries that have a comparative advantage in agricultural commodities to improve both job quality and pay.

20 The volatility index is the standard deviation of the percentage gap between exports and their trend level, calculated using the Hodrick-Prescott filter. The formula for calculating the index is: $100\sqrt{\frac{1}{T}\sum_{t=1}^{T}\left[\ln(X_t)-\overline{\ln(X_t)}\right]^2}$, where $\ln(X_t)$ is the log of exports in period t y $\overline{\ln(X_t)}$ the trend of this log calculated using the Hodrick-Prescott filter.

FIGURE 3.4. Export volatility index



Source: Own calculations based on UN Comtrade data.

To further strengthen the expansion of this particular sector, it would be useful to take a look at cases where its products have been successfully inserted into other markets. Ghezzi et al. (2022) present thirty case studies of successful insertion into agrifood markets in twelve Latin American countries. These include fresh foods (e.g., fruit, vegetables, and meat) and processed products (e.g., sun-dried mangoes, essential lemon oil, and gourmet chocolate), as well as specialized inputs and services in the sector (such as improved seeds and technical assistance services). These case studies enable us to identify six strategies for adding value:

TABLE 3.1 Strategies for adding value in the agri-food sector.

For fresh products	For processed products
1) Comply with basic requirements in external markets (standards imposed by governments or private customers).	**5)** Develop by-products (lemon essential oil, organic purees, etc.).
2) Obtain attribute credentials (such as organic or fair-trade certification).	**6)** Brand differentiation.
3) Develop products with more highly valued qualities (easy-to-peel mandarins, sweeter cranberries, longer shelf-life products).	
4) Make the most of temporary periods of low supply.	

Source: Ghezzi et al. (2022).

In addition, three distinct production organization models were identified that have proved effective under different conditions: (1) vertically integrated firms, (2) tractor companies working with small farmers, and (3) small farmer cooperatives or associations. The first of these allows for greater control over production but requires considerable financial resources. The other two generate value through the association of small producers, as this allows them to share the fixed costs of complying with the sector's stringent standards, standards that tend to impede the entry of small producers into new markets. Lastly, it is worth stressing the importance of supplying public goods (such as water infrastructure, technical assistance, and trade agreements on sanitary and phytosanitary issues) to enable the sector to develop successfully.

Other major export sectors in the region are the textile sector and the commodities sector, particularly copper, iron, and gold.

The textile sector is particularly important in the exports of El Salvador, Guatemala, and Nicaragua, and its output multiplier in all of them is equal to or higher than the economy average. This shows that the sector is strongly integrated in these economies and its significant presence and trade surplus suggest that the region has achieved a comparative advantage in textiles, which means that the time is ripe for the sector to expand its reach.

As for the mineral products copper, iron, and gold, all of these have become increasingly important for the region's exports thanks to substantial growth in Nicaragua and Panama, where they now account for 6.2% and 4.6% of GDP, respectively. In contrast, in the Dominican Republic they have remained stable at around 2% of GDP, while in Honduras they still play a minor role with 0.3% of GDP (see Table 3.2).

TABLE 3.2 Copper, iron, and gold exports as a percentage of GDP by country

COUNTRY	2016	2021
DOM	2.2	2.0
HND	0.4	0.3
NIC	2.7	6.2
PAN	0.1	4.6

Source: UN Comtrade.
Note: The most recent data for Honduras are for 2019.

In the case of these products, it is vital to take into account the significant volatility of their price, which is set by international markets. Based on monthly data, between 2012 and 2022, the price of iron ore fell 52% in a single year (2015), and that of copper and gold by 28% (2015) and 27% (2013). A similar trend can be seen in the year-on-year rises, reaching 136% (2021), 94% (2021), and 34% (2020), respectively. Figure 3.5 shows the international price index of these metals and how their value fell by more than half in just a few years, and also shows their very volatile gains.

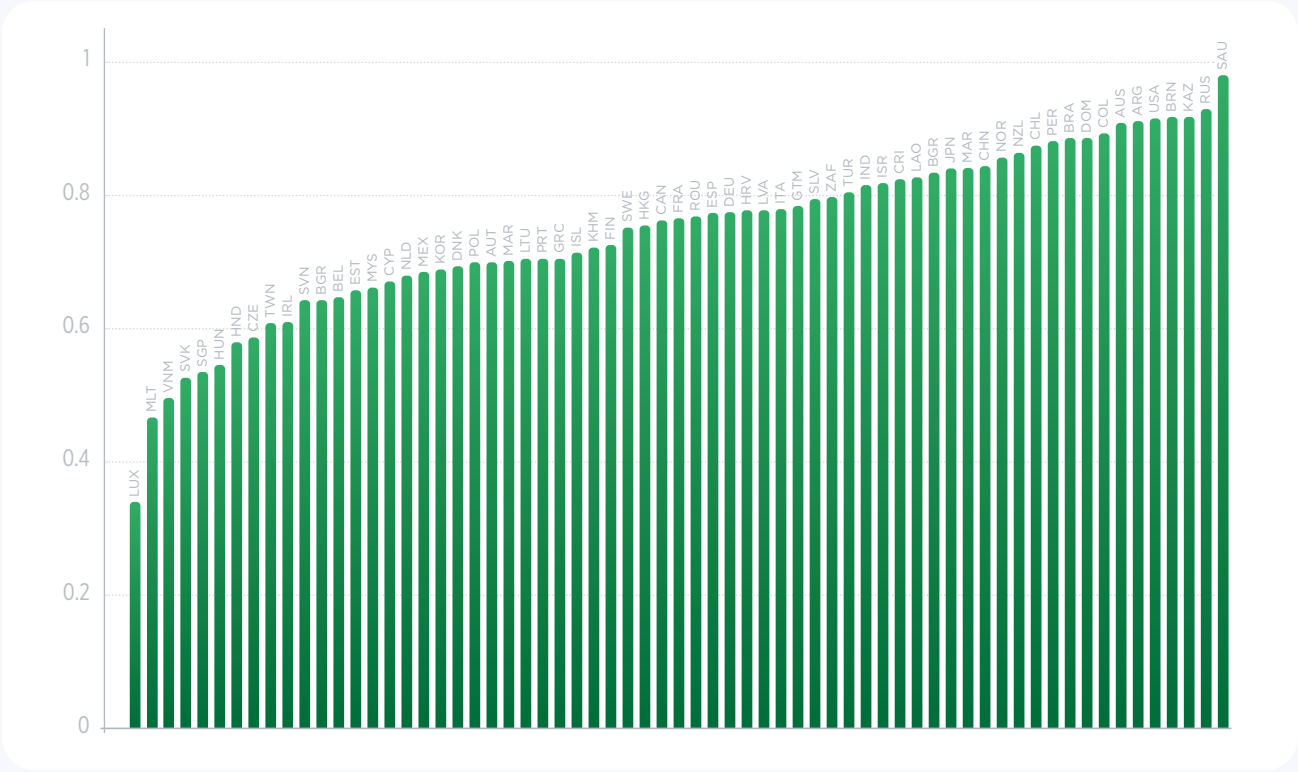
FIGURE 3.5. International price of copper, iron, and gold (Base index: January 2012 = 100)

Source: Bloomberg.

