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COLOMBIA

SELECTED ISSUES

March 8, 2023

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CONTENTS

BETTER TOGETHER: THE IMPACT OF FISCAL AND MONETARY POLICIES ON INFLATION[1]

Following a series of supply-side shocks, unprecedented policy stimulus, and a sharp recovery in economic activity after the pandemic, inflation rose above central bank targets in many economies around the globe, including Colombia. Amid a more challenging external backdrop and increasing monetary policy tradeoffs, this note explores the role that fiscal policy can play to support monetary policy in addressing inflationary pressures without unduly dampening growth. The empirical analysis and calibrated model suggest that fiscal policy can play a critical in role in tackling inflation, with important welfare enhancing implications.

A. The Policy Response to Previous High Inflation and Low Growth Episodes

1. Colombia, as many other emerging market economies, has been particularly susceptible to shocks that pushed inflation above central bank targets and lowered growth. These shocks have often given rise to monetary policy tradeoffs, as the central bank must balance the need to increase the policy rate to address inflationary pressures and prevent inflation expectations from becoming unanchored against the need to support growth to offset negative income effects of terms of trade shocks or other supply shocks. The magnitude of these trade-offs tends to be larger in economies in which inflation expectations are not well anchored (Bems and others, 2021 and IMF, 2018a).

2. The monetary and fiscal policy response to shocks has varied across countries depending on the strength of their policy frameworks. Empirical analysis using a panel VAR framework (PVAR) based on a sample of 24 inflation targeting small-open economies from 2000-21 (quarterly), including Colombia, shows that terms-of-trade shocks (which often move inflation and growth in opposite directions) have been accompanied by a tightening in monetary policy, particularly in countries with the largest deviation between medium-term inflation expectations and the central bank target.[2,3] In fact, in countries with better anchored inflation expectations, the monetary policy response was much less aggressive with fiscal policy playing a supportive role.

3. However, the empirical approach carries various shortcomings. The results from a PVAR are not structural, hence it is hard to disentangle the role of fiscal policy in lowering inflation and its effect on the monetary policy response. Also, this analysis is silent on welfare aspects (i.e., the

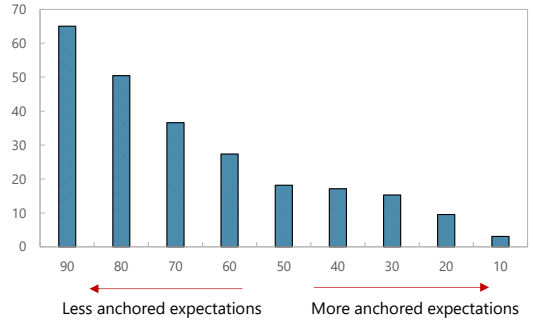
[1] Prepared by Marco Arena and Juan Yépez Albornoz

[2] The analysis estimates the response of inflation, inflation expectations, the monetary policy rate, and real government expenditure to a commodity terms-of-trade shock using a PVAR framework, with block exogeneity constraints. See Arena and Yépez Albornoz (forthcoming) for further details.

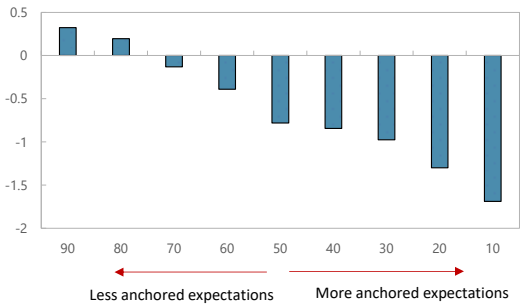
[3] The analysis uses a commodity terms-of-trade index prepared by Gruss and Kebhaj (2019), which allows to control whether an economy is a net commodity exporter or importer.

optimal policy mix). Hence, in the next section, we qualitatively match these results with a structural DSGE model.

Monetary Policy Response
(Cumulative change in policy rate, in basis points)



Fiscal Policy Response
(Cumulative change in public expenditure, in percent)



Source: IMF staff estimates.
Note: The bars represent cumulative one-year impulse responses to a 10 percent decline in commodity terms-of-trade. The horizontal axis denotes the percentile in the distributions of the deviations of inflation expectations from the central bank target.

B. Identifying the Role of Fiscal Policy

4. To shed light on the role of monetary and fiscal policy in lowering inflation, the results of the empirical model are qualitatively matched to a standard DSGE model. The parameters of the model are calibrated with Colombian macroeconomic data and incorporate a Taylor-type rule for monetary policy and a fiscal rule with a structural deficit target and debt anchor. Impulse responses from the theoretical model are qualitatively matched to the empirical findings.

5. The model shows that fiscal policy can play a supportive role, with important welfare enhancing effects. Key findings include:

- Lower (larger) fiscal adjustment, in the form of expenditure cuts, is indeed associated with lower (larger) overall demand adjustment and more (less) aggressive monetary policy tightening.[4,5] At the same time, a faster reduction in inflation takes place when fiscal consolidation supports the monetary policy response.

- Furthermore, households' welfare is higher if fiscal policy does not deviate from the fiscal rule. This result can be rationalized by the fact that an adverse productivity shock, given the presence

[4] A similar analysis can be done by focusing on revenue measures. However, an increase in taxes seems less plausible in the aftermath of a negative supply-side shock.

[5] Expenditure cuts could include reductions in subsidies and tax expenditures.

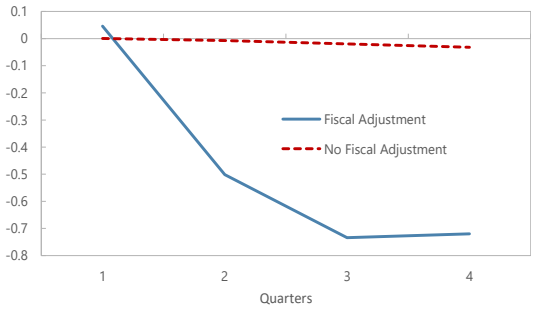
of nominal rigidities, creates a positive output gap. Hence, it is optimal for the economy to adjust to a lower level of potential output (Galí, 1999).

- Overburdening monetary policy increases the volatility of household consumption, affecting their lifetime expected utility. Hence, results from a canonical DSGE model suggest the optimality of adjusting fiscal policy, in line with a structural deficit target rule (as done in Colombia), in response to a negative supply-side (i.e., productivity) shock.

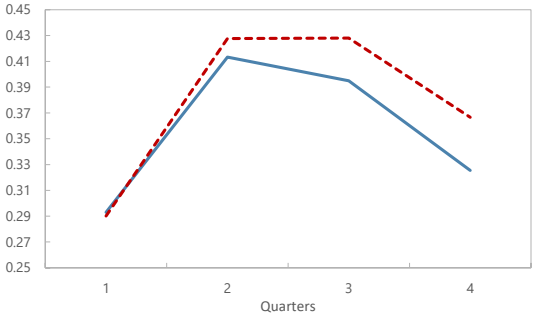
- Overall, these results suggest that an economy would benefit more in terms of welfare from monetary and fiscal policy moving in tandem (especially in a low growth and high inflation setting).

