

Macro-Fiscal Impacts of Colombia's Energy Transition Plan

Marco Arena, Alberto Garcia-Huitron, Bihong Huang, Daria Kolpakova,
Roberto Perrelli, Alpa Shah and Philippe Wingender

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IMF Selected Issues Papers are prepared by IMF staff as background documentation for periodic consultations with member countries. It is based on the information available at the time it was completed on September 15, 2025. This paper is also published separately as IMF Country Report No 25/281.

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ABSTRACT: This paper assesses the risks and opportunities of Colombia's energy transition plan. Recognizing that a sharp fall in oil and coal production would weigh heavily on fiscal sustainability and regional economies, it emphasizes that a well-managed expansion of renewable energy would be essential to mitigate these effects through policies to reskill workers, protect vulnerable communities, and foster broad social support. Moreover, complementary domestic, financial, and export-oriented reforms would further mitigate the economic costs, underscoring the importance of diversification, productivity gains, and stronger competitiveness to ensure the transition is sustainable and growth-enhancing.

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SELECTED ISSUES PAPERS

Macro-Fiscal Impacts of Colombia's Energy Transition Plan

Colombia

Prepared by Marco Arena, Alberto Garcia-Huitron, Bihong Huang, Daria Kolpakova, Roberto Perrelli, Alpa Shah and Philippe Wingender¹

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COLOMBIA

SELECTED ISSUES

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**Western Hemisphere
Department**

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MACRO-FISCAL IMPACTS OF COLOMBIA'S ENERGY TRANSITION PLAN¹

This paper assesses the risks and opportunities of Colombia's energy transition plan. Recognizing that a sharp fall in oil and coal production would weigh heavily on fiscal sustainability and regional economies, it emphasizes that a well-managed expansion of renewable energy would be essential to mitigate these effects through policies to reskill workers, protect vulnerable communities, and foster broad social support. Moreover, complementary domestic, financial, and export-oriented reforms would further mitigate the economic costs, underscoring the importance of diversification, productivity gains, and stronger competitiveness to ensure the transition is sustainable and growth-enhancing.

Background

1. **The Petro administration has been aiming to reduce Colombia's reliance on oil and coal by diversifying towards non-traditional, higher value-added exports while expanding its renewable energy sector.** The government's "green transition" strategy also strives to ensure that vulnerable populations are protected and impacted communities are appropriately supported.
2. **Staff have long advocated for well-designed and executed policies to facilitate a gradual and growth-friendly transition.** In the [2023 AIV Consultation](#), staff used a general equilibrium model to show that a sudden stop in oil production without developing a new export sector would be disruptive and seriously worsen fiscal and external sustainability. In the [2024 Article IV Consultation](#), staff showed that frictions that prevent the entry of new productive firms and distort the allocation of labor and capital were responsible for Colombia's low TFP growth and reversals in export diversification after the late 2000s, highlighting the need to develop industries with comparative advantage and greater exports valued added. This paper extends the work by providing further insights on the potential macro-fiscal impact of the energy transition.
3. **While the oil and coal sectors are paramount to the Colombia's economy, Colombia's petroleum reserves and production levels are set to continue to decline.** Fossil fuels represent 10 percent of Colombia's fiscal revenues, 35 percent of exports, and around 4 percent of GDP of the economy's value added. The importance is set to decline, however. For the oil sector, the reserves-to-production ratio, which assesses the remaining productive life of current proven reserves, stands at around 7 years, implying that without new discoveries, production is expected to cease in about 30 years. Similarly, gas production, which amounted to about 3 trillion cubic feet (Tcf) in 2020, is projected to last 6.5 years. Recent offshore discoveries could help boost production, but these are only expected to commence production after 2030.
4. **Currently, oil production is concentrated in a small number of larger onshore fields, mostly owned by the national oil company.** Among the more than 400 producing oil fields, only

¹ Prepared by Marco Arena, Daria Kolpakova and Roberto Perrelli (WHD), Bihong Huang (MCM), Alberto Garcia-Huitron and Alpa Shah (FAD), and Philippe Wingender (RES).

17 fields have production exceeding 10,000 barrels per day (bpd) in 2023, and only 8 fields with production greater than 20,000 bpd. Technical costs vary widely across fields, with granular estimates suggesting that 80 percent of production has a unit cost below US\$40 per barrel, although only 60 percent of production would be commercially viable at a price below US\$40 per barrel. Ecopetrol, the national oil company, remains the largest producer, accounting for 60 percent of production.

5. Meanwhile, coal production is highly concentrated among a few large mines, and on a recent steep decline. Colombia is the leading coal producer in Latin American, and the fifth largest exporter of thermal coal in the world. Production grew rapidly in the 2000s, more than doubling over the course of a decade until its peak of 91.5 million tons in 2017. Since then, production has been in marked decline (reaching 54.5 million tons in 2023), impacted by several mine closures. Thermal coal is largely exported, making up about 15 percent of total exports.