In the unfortunate wake of Russia's war against Ukraine and the resulting disruption to their exports, the CAPARD region could potentially help fill the void in the supply of various products previously supplied by these countries. Giordano and Michalczewsky (2022) carried out an initial analysis with a view to identifying basic commodities in Latin American exports that are similar to those supplied by Russia and Ukraine and which could potentially replace them. According to the authors, the main Russian exports that the countries of the CAPARD region could potentially replace are gold and shellfish, and in the case of Ukraine, iron alloys, iron bars and profiles, insulated cables, and cigarettes and cigars, i.e., certain agricultural and agro-industrial products (shellfish, cigarettes and cigars), as well as commodities (gold and iron) and some of their by-products (iron bars and profiles, and cables).

In light of the recent disruptions to global supply chains, it would be good to explore which variables determine local supply capacity in the export chain. The importance of local output in a country's export value chain can be measured by the value-added multiplier of exports. It is important to remember that the value added in a sector is obtained by calculating the difference between its gross output and the intermediate goods it uses, while the sector's value-added multiplier measures how that value added is passed along its supply chain as its output increases. We began by calculating the multipliers of the export sector in each country (see Figure 3.6). The difference between the multiplier and 1 is an approximate measure of the share of imports used in the export value chains. The countries at the top end are countries whose export sector is highly dependent on commodities, where it is to be expected that the largest share of the end product to be exported will be derived from locally sourced inputs.

///FIGURE 3.6. Value-added multiplier of the export sector by country



Source: Own calculations based on data from OECD input-output matrices.

Estimating the determinants of the value-added multipliers of the countries reveals the variables that determine how important local output is in the export value chain. The results of this (which are included in the Appendix)[21] show that a higher local component (value-added multiplier) is obtained for the exports of countries where a higher share of these come from the extractive sector (mining and oil) and the agricultural and agro-industrial sector, as well as larger countries (in terms of population) with a higher level of education. As expected, sectors where a significant proportion of the product comes from the soil and subsoil have a high proportion of local content in the value chain. The positive impact of schooling on improving local value added is due to the fact that it increases the productivity of sectors that supply inputs for end products, thus making local supplies more competitive compared to external ones. As a result, human capital enhances the efficiency of existing output, as well as creating a supply of new goods and services.

It is worth noting that countries with export value chains that are more dependent on local inputs are less vulnerable to disruptions in international supply chains, as was seen recently during the COVID-19 epidemic and Russia's conflict with Ukraine. At the same time, there are significant gains to be had by a company by entering multinational supply chains. Alfaro et al. (2002) found that four years after becoming suppliers to a multinational corporation for the first time, domestic firms in Costa Rica employed 26% more workers, had between 4% and 9% higher total factor productivity, and 20% higher sales to other clients.

21 The control variables GDP per capita, Herfindahl-Hirschman Export Index, and inflation were also used, though these did not prove to be significant.

In sum, there are important positive aspects to CAPARD exports, such as their integration with the rest of the economy, an agro-industrial chain with significant value added and employment generation capacity, and the significant proportion of low-volatility products (i.e., agricultural products), as well as competitive sectors (e.g., textiles) and emerging sectors (such as metallic minerals). To further expand the scope of the region's exports, it would be good to continue working on:

- Enhancing product complexity. The textile sector is one that is ripe for developing more sophisticated products by obtaining sustainability and design certification. Relocating value chains to the region (i.e., nearshoring) would help achieve this. Increasing participation in global value chains means investing in investment promotion, infrastructure, and integration (see IADB, 2022).

- Increasing productivity in the agricultural sector. Where the agricultural sector plays a major role, pursuing productivity gains by investing in technology that leads to greater efficiency in the use of water and fertilizers could help fill gaps previously filled by Russia or Ukraine (Giordano and Michalczewsky, 2022). In order to improve productivity in agro-industrial products, it would be useful to look at how various Latin American agro-industrial products gained entry into international markets, as described in Ghezzi et al. (2022). This could help identify bottlenecks and best practices in the relationship between the public and private sectors, particularly in the agroindustry sector.

- Bolstering the trade agenda in a way that takes into account market access, trade facilitation, logistics, and attracting investment. Similarly, given the current context of inflation, net exporters should avoid imposing export barriers. Mutual restrictions would further raise prices and damage the productive framework.

- Investing in education to encourage the participation of local companies in global export chains.

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Databases

UN Comtrade. Naciones Unidas. https://comtrade.un.org/

Banco Mundial. https://data.worldbank.org/

/// APPENDIX

Estimation of the determinants of the value-added multiplier of exports

	1	2	3	4
Log of population	3.81*** (0.601)	3.73*** (0.622)	3.56*** (0.735)	3.88*** (0.675)
Percentage of agricultural exports	0.54*** (0.126)	0.53*** (0.130)	0.53*** (0.130)	0.54*** (0.142)
Percentage of oil and mining exports	0.42*** (0.0524)	0.42*** (0.0527)	0.46*** (0.0891)	0.42*** (0.0546)
Education	0.65** (0.294)	0.79** (0.389)	0.56* (0.326)	0.63** (0.307)
Log GDP per capita		-0.87 (1.564)		
Herfindahl-Hirschman Index			-0.10 (0.163)	
Inflation				-0.18 (0.633)
R^2	0.694	0.696	0.696	0.685

(Standard errors in parentheses) (* p<0.1, ** p<0.05, *** p<0.01).