Impulse Responses to in DSGE Model and Welfare Analysis

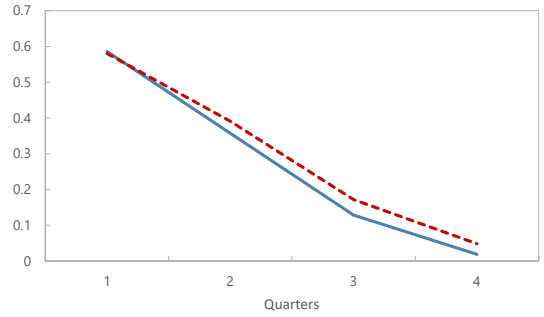
Fiscal Policy Response
(percent deviation from steady state)



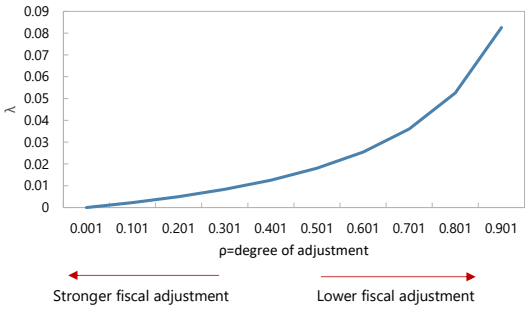
Monetary Policy Response
(percent deviation from steady state)



Inflation Response
(percent deviation from steady state)



Welfare Cost
(percent of foregone consumption)



Source: IMF staff estimates.
Note: Impulse responses to a one standard deviation TFP shock. TFP is assumed to follow an AR(1) process, with a persistence parameter equal to 0.9. Welfare analysis looks at the cost (in terms of foregone consumption) to deviations of fiscal policy response from the targets dictated by the model's fiscal rule (as in Schmitt-Grohe and Uribe, 2004). See Arena and Yépez Albornoz (2023, forthcoming) for more details.

IDENTIFYING RECENT INFLATION DRIVERS IN COLOMBIA[1]

Inflation rose sharply starting in the second quarter of 2021 due to a combination of global and domestic supply and demand factors. A key challenge for policy design is to identify the nature (demand vs supply) and the source (domestic vs external) of inflation drivers. Both "macro" and "micro" approaches are considered to disentangle the effects of different inflation drivers. Our results suggest that both external and domestic factors contributed significantly to headline inflation in Colombia. Moreover, we find that persistent inflationary shocks, even if they originate from the supply side, can become broad-based, affecting core and headline inflation, and becoming entrenched in inflation expectations. The evidence implies that a tight stance on monetary policy might be warranted.

A. Identifying Recent Inflation Drivers

1. Headline inflation rose sharply starting in the second quarter of 2021 due to a combination of global and domestic supply and demand factors. On the supply side, bottlenecks in global value chains and transport logistics (due to pandemic-related lockdowns and geopolitical events such as the Russia's war in Ukraine) caused inflation through the higher cost of intermediate inputs. Simultaneously, the recovery in demand following the removal of COVID-19 lockdowns also created upward pressures on the prices of inputs and raw materials, translating into broad-based inflation of final goods and services through the supply chain. A key challenge for policy design is to identify the nature (demand vs supply) and the source (domestic vs external) of inflation drivers.

2. Both "macro" and "micro" approaches are used to disentangle the effects of different inflation drivers. For the "macro" approach, we perform two analyses. First, we estimate a Bayesian VAR that includes both external (food prices, oil prices, and shipment costs)[2] and domestic variables (output gap, inflation or core inflation, and the nominal effective exchange rate)[3] for the period between 2000Q2 and 2022Q4. Second, we perform a forecast error decomposition analysis of

[1] Prepared by Marco Arena, Vu Chau, and Juan Yépez Albornoz.

[2] Following Carrière-Swallow et al (2022), global shipping costs are proxied by using the Baltic Dry Index (BDI).

[3] Following Ha, Kose, Ohnsorge, and Yilmazkuday (2019), a Bayesian VAR is estimated using external and domestic variables for the period 2000Q2-2022Q4. The identification strategy is done through sign restrictions, where, similar to Forbes, Hjortsoe, and Nenova (2017), the block of external (global) variables is combined with the block of domestic variables. Zero restrictions are imposed such that country-specific shocks do not affect external variables. It is assumed that a shock to oil prices affects shipment costs and food prices, and that a shock to shipment costs affects food prices. Also, it is assumed that external variables affect inflation/core inflation. A positive country-specific *supply* shock or positive country-specific *demand* shock increases country-specific output growth. Country-specific inflation falls by a country-specific *supply* shock. A positive exchange rate shock (appreciation) is assumed to increase the exchange rate, but other effects on domestic variables are left unrestricted.

inflation projections for 2022 based on different WEO vintages since 2017.[4] The "micro" approach applies a Bartik shift-share design that leverages how different production sectors are exposed to shocks differentially (Chau et al., 2023) to decompose the effects of various shocks (lockdowns, maritime congestion, fiscal stimulus, monetary policy, etc.) on inflation.

3. The Bayesian VAR estimation points to an important impact from external factors on headline inflation, but domestic factors were also important. The results suggest that external factors accounted for an average of around one-third of **headline inflation** between 2021Q4 and 2022Q4. Domestic factors, especially domestic demand and the exchange rate, account for an average of 36 percent. Regarding **core inflation**, the results also suggest that domestic factors accounted for about 35 percent of the contributions. External factors accounted for less than 30 percent. However, in both cases, additional idiosyncratic factors explain an important part of the contributions. These factors would include, among others, weather-related events, lasting effects from the 2021 social demonstrations, macroeconomic policies, and effects from indexation mechanisms.

Contribution of External and Domestic Factors to Inflation

(Relative to deviations from the mean; in percent)

	2021Q4	2022Q1	2022Q2	2022Q3	2022Q4
Total external shocks[1/]	41.2	32.5	30.6	32.8	30.6
Total domestic shocks	36.5	35.6	36.3	37.7	35.8
Domestic demand shock	19.0	13.6	18.1	18.6	17.3
Domestic supply shock	0.9	10.4	5.7	7.6	8.1
Exchange rate shock	16.6	11.6	12.5	11.5	10.4
Other	22.4	31.8	33.1	29.5	33.6

Source: IMF staff calculations.
[1/] Shocks associated to oil and food prices and shipment costs.

Contribution of External and Domestic Factors to Core Inflation

(Relative to deviations from the mean; in percent)

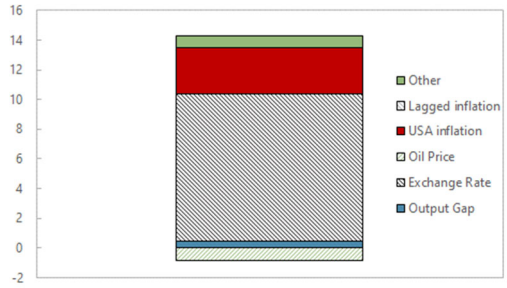
	2021Q4	2022Q1	2022Q2	2022Q3	2022Q4
Total external shocks[1/]	20.2	27.0	26.8	27.6	26.8
Total domestic shocks	36.4	32.9	35.5	35.6	35.0
Domestic demand shock	20.8	9.8	15.9	17.3	16.4
Domestic supply shock	8.0	13.6	9.6	8.4	9.0
Exchange rate shock	7.6	9.6	10.0	9.9	9.6
Other	43.4	40.0	37.7	36.8	38.3

Source: IMF staff calculations.
[1/] Shocks associated to oil and food prices and shipment costs.

4. Furthermore, the forecast error decomposition analysis points to significant effects from surprises related to external inflation. This result would also point to the contribution of external factors explaining headline inflation.[5]

Inflation Forecast Error Decomposition, 2022

(In percent)



Sources: IMF's World Economic Outlook database and IMF staff calculations.

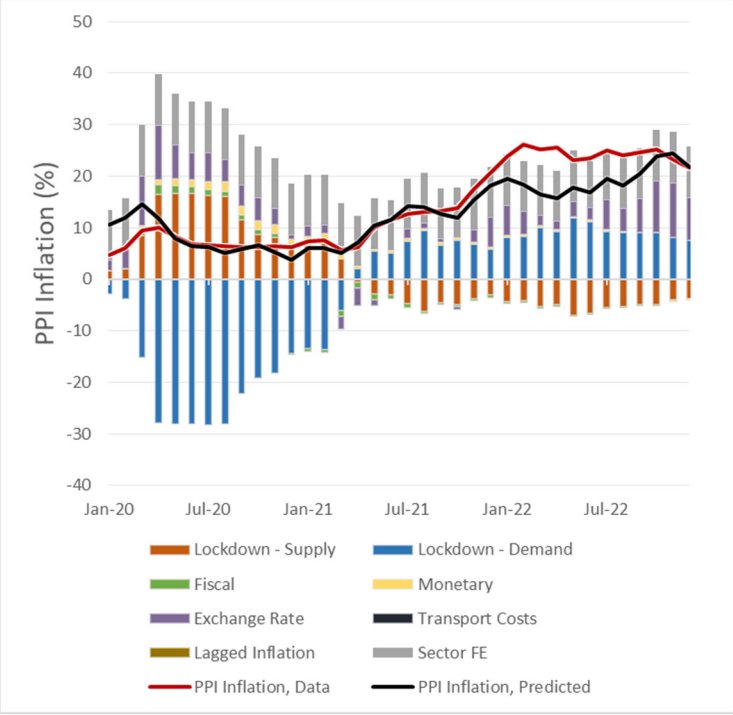
5. A more granular sector-level analysis ("micro" approach) suggests that demand recovery—both abroad and in Colombia—was the main driver of inflation,

[4] The estimation is based on regressing staff forecast errors about 2022 inflation outturns on lagged inflation, USA inflation, oil prices, and the output gap. The analysis uses the January, April, July, and October data reported to the IMF's World Economic Outlook for different vintages (from 2017 until 2022).