6. Government revenues from oil and coal extraction are collected through a royalty-tax fiscal regime. Oil projects operate under a range of fiscal regimes depending on the contract date, typically with either a flat 20 percent royalty or a progressive royalty from 8 to 25 percent depending on field production.² In addition, a corporate income tax applies to profits, with rates currently at 35 percent. Coal mines producing more than 3 million metrics tons of coal per year are subject to a 10 percent royalty. A windfall tax was introduced in 2023 at a rate of 10 percent and increased to 15 percent in 2024.

7. Future oil production will also be impacted by the administration's decision to restrict new exploration. The government has halted any new licensing rounds for oil exploration. Recent fiscal policy initiatives include a price-based windfall tax of 10-15 percent on petroleum profits and disallowing the deduction of royalties from corporate income tax (later overturned by the high court). While these changes may increase government revenue in the short run, they are likely to further reduce oil production over the medium to long term.

Economic Impacts of the Energy Transition

8. The proposed transition is taking place in the context of considerable global uncertainty regarding future fossil fuel usage. Staff analysis uses the International Energy Agency (IEA) forecasts of global oil, gas, and coal production and prices under three climate change mitigation scenarios (Figure 1).³ The Stated Policies Scenario (STEPS) provides an outlook based on the latest policy settings, including energy, climate, and related industrial policies. The Announced Pledges Scenario (APS) assumes all national energy and climate targets made by governments are met in full and on time. The Net Zero Emissions by 2050 (NZE) scenario assumes mitigation efforts

² Contracts also contain either constant shares of production that vary by contract or a 'high price participation' that applies a sliding scale rate of participation according to the oil price.

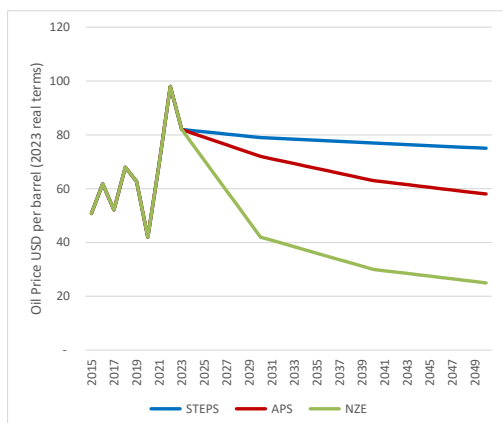
³ Colombia's baseline projections used for the purposes of macroframework tables are difficult to compare with those resulting from the application of the IEA scenarios because the former assumes no new contracts on fossil fuel exploration whereas the latter are driven by changes in global demand and global prices.

which limit global warming to 1.5 °C. These projections, however, are subject to considerable uncertainty as energy policies in key economies continue to evolve. Using a project-level (bottom-up) modeling methodology (FARI Methodology⁴), staff analysis shows the impact of the projected decline in oil price on Colombia's oil production under alternative scenarios:

- Under the **STEPS scenario**, oil production would decline from current levels (estimated at 736 thousand barrels per day (bpd), towards 510 thousand bpd by 2030, 184 thousand bpd by 2040, and 44 thousand bpd by 2050 (Figure 2, Panel A).

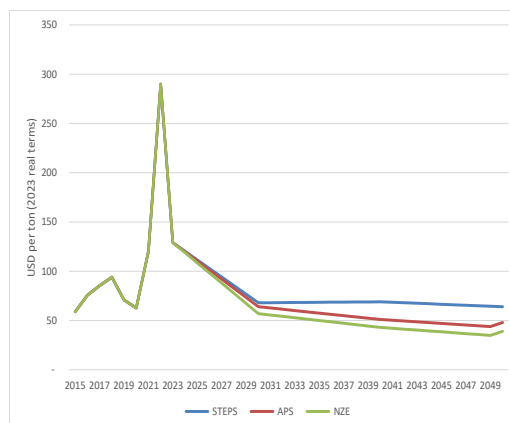
Figure 1. World: Projected Fossil Fuel Production and Prices—Global Scenarios

A. Transition Scenarios: Oil Prices



Source: International Energy Agency (IEA).

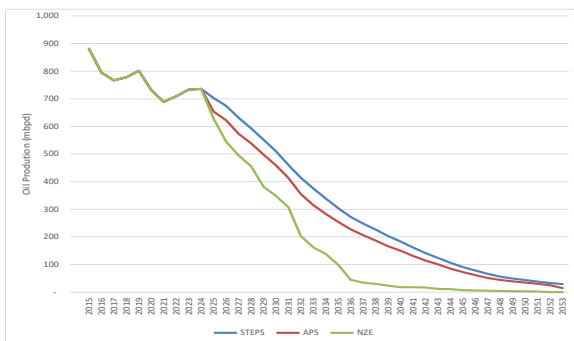
B. Transition Scenarios: Coal Prices



Source: International Energy Agency (IEA).