CHAPTER

4

BOOSTING COMPETITIVENESS

and diversification in CAPARD and Mexico

CHAPTER 4

BOOSTING COMPETITIVENESS and diversification in CAPARD and Mexico

Lucía Martín Rivero
and Mauricio Monge

Since the 1990s, the CAPARD region and Mexico have become increasingly open and connected to the rest of the world. This has been reflected in both a structural change that has seen the abandonment of the import substitution model and the implementation of policies focused on market and product diversification. As a result of these structural changes, between 1990 and 2019 the average annual growth rate of goods exports from the CAPARD region exceeded the global average, reaching 9.4% (compared to the global rate of 6.7%). A notable aspect of the growth during this period is the fact that the percentage of manufactures in total exports rose from 25% to 54%.

In both the CAPARD region and Mexico, and indeed around the world, the phenomenon of economic integration has been driven by the technological advances and economic policy changes of the last few decades. Customs tariffs, especially those on manufactured products imported by developed countries, have been steadily reduced, while many emerging economies have introduced trade liberalization reforms and signed trade agreements that allow for greater economic integration. According to World Trade Organization (WTO) data, between 1990 and 2021 the number of regional trade agreements in force in Central America[22] rose from 4 to 43, in Mexico from 6 to 23, and in the Dominican Republic from 0 to 5.

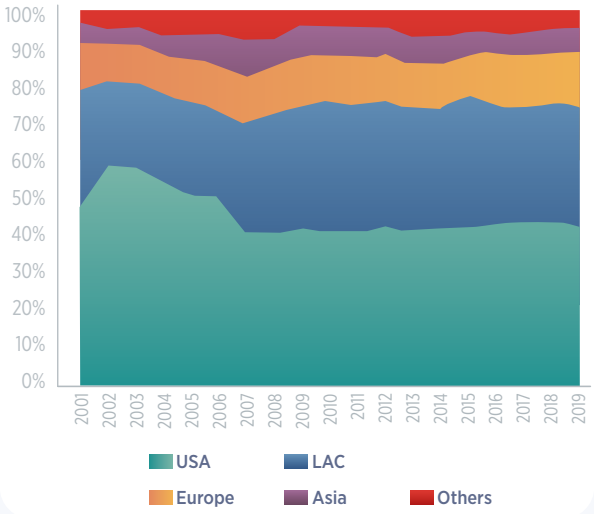
Though most CAPARD and Mexican exports are destined for the U.S., these countries have managed to diversify their export destinations to include other trading blocs (see Figure 4.1). In particular, Central American exports to other destinations increased from a low of 57.0% of the total in 2000 to 66.8% in 2019. In the Dominican Republic, the figure increased from a low of 21.6% in 2003 to 44.5% in 2019. It is a similar story in Mexico, where the proportion rose from a low of 11.6% to a high of 22.1% between 2000 and 2019.

While CAPARD countries have actually diversified into other markets, this is also a reflection of the fact that China and other Asian countries are continuing to consolidate their position as some of the main suppliers of manufactured goods to the U.S. Between 2000 and 2020, China's share of U.S. imports rose from 7.2% to 20.1%, and that of the Asian bloc from 36% to 43.6%.

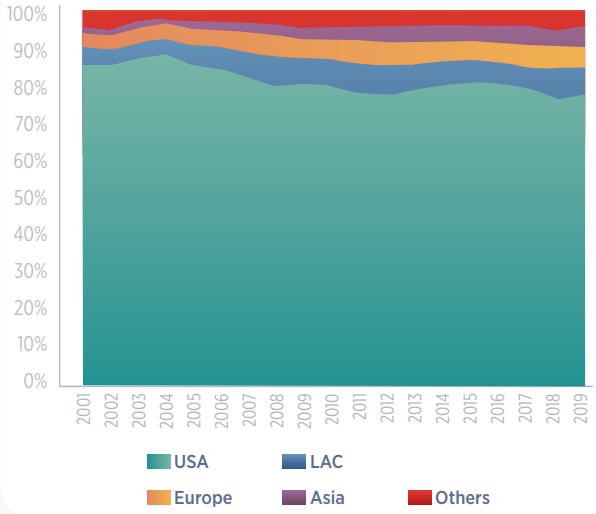
22 The WTO includes Panama as part of Central America..

///FIGURE 4.1.

CAPARD: Goods exports by destination (% of total)



MEXICO: Goods exports by destination (% of total)



Source: Trade Map, SIECA, and central banks.

Over the last two decades, not only have the products exported from each country changed, but so has the complexity of those products,[23] with some shifting from low- to high-complexity ones. In others, the complexity of their exports has either stayed the same or has actually decreased, which can affect both a country's growth and its well-being.[24]

To measure this, we use the *Atlas of Economic Complexity's* Product Complexity Index (PCI), which ranks how complex it is to produce a good based on how many other countries can produce it and the economic sophistication of those countries. The higher the PCI of a product compared to that of another, the more complex it is.

Of all the countries in the region, that with the highest degree of export sophistication is Mexico (see Table 4.1). By concentrating on the vehicle, machinery, and electronics sectors, it has managed to increase its complexity over the years, reaching a level of export complexity comparable to that of China's. For example, in 2010, the complexity index of the Chinese export basket stood at 0.38, while in the same year that of Mexico was 0.14; by 2019, the figure for Chinese exports was 0.38, while the equivalent for Mexican exports was 0.34.

Other countries that have boosted their level of export sophistication over the years are Nicaragua and those of the Northern Triangle. While most of their exports continue to be mainly textiles and agricultural products, in recent years they have expanded to include new sectors. In Guatemala for example, the increase in the country's exports of chemical products

23 Complexity refers to the diversity and sophistication of the know-how required to produce a product.
24 The evidence shows that countries whose economic complexity is greater than would be expected given their current level of income tend to grow faster than those that are "too rich" for their current level of economic complexity (Hausmann et al., 2011).

(such as packaged medicaments) and in the importance of its electrical energy exports compared to mineral exports has, since 2014, resulted in an increase in the complexity of its exports. Other notable cases include Honduras and Nicaragua, where the export of electrical apparatus and related parts, primarily to the U.S. and Mexico, has raised the level of sophistication of their exports.