[5] Care is needed with the interpretation as exchange rate dynamics could also reflect, partially, the policy response to external and domestic shocks, especially in inflation targeting economies.

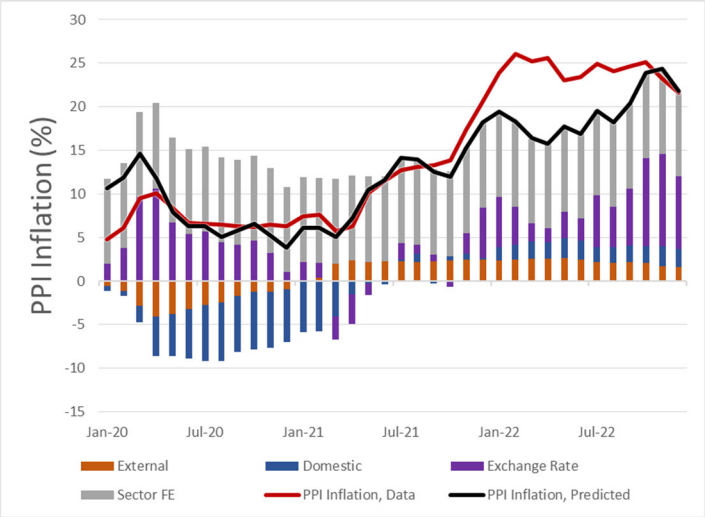
alongside exchange rate depreciation. Identifying the drivers of inflation is empirically challenging due to the presence of many confounding shocks (lockdowns, maritime congestion, fiscal stimulus, global commodity shocks, etc.), as well as the various channels through which a shock can affect inflation. For example, on the one hand, Covid lockdowns were a supply shock because they disrupted production and supply chains; on the other hand, lockdowns were also a demand shock, since they either directly prevented consumption (e.g., restaurants and hotels) or indirectly lowered aggregate demand via the income channel (workers who lost income during lockdowns would consume less). To delineate the effects of various shocks and channels, staff applied a Bartik shift-share design that leverages how different production sectors are exposed to shocks differentially (Chau et al., 2023). Identification uses information from global sectoral input-output linkages for over 1000 production sectors, including those in Colombia. The results suggest that the strong post-pandemic recovery of demand worldwide was the biggest contributor to inflation in Colombia in 2021-2022. While there remained supply bottlenecks in certain industries, the relaxation of lockdown stringency across the world lowered the price pressure overall. The effect of the exchange rate on inflation has also become important since the second half of 2021. Importantly, the sectoral model, which explains inflation well throughout the pandemic, significantly underpredicts inflation from 2021Q3-2022Q2, suggesting that other domestic idiosyncratic factors (weather-related shocks, fiscal policies) and global commodity price shocks) may have contributed to up to one-third of the inflation during this period.

Contribution of Key Inflation Drivers for Colombia



Sources: OECD, Haver, Oxford CGRT, IMF staff estimates; Chau et al. (2023)

Contribution of domestic versus external drivers of inflation for Colombia



Sources: OECD, Haver, Oxford CGRT, IMF staff estimates; Chau et al. (2023)

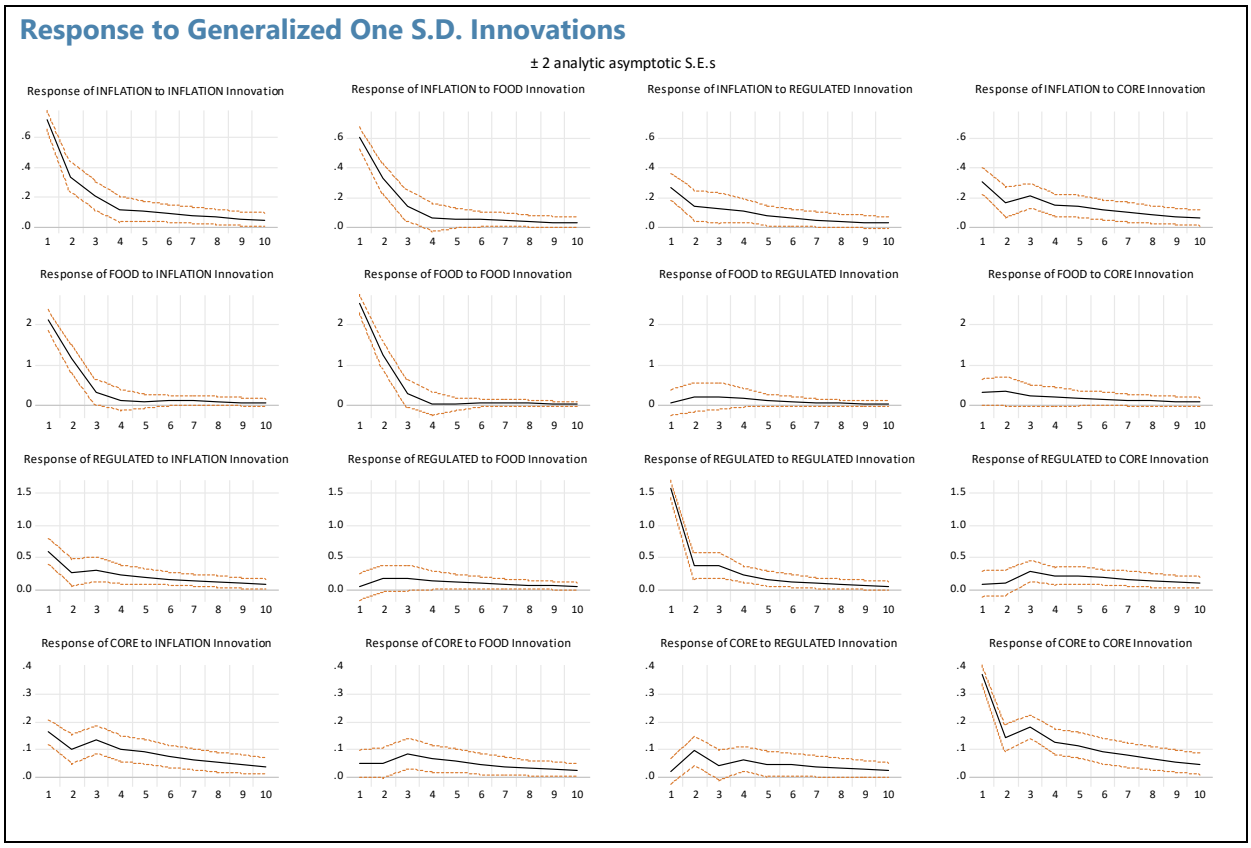
B. Can Supply-Driven Shocks be Transmitted to Core Inflation?

6. In the case of Colombia, second-round effects have been common, with supply-driven shocks becoming widespread and affecting core inflation.[6] In this regard, policy action could be warranted in the case of persistent increases in world food prices (supply shocks) and/or supply bottlenecks, given the lag with which they are transmitted domestically, their impact on inflation expectations, and the existence of indexation mechanisms. This is because even if inflationary pressures were to come from persistent supply shocks, as the ones experienced since 2021, they would become entrenched in inflation through second round effects because of both indexation mechanisms and an increase in inflation expectations.

7. A VAR analysis was used to analyze the interaction between the components of CPI. Second round effects are material, as a shock to headline CPI inflation has significant, positive subsequent effects on its components.[7] A VAR estimated using monthly information of CPI inflation and its components (core, food, and regulated prices) for the period between 2000 and 2019 shows that the shocks to the sub-baskets of the CPI have significant, positive effects on headline monthly inflation on impact. The responses of CPI inflation to food inflation shocks and to core inflation shocks tend to persist (up to 2 and 6 months, respectively). Shocks to food and regulated items' inflation have effects on core inflation that could last up to 6 months and 4 months respectively). Also, shocks to the headline CPI monthly inflation show some persistence, which would imply added persistence to annual inflation (Vargas et al., 2009).

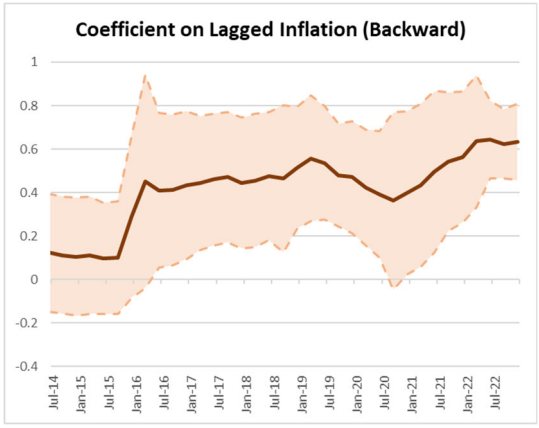
[6] Core inflation excludes the categories of food and regulated items.

[7] Vargas et al. (2009) interpret these effects as responses to an innovation in "macroeconomic inflation."



8. Inflation in Colombia exhibits a relatively high degree of persistence and has become "stickier" in recent periods. To study persistence, we estimate a "hybrid Phillips Curve" —the relationship between inflation and past inflation, forward-looking expectations, and a measure of the output gap—using rolling 10-year samples of data from 2004-2022. Our results show that inflation remains highly persistent and is becoming more so over time (the coefficient on lagged inflation has steadily risen from 0.2 to 0.6 over two decades).

Inflation Persistence in Colombia



Sources: Haver Analytics, Banco de la República; IMF staff calculations.

9. Inflation persistence reflects in part the still relatively high level of indexation in the economy. As discussed by Vargas et al (2009), indexation is a relevant factor in the transmission of supply shocks to core inflation in

Colombia.[8] A ruling of the Constitutional Court suggested that the purchasing power of the minimum wage should be sustained, implying that the minimum wage annual adjustment is unlikely to be lower than headline inflation in the previous year.[9] Furthermore, as discussed in Vargas et al. (2009) it is believed that the minimum wage adjustment could influence the increase of wages that are close to the minimum wage. A second source of indexation in Colombia comes from regulated prices. In particular, the rates of electricity, gas and water/sewage are linked to past CPI or PPI. In addition to wage and regulated price indexation, there are other informal indexation practices that may help explain why inflation persistence remains high in Colombia, despite a reduction after the fall of inflation and the adoption of an inflation targeting regime (Vargas, 2007).

10. Headline inflation can impact inflation expectations with knock on effects on core inflation. To analyze how inflation shocks could impact inflation expectations, we assess how inflation surprises, that is inflation forecast errors, affect inflation expectations. Specifically, we estimate the extent to which inflation expectations are adjusted following an inflation surprise.[10]

11. Inflation expectations are partially impacted by inflation surprises. In a second exercise we measure the impact of deviations from expected inflation on the dynamics of inflation expectations. The objective is to estimate the extent to which inflation expectations are adjusted following an inflation "surprise". More precisely, we consider the relationship between time-t revision in inflation expectation i periods ahead $A_{t|t+i} = E_t\pi_{t+i} - E_{t-1}\pi_{t+i}$ and inflation surprise $S_{t-1}^t = \pi_t - E_{t-1}\pi_t$ (the difference between realized inflation versus expectation):

$$A_{t|t+i} = \alpha_i S_{t-1}^t$$

The coefficient α_i gauges the impact of inflation surprises on revision of inflation expectations. If α_i is close to one, inflation surprises would be fully transmitted to inflation expectations, which would indicate a low degree of anchoring of inflation expectations. The estimation is done for the period 2000Q1-2022Q3 for different inflation expectation horizons (6-month, 9-month, and 12-month ahead).

12. The results suggest that the impact of inflation surprises on expectations is positive and statistically significant, is not transmitted one-to-one, and declines with the expectation horizon. The latter can be interpreted as evidence of partial and declining transmission of inflation surprises to expectations. If an inflation surprise is defined as the difference between food price inflation and the past expectation of current inflation to distinguish between demand and supply shocks, or persistent and short-lived shocks, the results suggest again that a positive impact of the

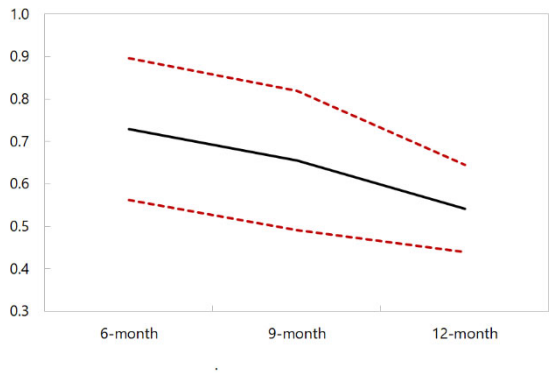
[8] Morales and Jaramillo (1996) mentioned that the subgroup of indexed items represent about 42 percent of the CPI basket. Currently, staff estimate that the fraction of the CPI basket that is indexed directly to last year inflation, PPI, and minimum wage would be around 35 percent.

[9] See Vargas et al. (2009, p. 8).

[10] The analysis uses the central bank's survey of economic expectations from entrepreneurs (done quarterly).

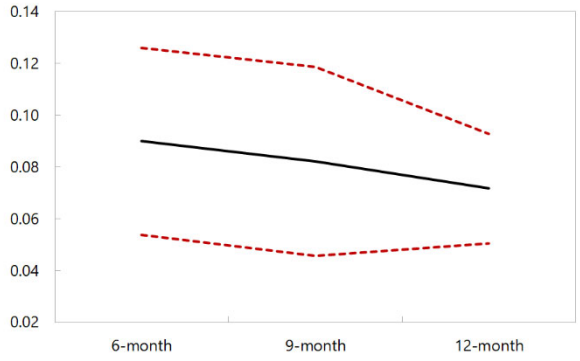
shocks on the expectations adjustment, but of significantly lower magnitude. These results indicate that shocks are not fully transmitted to inflation expectations.[11]

Response of Expectations Adjustment to an Inflation Surprise
(Coefficient and 95 percent confidence intervals)



Source: IMF staff calculations.

Response of Expectations Adjustment to an Inflation Surprise (Food)
(Coefficient and 95 percent confidence intervals)



Source: IMF staff calculations.

13. The overall results suggest that persistent inflationary shocks, even if they originate from the supply side, can become broad-based, affect core inflation and inflation expectations, and could become entrenched in headline inflation. To reduce inflationary pressures and mitigate the risks of expectations becoming unanchored, the central bank would need to react to preserve its hard-gained credibility. Moreover, since end-2021, inflationary shocks in Colombia have coincided with a period of excess capacity, with important domestic demand pressures due to the lifting of COVID-related mobility restrictions and a faster-than-expected recovery in economic activity. The indexing to a higher level of inflation has also contributed to this increase.

[11] The analysis was replicated using inflation expectations from market analysts and the estimated coefficient associated to one-year ahead inflation expectations was 0.29. Also, the regressions were performed using 24-month ahead inflation expectations for both entrepreneurs and market analysts, whose sample starts in 2015Q1. The estimated coefficients were 0.41 and 0.13, respectively.