TABLE 4.1 Average complexity of goods exports 2001–2019

Region	ISO3	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Asia	TWN		0.62	0.57	0.67	0.62	0.72	0.70	0.70	0.78	0.80	0.77	0.76	0.70	0.71	0.78	0.86	0.78	0.79	0.90
	SGP		0.57	0.51	0.62	0.21	0.18	0.42	0.39	0.50	0.42	0.30	0.35	0.24	0.33	0.50	0.62	0.44	0.46	0.44
	CHN		-0.04	0.05	0.15	0.22	0.27	0.31	0.39	0.38	0.34	0.38	0.41	0.37	0.37	0.37	0.36	0.35	0.40	0.38
	VNM		-1.36	-1.34	-1.20	-1.31	-1.24	-1.13	-1.13	-0.93	-0.76	-0.67	-0.56	-0.41	-0.38	-0.21	-0.18	-0.15	-0.04	-0.14
CAPARD	MEX	0.26	0.25	0.16	0.23	0.13	0.10	0.06	-0.04	0.11	0.14	0.07	-0.01	0.05	0.15	0.30	0.36	0.32	0.31	0.34
	CRI	-0.36	-0.27	-0.23	-0.23	-0.17	-0.12	-0.08	-0.13	-0.06	-0.19	-0.17	-0.14	-0.11	-0.18	-0.25	-0.33	-0.35	-0.26	-0.23
	DOM		-0.78	-0.68	-0.60	-0.51	-0.44	-0.46	-0.50	-0.45	-0.51	-0.55	-0.51	-0.77	-0.75	-0.62	-0.66	-0.67	-0.59	-0.68
	SLV					-0.98	-0.88	-0.80	-0.75	-0.74	-0.74	-0.82	-0.71	-0.83	-0.72	-0.69	-0.66	-0.66	-0.69	-0.65
	GTM					-1.14	-1.12	-1.08	-1.14	-1.13	-1.09	-1.14	-1.08	-1.12	-1.12	-1.03	-1.02	-1.05	-1.01	-1.06
	HND						-1.21	-1.13	-1.24	-1.16	-1.21	-1.28	-1.02	-1.27	-1.00	-1.13	-1.10	-1.18	-1.12	-1.31
	NIC												-1.17	-1.26	-1.24	-1.15	-1.17	-1.23	-1.20	-1.32
	PAN	-1.30	-1.32	-1.32	-1.36	-1.34	-1.31	-1.35	-1.39	-1.27	-1.25	-1.22	-1.27	-1.28	-1.23	-1.22	-1.22	-1.31	-1.29	-1.59
	BLZ			-1.39	-1.45	-1.33	-1.46	-1.70	-2.11	-1.77	-1.81	-1.62	-1.62	-1.59	-1.27	-1.32	-1.20	-1.17	-1.34	-1.45

Low complexity — High complexity

Source: Compiled by the authors based on data from the *Atlas of Economic Complexity*, Trade Map, and SIECA.

Note: Blank spaces indicate unavailable or inconsistent information in the aggregation of exported products, primarily from free trade zones in Northern Triangle countries and Nicaragua. In the case of Panama, only exports of locally manufactured products are considered (i.e., re-exports of goods are excluded).

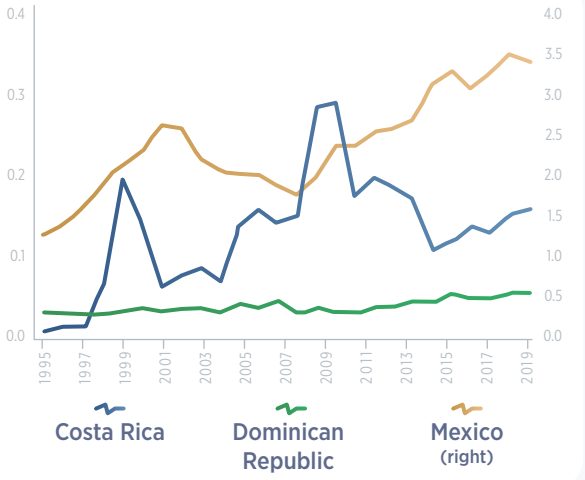
The two countries with the most sophisticated exports in the CAPARD region, Costa Rica and the Dominican Republic, have seen the complexity of their export baskets decline somewhat in recent years. The departure of Intel from Costa Rica in 2014, where it was primarily engaged in the production and export of microprocessors, had a negative impact on the complexity of the country's export basket. In the Dominican Republic, mineral exports have enabled the country to diversify the destinations of its exports, mainly towards India, Switzerland, and Canada, though this has meant that the complexity of its exports has waned. Similarly, in Panama, copper exports have helped the country diversify its trading partners, though the lack of sophistication of this product, which accounted for over 50% of the total value of its exports in 2019, impacted the sophistication of the country's export basket.

In those countries with a more sophisticated export basket, such as Costa Rica, the Dominican Republic, and Mexico, their share of world exports of goods such as machinery and electronics has remained stable, while that of certain Asian countries continues to grow. More specifically, between the mid-1990s and 2020, the share of exports of these three countries remained at

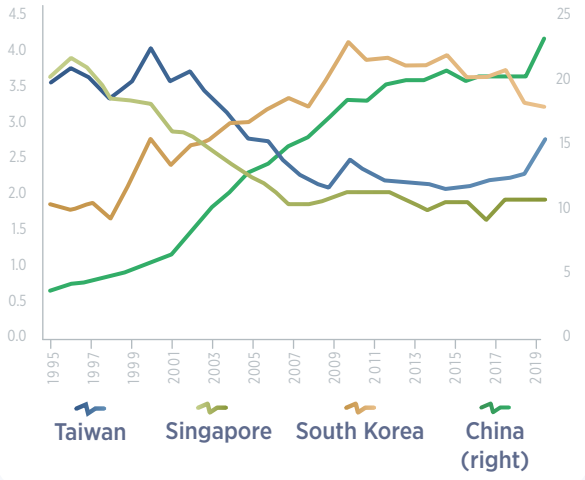
essentially the same level. The only exception was Mexico's machinery exports, the share of which rose from 1.4% of all machinery exports worldwide to 3.3% between 1995 and 2020. Similarly, the presence of Intel in Costa Rica boosted its share of electronics and machinery exports, which decreased when the company left Costa Rica in 2014 (see Figure 4.2).

FIGURE 4.2. Market share of world machinery and electronics exports: Central American and Asian countries

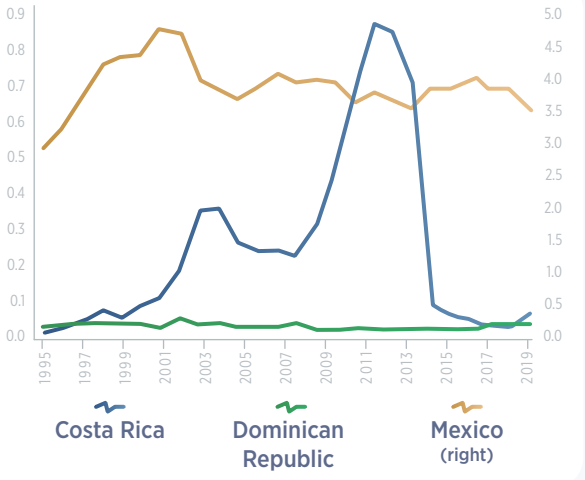
Market share of world machinery exports: Costa Rica, the Dominican Republic, and Mexico



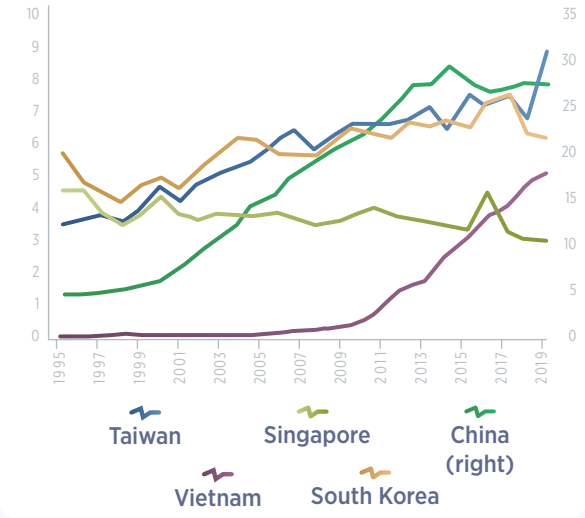
Market share of world machinery exports: Asian countries



Market share of world electronics exports: Costa Rica, the Dominican Republic, and Mexico



Market share of world electronics exports: Asian Countries



Source: *Atlas of Economic Complexity.*

Advantages of the CAPARD region and Mexico over their competitors

The pandemic highlighted the fact that the need for nearby suppliers of inputs, services, and end products represents an opportunity for the countries of the region to play a greater role in global value chains. This is no temporary trend and will become part of the new normal in international trade.

Two of the main advantages of Mexico and the CAPARD countries in their efforts to increase their share of international trade are their cost competitiveness and physical proximity to the U.S. The advantages of nearshoring[25] between the U.S. and the countries of Central America as opposed to their Asian competitors are obvious. The region comprising Mexico and Central America shares similar time zones to the U.S. and has a closer cultural affinity than other regions, as well as a platform that enables it to export goods at a more competitive cost. On top of this, its geographical proximity means transport costs are drastically reduced.

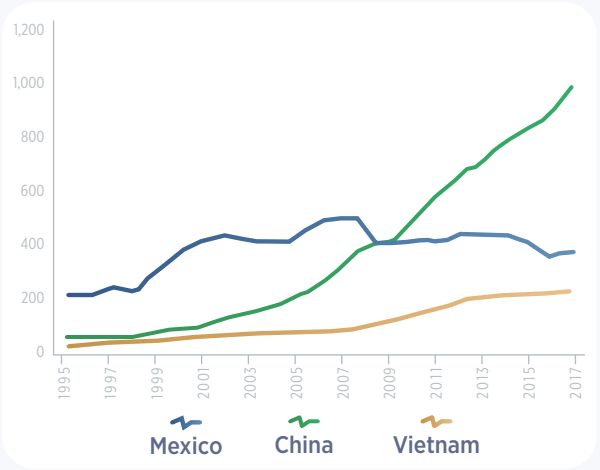
For example, shipments from China to the U.S. take longer and are more expensive than shipments from Mexico to the U.S. According to Investing Daily, it would cost around USD 7,000 to ship a 40-foot container from China to the eastern U.S., compared to USD 2,800 from Mexico. Similarly, shipments from Mexico can take between 24 and 48 hours to arrive, whereas shipments from China can take up to three weeks.

As for cost competitiveness, a crucial element in the strategy of manufacturing companies continues to be labor cost estimates: low labor costs have been key to the success of various Asian countries in strategic sectors. However, these countries have seen their advantage in terms of competitive costs gradually eroded by rising wage bills.

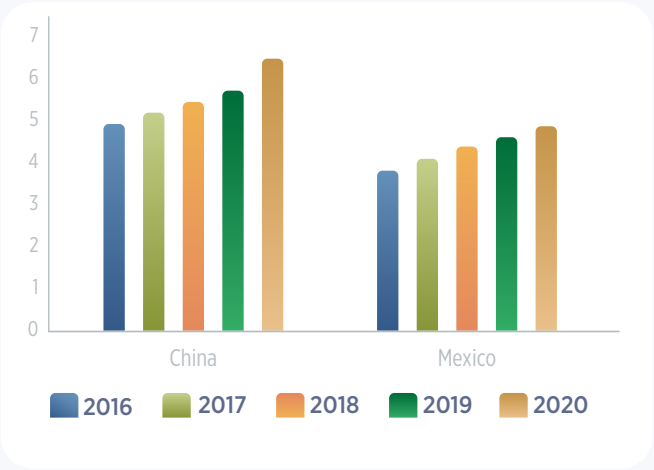
The most notable case of this is China. The Economic Intelligence Unit estimates that the average monthly wage in China increased 263% in nominal terms between 2007 and 2018, putting it 158.5% above Mexico's average monthly wage and 316% above Vietnam's.

FIGURE 4.3. Wages

Average monthly wage
(nominal U.S. dollars)



Hourly wage in the manufacturing sector
(U.S. dollars)



Source: *Economic Intelligence Unit.*

25 Nearshoring is the practice of transferring operations to a nearby country, giving it preference over one located further away.

Of course, one thing to bear in mind is that the wage rises seen in a number of countries have been in response to increases in productivity. Such pay increases are desirable if they promote a greater level of transformation, an improvement in production levels, or the integration and extension of the industrial chain. Therefore, in order to make these industries more competitive in CAPARD countries, the advantage of competitive labor costs will need to be accompanied by professionalization of the workforce and technological innovation in production processes.

Opportunities for diversification in the countries of the CAPARD region

In order to grow exports, it is important to identify the products the region should shift towards, taking into account the production matrix of its current exports and competitive advantages. By leveraging nearshoring and cost advantages, the countries of the region would stand to benefit from increased growth and employment by attracting investment, and from regional integration throughout LAC.