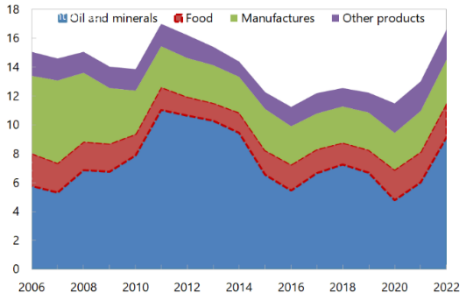
EXPORT DIVERSIFICATION IN COLOMBIA: A WAY FORWARD AND IMPLICATIONS FOR ENERGY TRANSITION[1]

The new administration is seeking to reduce the economy's reliance on oil and coal, two of Colombia's largest exports, by expanding the production of renewable energy, and diversifying exports towards non-traditional higher value-added sectors. A well-designed and executed export diversification plan would be key to facilitate the energy transition, boost productivity, and thus, long-term growth. The transition would be challenging and would need to be gradual, as it would require significant improvements in infrastructure, a continued focus on providing high quality education, labor market reforms to further reduce informality, and the removal of non-technical non-tariff barriers. This note presents some stylized facts about Colombia's exports basket and provides a brief literature review of factors and policies that could support a successful energy transition strategy.

A. An Overview: Composition of Colombia's Exports

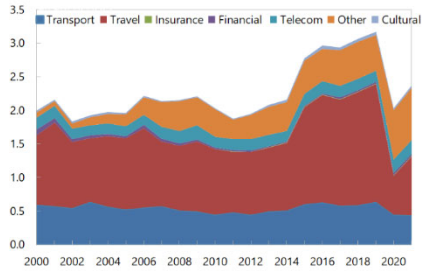
1. Commodity exports have gained prominence during the last two decades. While total exports increased from 15 percent in 2006 to 16.6 percent of GDP in 2022, commodity exports (oil, minerals, and food) rose from 8 percent of GDP in 2006 to almost 13 percent at the height of the commodity super cycle in 2013, then recede to 11.5 percent in 2022. Non-commodity exports have marginally declined. Comprised mainly of manufacturing products, non-commodity exports accounted for 7 percent of GDP in 2006 and 5 percent in 2022, although during the last five years they saw a small rebound. Interestingly, the share of services exports to GDP, a type of non-commodity exports, has doubled over the last decade, driven mainly by tourism and other services (health, IT, and marketing). Transportation services have remained unchanged at around 0.5 percent of GDP.

Evolution and Composition of Goods Exports
(Percent of GDP)



Sources: DANE; IMF staff elaboration.

Evolution and Composition of Services Exports
(Percent of GDP)



Sources: Haver Analyics; IMF staff elaboration.

[1] Prepared by Marco Arena, Vu Chau, Zoltan Jakab, Sergio Rodríguez and Juan Yépez Albornoz. Daria Kolpakova provided excellent research assistance.

2. Colombian commodity exports have been concentrated mainly in hydrocarbons and a few agricultural products. In 2022, oil and mining exports (crude oil and coal) accounted for 55 percent of goods exports, 17 percentage points higher than in 2006. However, this large increase is driven by prices rather than volumes: Compared to 2015, current oil export volumes are 30 percent lower, and coal export volumes are 11 percent lower. While the importance of agricultural products (food products and other agricultural products) has fluctuated over time, it remained about the same –15 percent in both 2006 and 2022. The share of manufacturing exports relative to goods exports fell from 35 percent in 2006 to 18 percent in 2022. The decline reflects price effects, as the volume of manufacturing exports has remained broadly stagnant. At a more granular level, five products account for about 65 percent of goods exports (Table 1).

Table 1. Colombia: Exports of Goods: Top Products
(Millions of US dollars; Share of Total Exports)

		2006	
HTS Chapter	Products	Millions of USD	Share in Total Exports
27	Fuels and oils	9,026	37.0
9	Coffee and tea	1,461	6.0
72	Iron and steel	1,107	4.5
71	Pearls and precious stones and metals	919	3.8
6	Plants and flowers	679	2.8
8	Fruits	478	2.0
87	Vehicles other than railway	436	1.8
17	Sugars and sugar confectionery	401	1.6
39	Plastic and plastic products	312	1.3
1	Live animals	196	0.8
62	Apparel and clothing accessories	185	0.8
30	Pharmaceutical products	152	0.6
48	Paper and paper products	138	0.6
21	Prepared foods	138	0.6
	Sub-total (Top 25 products)	15,629	64.1
	Memorandum		
	Total Exports	24,391	

		2011	
HTS Chapter	Products	Millions of USD	Share in Total Exports
27	Fuels and oils	36,147	63.5
71	Pearls and precious stones and metals	2,775	4.9
9	Coffee and tea	2,608	4.6
72	Iron and steel	827	1.5
6	Plants and flowers	804	1.4
8	Fruits	770	1.4
17	Sugars and sugar confectionery	723	1.3
39	Plastic and plastic products	679	1.2
88	Aircraft, spacecraft, and parts	506	0.9
74	Copper and copper products	265	0.5
30	Pharmaceutical products	237	0.4
	Sub-total (Top 25 products)	46,340	81
	Memorandum		
	Total Exports	56,954	

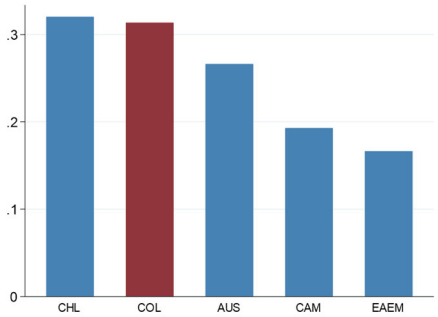
		2016	
HTS Chapter	Products	Millions of USD	Share in Total Exports
27	Fuels and oils	14,528	46.8
9	Coffee and tea	2,379	7.7
71	Pearls and precious stones and metals	1,392	4.5
6	Plants and flowers	912	2.9
8	Fruits	849	2.7
39	Plastic and plastic products	540	1.7
17	Sugars and sugar confectionery	396	1.3
72	Iron and steel	328	1.1
87	Vehicles other than railway	325	1.0
15	Animal or vegetable fats and oils	209	0.7
30	Pharmaceutical products	203	0.7
38	Miscellaneous chemical products	191	0.6
76	Aluminum and aluminum products	154	0.5
74	Copper and copper products	142	0.5
	Sub-total (Top 25 products)	22,547	73
	Memorandum		
	Total Exports	31,045	

		2021	
HTS Chapter	Products	Millions of USD	Share in Total Exports
27	Fuels and oils	18,633	45.2
9	Coffee and tea	3,091	7.5
71	Pearls and precious stones and metals	2,998	7.3
6	Plants and flowers	1,274	3.1
8	Fruits	1,131	2.7
39	Plastic and plastic products	1,001	2.4
72	Iron and steel	528	1.3
15	Animal or vegetable fats and oils	362	0.9
21	Prepared foods	297	0.7
76	Aluminum and aluminum products	285	0.7
74	Copper and copper products	229	0.6
17	Sugars and sugar confectionery	205	0.5
30	Pharmaceutical products	192	0.5
1	Live animals	152	0.4
	Sub-total (Top 25 products)	30,379	74
	Memorandum		
	Total Exports	41,224	

Sources: DANE and IMF Staff Calculations.

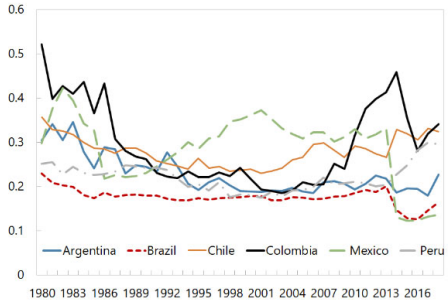
3. Colombia's high dependence on oil exports helps explain relatively high goods export concentration metrics when compared with other emerging market economies. With a Herfindahl-Hirschman index (HHI) of goods exports concentration above 0.3 for the period 2016-2018, Colombia's export basket appears less diversified than those of manufacturing powerhouse countries of Central America and Mexico (CAM) or East Asian Emerging Markets (EAEM). Relative to South American peers, Colombia's concentration index exhibited a gradual decline since the late 1980s, but this trend changed in 2008 due to the increase of oil exports, reaching the highest level among peers by 2014. The index exhibited a significant decline that coincides with the 2014-2016 oil price shock. By 2018, together with Chile, Colombia shows the highest concentration index relative to peers. The latter would raise questions regarding the progress of export diversification in the country.