We use Harvard's *Atlas of Economic Complexity* to identify potential products the region could explore further. The Atlas monitors global trade flows across markets and tracks their dynamics over time in order to identify new opportunities for each country to diversify. This report applies three criteria used in the *Atlas* to identify these potential products, as described in the box below.

/// Box 4.1. Methodology for identifying opportunities for diversification

To determine which potential products the region could further explore, we use Harvard's *Atlas* of *Economic Complexity,* which monitors global trade flows across markets and tracks their dynamics over time in order to identify new opportunities for diversification for each country. The three criteria used to identify potential products are:

- **The Product Complexity Index (PCI):** This measures the diversity and sophistication of the productive knowledge required to produce a product. It is calculated based on how many other countries can produce a product and the economic complexity of those countries. For the purpose of the analysis, the products worth exploring by each country need to have a PCI higher than the average of their 2019 export basket (see Table 4.1).
- **Distance:** Measured on a scale from 0 and 1 depending on how "close" a potential new product is to a country's current export basket. The closer (i.e., closer to 0) a potential product is to the country's export basket, the more likely that product is to be considered a viable new export item.[26] For the purpose of the analysis, only products with short distances are considered.
- **Revealed Comparative Advantage (RCA):** Used in this document as a measure of whether a country is an exporter of a given good. The products used are those that have a value greater than zero (i.e., the country exported that good in 2019) but less than one[27] (i.e., the country has no revealed comparative advantage in exporting that good).

26 Products with short distances require similar conditions in terms of skills, infrastructure, resources, interconnected markets, and so on for the product to stand out more easily from others.

27 According to Balassa's (1965) definition, a country achieves an RCA greater than 1 for a product if the ratio of its exports of that product to its total exports is greater than the share of that product's global exports in total world trade. In other words, an RCA greater than 1 indicates that the country is more competitive than the average in exporting that product.

Countries of the Northern Triangle

The main goods export sector in El Salvador and Honduras is the textile industry, which is also the second most important in Guatemala after agriculture. However, in terms of complexity, these countries' textile exports lag behind those of China and Vietnam, the main suppliers of textiles to the U.S. According to Harvard's Atlas of Economic Complexity, over 50% of textile exports from the former countries consisted of low-complexity products such as knit T-shirts, sweaters, and sweatshirts. In contrast, the main textile products exported from China and Vietnam (textile footwear) accounted for no more than 5% and 15% of total textile exports, respectively.[28]

Based on the methodology described previously, the top ten textile products into which the Northern Triangle countries could most easily move and diversify are those shown in Table 4.2 below.

TABLE 4.2 Product diversification opportunities: Honduras, Guatemala, and El Salvador

HONDURAS			
Product	RCA	Distance	PCI
Activewear	0.121	0.787	-0.927
Mattresses and bedding	0.801	0.803	-0.608
Nets	0.268	0.806	-0.846
Woven garments with impregnated fibers	0.888	0.807	-1.05
Parts of footwear	0.368	0.807	-0.875
Headgear	0.427	0.822	-1.31
Synthetic yarn	0.934	0.825	-0.291
Knitted gloves	0.788	0.825	-1.07
Woven cotton fabrics	0.139	0.836	-0.724
Canopies and tarpaulins	0.202	0.837	-0.404
Seats	0.308	0.838	0.0185

GUATEMALA			
Product	RCA	Distance	PCI
Knitted and crocheted socks and hosiery	0.355	0.724	-0.857
Activewear	0.244	0.726	-0.927
Leather footwear	0.366	0.746	-0.643
Nets	0.181	0.749	-0.846
Parts of footwear	0.92	0.753	-0.875
Carpets and other floor coverings	0.372	0.763	-0.856
Textile wadding	0.195	0.765	-0.0866
Seats	0.254	0.776	0.0185
Canopies and tarpaulins	0.9	0.78	-0.404
Curtains	0.101	0.782	-0.302

28 According to the Harmonized System Codes developed by the World Customs Organization (WCO), textile products from China and Vietnam come under into 91 and 55 textile categories, respectively, while those from the Northern Triangle range from 31 to 42 categories.

EL SALVADOR			
Product	RCA	Distance	PCI
Sewing yarn of synthetic filaments	0.922	0.785	-0.311
Seats	0.235	0.79	0.0185
Furniture and furniture parts	0.942	0.795	0.444
Canopies and tarpaulins	0.484	0.796	-0.404
Quilted textile products	0.286	0.804	0.156
Synthetic fibers	0.301	0.815	0.342
Lace fabrics	0.516	0.817	-0.278
Fabrics with metallic yarns	0.247	0.819	-0.238
Woven fabrics of synthetic filament	0.612	0.821	-0.267
Rubberized fabrics	0.274	0.833	0.683

Source: Compiled by the authors based on data from the *Atlas of Economic Complexity.*

It would be relatively easier for the countries of the Northern Triangle to exploit these products than to venture into new industries not yet established in the country, given that they not only already have a foothold in the U.S. market, but also boast the necessary know-how in textile production. Moreover, they offer geographic advantages such as a similar time zone to the U.S., as well as being closer, having a greater cultural affinity, and the possibility of maritime traffic via both the Atlantic and Pacific Oceans.

It is worth emphasizing just how much the exports of the countries of the Northern Triangle could increase if they were to exploit the products mentioned. For example, if Honduras had exported 10% of what the U.S. imported in bedding and mattresses in 2021, its foreign sales could have increased by USD 605 million. It is a similar story in El Salvador, which, if it had sold 5% of what the U.S. imported in seats in 2021, could have increased its exports by USD 1.481 billion. In the case of Guatemala, if it had exported 10% of what the U.S. imported in footwear in 2021, its exports could have risen by USD 1.093 billion.

Costa Rica and the Dominican Republic

Costa Rica and the Dominican Republic have sophisticated manufacturing sectors that they began to develop in the 1990s. In Costa Rica, creating free trade zones and promoting the country abroad helped attract large foreign high-tech firms such as Intel, Procter and Gamble, Baxter, and Abbot Laboratories, which enabled the country to shift away from low-tech sectors such as textiles to more technology-intensive sectors such as electronics, medical and biomedical devices, the aeronautical and aerospace value chain, and film equipment.

Similarly, the Dominican Republic went from being a relatively isolated economy to one integrated into global developments and trends. The country went from having 98 trading partners in 2000 to 150 or so in 2017. It has also expanded its investor network by welcoming investments in new industries (such as medical devices) and by formalizing diplomatic relations with China in 2019. This has been evident in the make-up of the free trade zones, which have moved away from producing mostly textiles and apparel towards developing the service sector.

The consolidation of medical manufacturing in these countries has positioned them, together with Mexico, as the leading exporters of medical instruments in Latin America, and among the top ten suppliers of these products to the U.S.

Similarly, Costa Rica and the Dominican Republic boast other sophisticated sectors that are now positioned internationally. In Costa Rica, microprocessor production gained momentum once again in 2020 with Intel's return to the country. According to Intel, what led the company to see Costa Rica as a good option to expand its capacity was the existing infrastructure, the synergy with operations already in place, the talent, the free zone regime, and the legal certainty. In the Dominican Republic, electrical equipment production accounts for 16.6% and 9.3% of free trade zone exports and the country's total exports, respectively. According to Trade Map, in 2021, the value of the country's exports to the U.S. of electrical switches for a voltage not exceeding 1,000 V—the country's main electrical product—was USD 738 million, a figure only surpassed by Mexico, China, Japan, and Germany.

Now that these high-tech sectors have become established in these countries and are positioned in the U.S. market, and what with the current restructuring of global value chains, there is an opening for other products with higher technological content and added value to emerge as major export goods. Based on the methodology previously discussed, the main products that Costa Rica and the Dominican Republic could exploit are:

TABLE 4.3 Product diversification opportunities: Costa Rica and the Dominican Republic

Costa Rica			
Product	RCA	Distance	PCI
Machinery for soil preparation or cultivation	0.387	0.847	0.798
Pharmaceutical goods	0.859	0.849	0.585
Machinery for working minerals	0.224	0.849	0.121
Parts for electrical apparatus	0.397	0.853	0.647
Parts for use with electric generators	0.714	0.854	0.74
Automatic regulating instruments	0.225	0.859	1.38
Electric motors and generators	0.146	0.86	0.764
Electrical boards	0.219	0.862	0.623
Automotive components	0.123	0.862	1.27
Electrical transformers	0.184	0.864	0.835

Dominican Republic			
Product	RCA	Distancia	PCI
Insulated electrical wire	0.764	0.823	-0.575
Medicaments, packaged	0.173	0.874	0.849
Parts for use with electric generators	0.201	0.878	0.74
Centrifuges	0.323	0.882	1.09
Electrical resistors	0.321	0.882	0.695
Electrical transformers	0.501	0.883	0.835
Electrical boards	0.112	0.887	0.623
Camera parts	0.235	0.888	0.287
Measuring instruments inc. thermometers, hydrometers, etc.	0.128	0.891	1.16
Automotive components	0.114	0.893	1.27

Source: Compiled by the authors based on data from the *Atlas of Economic Complexity.*

Costa Rica and the Dominican Republic have an advantage over their Latin American peers when it comes to venturing into the products listed. In Costa Rica's case, the country offers political and legal stability; a free trade zone system that houses multinational firms focused on advanced manufacturing; multiple trade agreements; a labor force endowed with high levels of technical and professional competence, and one of the highest levels of English proficiency in the region. Meanwhile, the Dominican Republic offers a labor force that is cost-competitive, numerous industrial parks, and an increasing number of trade agreements entered into in recent years, as well as being an ideal location thanks to its eight international airports, various seaports, and high-capacity multimodal port. Furthermore, the advanced manufacturing products that these countries export or into which they could potentially expand are of considerable interest to the U.S.[29]

As in the countries of the Northern Triangle, achieving consolidation in the products specified would have a considerable impact on Costa Rica's and the Dominican Republic's exports. If Costa Rica managed to export 10% of what the U.S. imports in parts for electrical apparatus and pharmaceuticals (two products of interest to the U.S.), exports would increase by USD 750 million. In the Dominican Republic, exporting 5% of what the U.S. imports in electrical cable and electrical resistors would have an impact worth some USD 1.3 billion.

However, there are still challenges to be overcome before these industries can become consolidated. These include reducing the cost of electricity, ensuring nationwide broadband connectivity at a competitive cost, and simplifying the procedures in free trade zones, among others.

Key reforms needed to compete in the international market

The region needs to promote measures designed to enable it to make the most of its advantages. Nevertheless, despite its physical proximity to a major market and cost competitiveness, overcoming the existing asymmetries compared to other economies will require a comprehensive trade strategy. That strategy will need to incorporate product differentiation that would allow value to be added through an improvement in quality.

The level of complexity of its production structure, low level of involvement in international value chains, predominance of inter-industrial foreign trade, and relative backwardness of its transportation infrastructure and logistics services are some of the challenges that hold the region back from participating in international trade to the same extent as other emerging economies. In order to narrow the gaps, the region will need to concentrate its efforts on overcoming these.

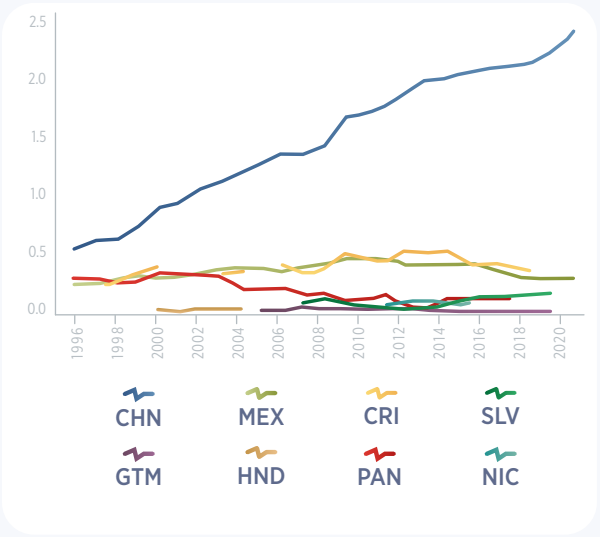
In various emerging countries, innovation has proven to be a key element in development and advances in production. As an example, let us look at China. In 2006, the Chinese government adopted the national medium- and long-term plan for development and technology 2006–2020. The so-called 2020 Plan achieved rapid progress in research training, high-tech manufacturing, academic publications, patents, and commercial applications, and China is regarded as a leader in certain areas of innovation. According to a 2016 Oxford Martin School report, China has replaced the U.S. as the largest market for industrial automation, with 77% of Chinese jobs at risk of automation (IADB, 2016).

29 In 2021, President Biden ordered a review of the global supply chains used in four industries key to the United States: computer chips, high-capacity batteries for electric vehicles, pharmaceuticals and active pharmaceuticals ingredients, and critical minerals used in the electronics industry.