Export Concentration Index
(Herfindahl-Hirschman index; 2016-2018 average)



CAM: Central America and Mexico; EAEM: East Asia Emerging Markets
Source: Salinas (2021)

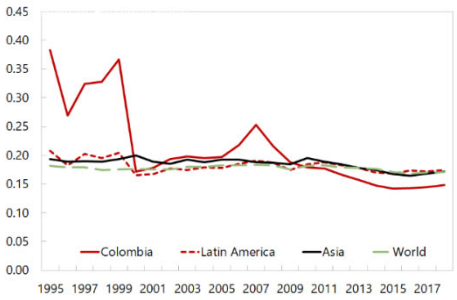
Export Concentration Index
(Herfindahl-Hirschman index; 1980-2018)



Source: Salinas (2021).

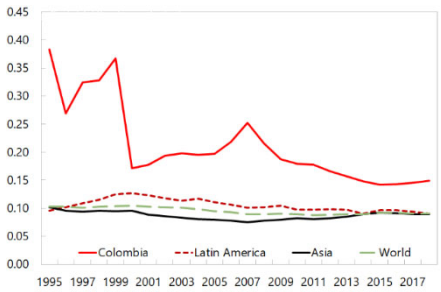
4. However, Colombia has become significantly more diversified in exporting services. Colombia now has more viable service export industries, including travel and transport. The improvement is stark when compared to Latin America, Asia, or world averages. In terms of destination diversification, Colombia has been on a positive trend, with export incomes now relying on a wider set of trade partners instead of one key trade partner. This trend is displayed by overall exports as well as services-only exports.

Export Concentration-Services
(Herfindahl-Hirschman Index)



Sources: OECD (2017); IMF staff elaboration.

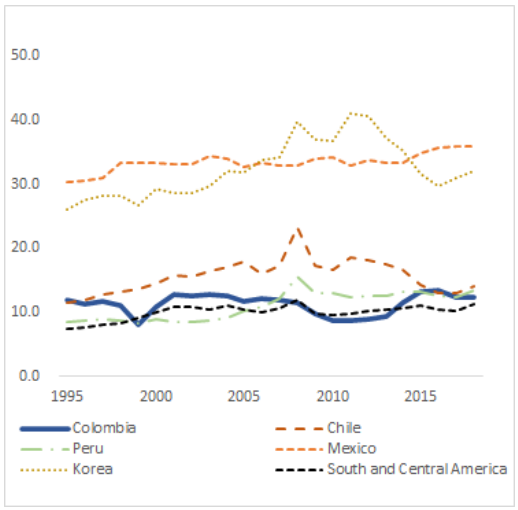
Export Destination Concentration-Services
(Herfindahl-Hirschman Index)



Sources: OECD (2017); IMF staff elaboration.

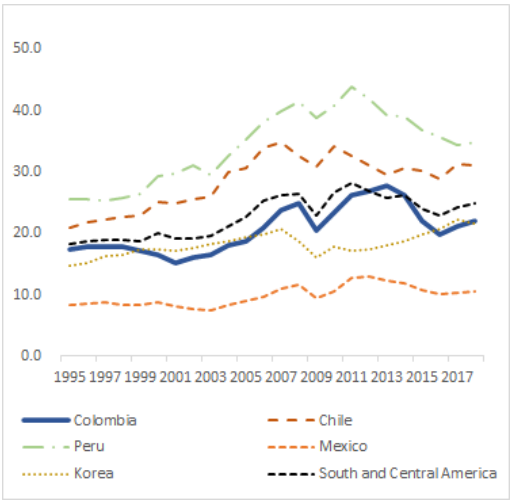
5. That said, Colombia's participation in Global Value Chains (GVCs) remains limited. GVCs participation can be measured either as the foreign value-added content embodied in a country's gross exports (backward participation) or the domestic value-added content embodied in a foreign country's exports as a share of domestic gross exports (forward participation). Even though Colombia's backward participation is close to the South and Central America's regional average, it falls short of peers (e.g., Chile and Mexico) as well as export-oriented countries (e.g., Korea). Colombia's forward participation tends to be higher, as is the case for commodity exporters; however, it's still significantly below peers (such as Chile and Peru).

Backward Global Value Chain Participation



Sources: OECD; IMF staff elaboration. Backward GVC participation is measured as the foreign value-added share of gross exports.

Forward Global Value Chain Participation



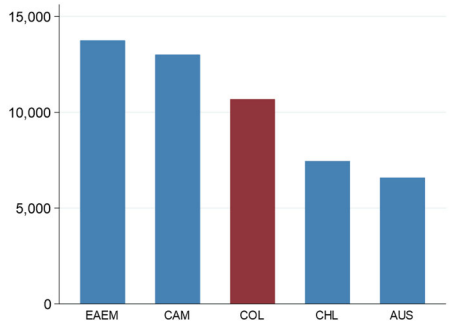
Sources: OECD; IMF staff elaboration. Forward GVC participation is measured as the domestic value added in foreign exports as a share of gross exports.

B. Factors Affecting Export Diversification

6. Remoteness (proximity to markets). In line with the empirical international trade literature, Salinas (2021a) finds that distance to international markets is significantly associated with export categories that can diversify the typically commodity-dependent export baskets of developing countries. At the same time, this result is also supported by empirical studies in the Global Value Chain (GVC) literature which conclude that gravity equation variables are key determinants of GVC participation (see for example, Cadestin and others, 2016, and Raei and others, 2019). In physical distance, Colombia does not seem to be far from major markets. However, remoteness can also come from deficiencies in physical and/or, financial

Proximity to Markets

(US$/mn)



CAM: Central America and Mexico, EAEM: East Asian Emerging Markets. Proximity to markets is the sum of GDP of partner countries weighted by their distance to the country.
Sources: UN Comtrade; Salinas (2021).

infrastructure, differences in language, culture, economic arrangements, among other factors, which could be affecting Colombia.

7. Role of Policies. While distance-related variables are mostly exogenous, several others that can foster export diversification and raise value added in exports are determined by public policies of the exporting economy. Several studies (Ding and Hadzi-Vaskov, 2017; Giri and others, 2019; Salinas, 2021a) statistically associate export diversification and/or export complexity[2] with higher educational attainment, stronger governance and institutional development, lower barriers to trade, and higher physical infrastructure development.[3] Daude, Nagengast, and Perea (2014) explore a number of factors that could, a priori, have a positive effect on economic complexity, and identify energy availability, tertiary education, and foreign direct investment inflows as the most important variables. The April 2015 IMF's *Regional Economic Outlook: Asia and the Pacific* uses a similar methodology to Daude, Nagengast, and Perea (2014), identifying trade openness and institutional quality as important positive correlates of complexity. In addition, geographic distance to markets and size of government are found to be negatively correlated with complexity.[4] Studies on global value chains point out that increased participation in complex production networks requires supportive transportation and logistics infrastructure as well as modern information and communication technologies systems (Blyde, 2014).

8. Specialization. An argument against complete diversification is that countries have much to gain from specializing in a set of products with comparative advantages, either in technological progress (Ricardo) or in factor endowments (Heckscher-Olin). However, the level of specialization in each country changes over time. Imbs and Wacziarg (2003) find that, countries tend to diversify as they get richer, before specializing again after reaching a certain income threshold.

9. While policies supporting Colombia's diversification have improved, there is room for further improvement. Over the last 25-30 years, Colombia has made important advancements that can foster export diversification like improving human capital, governance, infrastructure quality and trade openness. However, continued work is needed. As indicated by OECD et al. (2019), Colombia has taken steps to address the infrastructure gap, but more needs to be done to increase *transport connectivity*. Authorities' data show the average logistics cost of the country's companies, as a percentage of sales, stands at 12.6 percent (down from 13.5 percent in 2018), mainly represented by transportation costs. The cost to export a container could decline between 25 and 50 percent with advancements, which are in the authorities' infrastructure agenda, in fluvial and railway infrastructure and trade facilitation measures. As discussed in the Internationalization Mission's Report (2021), the last three decades have seen significant reductions in trade protections. However, *tariffs* remain higher than those of its regional peers. In addition, significant tariff dispersion remained after the period of trade liberalization. of the 1990s, which worsened in the last two

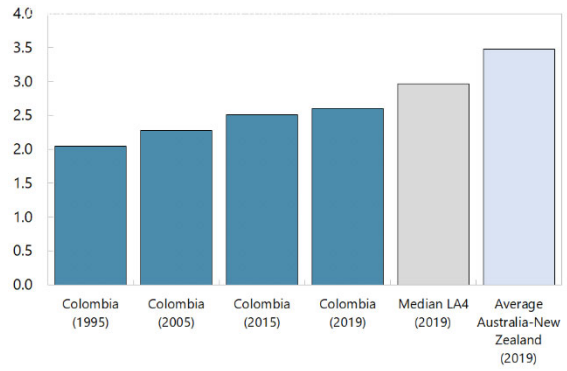
[2] Exports with Product Complexity Index above zero according to Hausman et al. (2013).

[3] The scatterplot shows that the predicted variable is just slightly higher than the actual, suggesting that there is still room to improve diversification and complexity by further strengthening policy fundamentals.

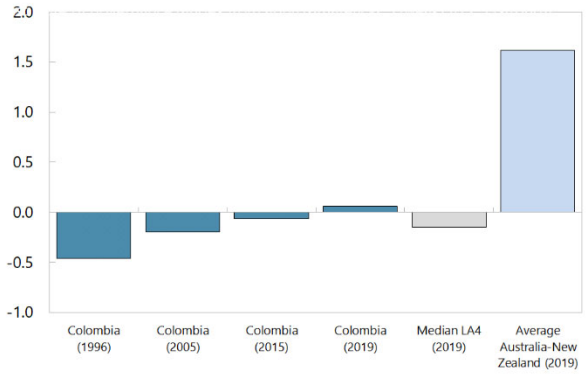
[4] See also IMF (2015).

decades. At the same time, the Report (p. 79) notes that "*non-tariff measures* that limit trade have proliferated, assuming equivalent levels of tariff protection, which reached a peak of 123 percent in 2000, and have remained close to that level ever since (García J., 2014; Botero, Garcia, and Correa, 2018)." Moreover, "Colombia stands out for its extremely widespread of non-technical non-tariff measures calls, in particular, quality and price control."

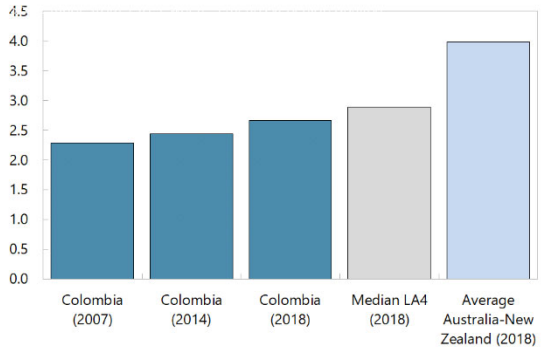
Human Capital Index
(Based on years of schooling and returns to education)



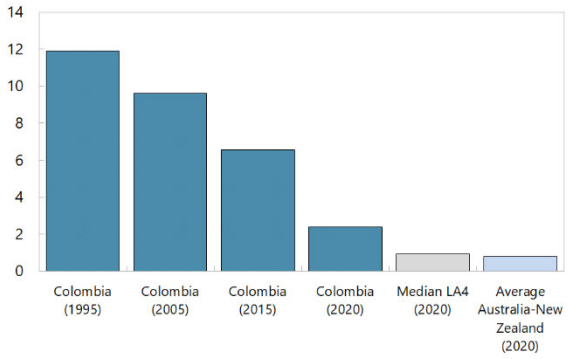
Government Effectiveness
(Estimate of governance ranges from approximately -2.5 (weak) to 2.5 (strong)



Quality of Trade and Transport Infrastructure
(Score range from 1 to 5, where 5 means high quality)

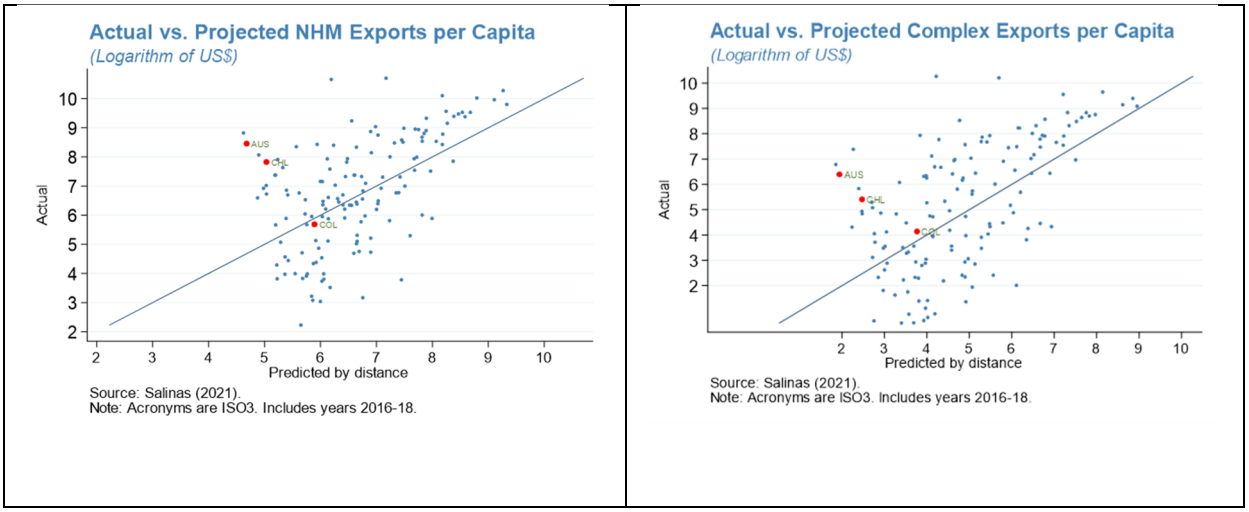


Tariff Rate
(Weighted mean, all products; in percent)



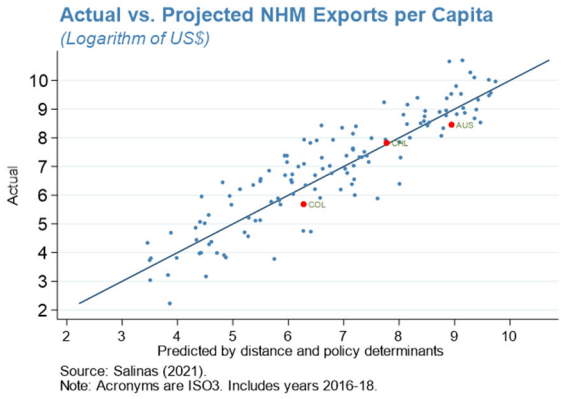
LA4: Brazil, Chile, Mexico, and Peru.
Sources: Feenstra, Inklaar, and Timmer (2015)-Penn World Table (version 10.01); the Worldwide Governance Indicators 2022 (World Bank), Logistics Performance Index (World Bank), WITS (World Bank); IMF staff elaboration.