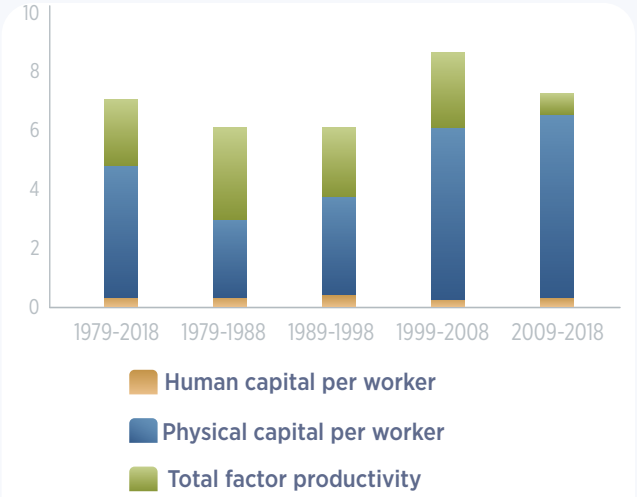
With annual R&D investment reaching 2.4% of GDP in 2020, the proportion of spending that China allocates to it is over five times what CAPARD countries do. These differences in R&D investment can further widen productivity gaps. For example, estimates suggest that a 10% increase in investment in R&D would result in a nearly 2% increase in total factor productivity. While the region's investment has remained low over the past two decades, that of China has quadrupled.

FIGURE 4.4. Spending on R&D and productivity

Spending on R&D (% of GDP)



Breakdown of growth in output per worker in China (% contribution to average annual growth in real growth per worker)



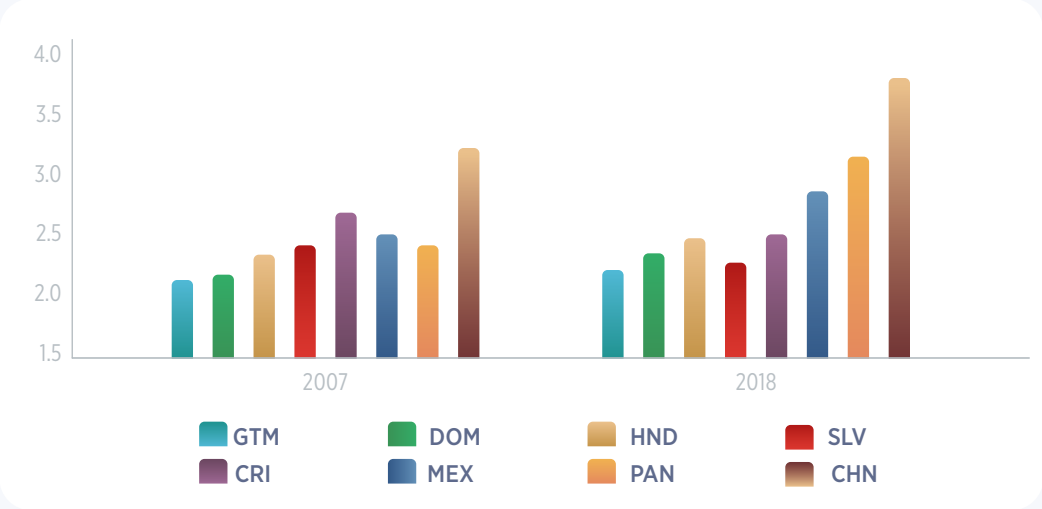
Source: UNESCO and Brandt et al. (2020).

Another key element in enabling the region to exploit its geographic proximity to the U.S., boost productivity, and leverage nearshoring is investment in transportation infrastructure and logistics services. According to the Secretariat for Central American Economic Integration (SIECA, 2019), the logistics cost of shipping freight in Central America is one of the highest in the world. This is due to the shortage of co-modal infrastructure, lack of coordination in border management, and deficient logistics infrastructure. Logistics costs can represent up to 40% of the cost of merchandise, which affects competitiveness, productivity, and market access.

In many cases, international overland transportation routes are not yet equipped for the flow of traffic, both in terms of the number and layout of routes, and the weight and dimensions of the means of transport concerned. Furthermore, border crossings do not meet the international standards for trade facilitation. This results in delays of up to 48 hours at border crossings and average speeds of 18.6 km/h. Similarly, certain sections are unsafe, resulting in security costs amounting to 22% of the value of the freight.

All of this is reflected in the countries' logistics performance (see Figure 4.7). IADB estimates (Calatayud and Montes, 2021) indicate that if the quality of logistics services in any LAC country were to improve by one unit (on a scale of 1 to 5), its exports in dollars would increase by around 7%. Moreover, exports of manufactured goods would rise by 18% as a result of this one-unit improvement.

///FIGURE 4.5. Logistics performance index: Quality of trade and transport-related infrastructure (1 = low, 5 = high)



Source: World Bank.

In sum, to enhance their presence in global value chains, CAPARD and Mexico would benefit from a trade strategy geared towards fostering innovation, as well as integrated infrastructure, transport, and logistics policies, in order to produce goods with a higher technological content and deliver these speedily.

Under the right conditions, the CAPARD region and Mexico could take advantage of the trend towards regional value chains and develop into a regional hub for supplying inputs to the medical device, automotive, and aeronautics industries. The textile exporting countries of the Northern Triangle could supply medical protective equipment and become suppliers of textile inputs to the automotive and aeronautical industries of Mexico, which could itself become a supplier, along with Costa Rica and the Dominican Republic, of medical and pharmaceutical equipment to the region.

One example of the advances of the nearsourcing phenomena is Panama, which is promoting itself as a manufacturing and logistics hub for regional value chains and focusing on attracting new production lines, including assembly lines. To this end, a special-regime law, EMMA, was enacted to promote the establishment and operation of multinational firms engaged in manufacturing. As part of this new approach, the primary short-term opportunities will focus on logistics services, products for securing cargo, last-mile light manufacturing, automotive retrofitting, computer services, warehouse services, coffee-based products, steel products, electronic equipment recycling, and copper products.

Meanwhile, Costa Rica is focusing its efforts on increasing its presence and involvement in the global microprocessor manufacturing chain. As mentioned previously, in 2020, server-chip assembly and testing activity returned to the country. It would be beneficial to attract foreign direct investment in the manufacture of the organic substrates used in the assembly process of these microprocessors. Companies in the sector currently source these inputs from a number of Asian countries.

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