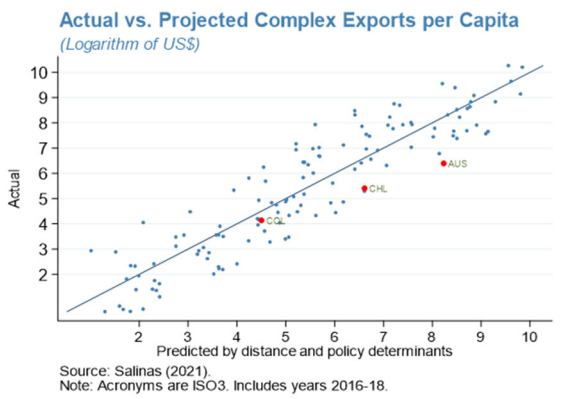
10. Further strengthening policy areas such as governance, education, infrastructure, and technological readiness would contribute to export diversification in Colombia. Based on the results of a gravity-model that also includes additional policy variables (Salinas, 2021a),[5] it is found that, first, the level of Colombia's non-hydrocarbon/mineral (NHM) and complex exports is in line with the country's degree of remoteness or proximity to international markets. Second, after including policy variables related to infrastructure, educational attainment, governance and institutional strength, and tariffs (as a proxy for trade barriers), the level of NHM and complex exports show an additional expansion. However, further strengthening the implementation of horizontal policies would foster larger export diversification. The cases of Australia and Chile illustrate that despite the degree of remoteness, the implementation and strengthening of horizontal policies allowed them to expand their level of NHM and complex exports.[6]



[5]We are thankful to Gonzalo Salinas for sharing the results of his work. As presented in Salinas (2021a), panel regressions are estimated based on Hausman and Taylor (1981) technique with groups consisting of all combinations of reporter and partner countries in UN Comtrade database. Observations are non-overlapping 5-year averages within the 1962-2018 period, depending on data availability. Dependent variable is the logarithm of the value of exports excluding hydrocarbon and mineral products (SITC2 codes 0-2999, 4000-6772, 6900- 8999). Explanatory variables include gravity equation variables extracted from the CEPII gravity database constructed by Head and others (2010) and Rose (2004). 15 Variables measuring political stability and governance are extracted from Polity IV (2014) and World Bank (2020a), respectively. Educational attainment data was retrieved from the United Nations Education index (UNDP, 2020) and Barro-Lee (Barro and Lee, 2013). Tariff data comes from the World Integrated Trade Solution (World Bank, 2020b). Infrastructure quality and other measures of horizontal variables come from the Global Competitiveness Report (World Economic Forum and Harvard University, 2020). Labor market flexibility is approximated through related subindices in the Global Competitiveness Report and in International Monetary Fund (2019). Multilateral resistance terms and partner country's policy variables are also included.

[6] For an analysis of the case of Chile, see Salinas (2021b)

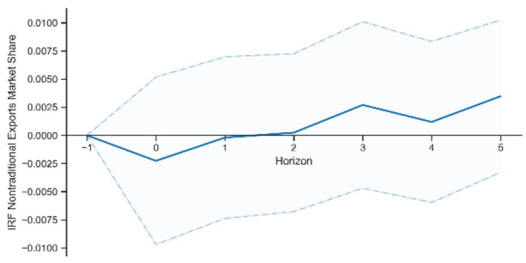




C. The Role of the Exchange Rate

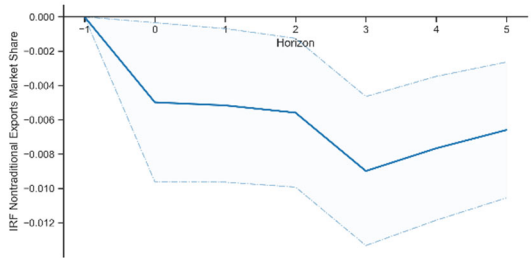
11. Exchange rate flexibility will remain critical in supporting the growth in nontraditional exports. IMF (2017) finds that external adjustments to large and persistent shifts in terms of trade reflect mainly the increased flexibility of exchange rates. It finds that a real depreciation leads to a small boost to exports and a stronger reduction in imports than in the past, with demand shifting toward locally produced goods. Moreover, the study finds that, in terms of global shares, export performance responds more significantly to changing relative prices for non-commodity products and for exporters that trade manufactured goods more heavily. Staff analysis using local projection (Jorda, 2005) shows that this phenomenon is unique to commodity exporters: a 20 percent depreciation of the real effective exchange rate increases the market share of nontraditional exports by 5 percent for a commodity exporter, but lowers the market share of nontraditional exports for a non-commodity exporter by about 12 percent.

Impulse Response of Nontraditional Exports to Large Depreciation Shock for Commodity Exporters
(Percent increase of market share per % currency depreciation)



Sources: OECD, BIS, IMF staff calculations.

Impulse Response of Nontraditional Exports to Large Depreciation Shock for Non-Commodity Exporters
(Percent increase of market share per % currency depreciation)



Sources: OECD, BIS, IMF staff calculations.

12. Developing non-traditional export sectors takes time. While exchange rate flexibility can support new export sectors to develop, many caveats remain. Firstly, the magnitude of the effect is small. Our analysis is in line with IMF (2018) in estimating a 5 percent increase in market share following a large real depreciation. Furthermore, it tends to take long (five years) to fully materialize the boosting effect. Additionally, in the case of Colombia, trade costs tend to blunt the export volume response (IMF, 2020). Casas et al. (2017) find that, in Colombia, manufacturing exports firms tend to absorb about half of the price changes arising from exchange rate changes, and by even more in the short run than adjusting production. Gopinath et al. (2020) pointed out that exports' response may be muted when prices are sticky in a dominant currency.

D. What Are the Implications for the Energy Transition Strategy?

13. Climate related issues are at the center of the new administration's policy agenda. The administration plans to boost productivity and long-term growth by diversifying the production structure of the economy, transitioning away from extractive industries into new economic activities and relying more on non-conventional renewable energy sources. The agenda has five pillars: 1) reducing land use and deforestation and expanding the agricultural frontier; 2) ensuring that territories are resilient to climate change and natural disasters; 3) incentivizing the re-industrialization of the economy and promote more environmental-friendly economic activities and the use of renewable sources of energy; 4) focusing on inclusive policy making to foster a more equitable and productive economy; and 5) developing a progressive energy transition strategy aimed at using surpluses from the oil and coal sectors to finance alternative industries.[7]

14. A key challenge would be to reduce the high dependence on energy and mining exports, which represent around 6 percent of GDP. As discussed at the beginning of the chapter, oil and coal exports comprise around half of Colombia's export basket and most of the FDI in the country flows into the mining industry. Furthermore, fuel-related revenues represent an important source of fiscal revenues, and the dependence on the sector would increase in coming years as a result of the 2022 tax reform (more than half of the reform's total yield comes from taxes on the oil and coal sector). Hence oil and coal are key for Colombia's FX generating capacity and essential for safeguarding external and fiscal sustainability.

15. Uncertainties regarding the prospects for the oil and mining sectors could generate significant macroeconomic effects. For illustrative purposes, a no-replacement of oil/coal production scenario is presented below. Based on a partial equilibrium approach where oil production declines by about 90 percent by 2033, the results suggest that GDP would go down by 1.3 percent (based on the sector's value added in GDP), the current account deficit ratio would hover at around 6 percent of GDP and fiscal revenues could fall by 2 percent of GDP. In addition, in the context of a general equilibrium approach (Jakab, 2023, forthcoming),[8] the model-based simulations

[7] Historical Pact (2022): Programa de Gobierno. Colombia Potencia Mundial de la Vida.

[8] A general equilibrium New Keynesian two country model is calibrated for Colombia following Erceg and Linde (2013) to gauge the indirect effects. In this model, agents gradually learn about how persistent the drop in production of oil. Expectations are based on a filtered path of future oil production path.

suggest that GDP could drop by more than 2 percent in 2-3 years and only gradually recover, and that the trade balance would deteriorate permanently by more than 1.5 percent of GDP.

16. An energy transition strategy, which involves developing alternative sources of energy and new export sectors must be carefully calibrated and implemented in a gradual manner. The energy transition would require a well-designed and communicated gradual strategy as the build-up and strengthening of policy fundamentals to boost export diversification, including services, would take time. With oil consumption at about 0.460 million barrels per day (mmb/d), including gasoline imports of about 0.110 mmb/d, a fast reduction in domestic production could generate external gaps.

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