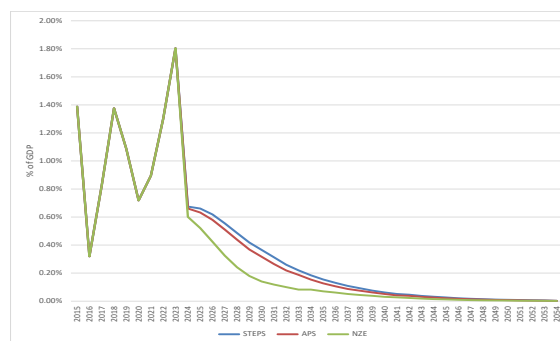
Figure 2. Colombia: Oil Production and Government Revenues, 2015-2050

A. Transition Scenarios: Oil Production



Source: IMF staff estimates

B. Transition Scenarios: Government Revenues



Source: Hacienda and IMF staff estimates

⁴ The analysis uses the IMF's FARI project-level cash flow model to estimate government revenues from fossil fuel projects under different energy transition scenarios. It models each major coal mine and oil field individually, incorporating production, cost, and fiscal regime data to assess profitability and determine when projects may shut down as prices decline. The approach relies on detailed asset-level data (notably from Rystad Energy for oil). Historical revenues reflect authorities' reported royalty and income tax collections for the years 2015–2023.

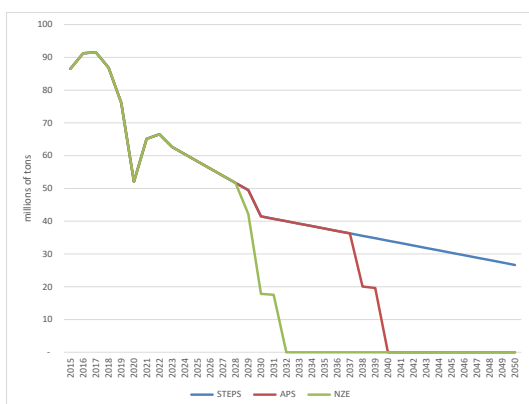
- In the **APS scenario**, Colombia would be producing 460 thousand bpd by 2030, 150 thousand bpd by 2040, and 35 thousand bpd by 250, with several smaller fields ceasing production. The APS scenario converges to a production level 20 percent lower than the STEPS scenario in 2050.
- Under the **net zero (NZE) scenario**, the decline is sharper, with production dropping to 350 by 2030, 18 thousand bpd by 2040, and to only 3 thousand bpd by 2050.

9. Meanwhile, the projected reduction in oil production would carry serious fiscal implications. Under the net zero scenario, royalty and income tax revenues from oil production would fall to 0.14 percent of GDP by 2030, and to near zero by 2050 (Figure 2, Panel B). The impact is slightly lower in the other two scenarios. Altogether, the analysis shows that a steep decline in oil production would reduce Colombia's royalties and income tax revenues by 0.9-1.2 ppts of GDP per year by 2030. The losses would be higher once lower dividends from Ecopetrol are factored in.

10. Much like oil, the coal industry would see a steep decline in production across Colombia's regions.⁵ Mining production costs in Colombia range from US\$40 to US\$70 per ton. Staff analysis assumes an operating cost in the range of US\$30-45 per ton, with an additional US\$20 per ton in transportation costs. The APS scenario accelerates the decline in production in the 2025-2030 period with early closure of the Cerrejon mine (4 years earlier than in the STEPS scenario) and all other mines by 2040 (Figure 3, Panel A). Government revenues follow this steep decline, amounting to 0.07 percent of GDP by 2030 and 0.01 percent of GDP in 2039 before mining activity ceases (Figure 3, Panel B). Under the NZE scenario, all Colombian coal production is assumed to cease by 2032, when the European coal price is projected fall to US\$54/ton.

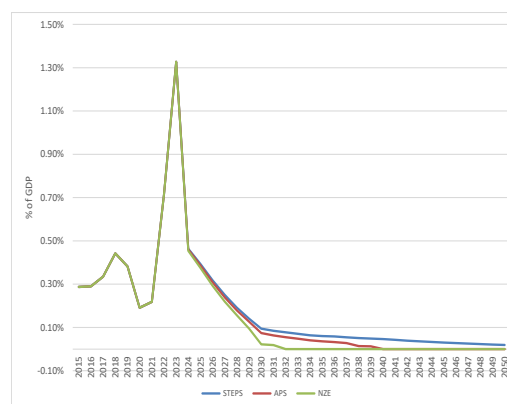
Figure 3. Colombia: Coal Production and Government Revenues, 2015-2050

A. Transition Scenarios: Coal Production



Source: IMF staff estimates

B. Transition Scenarios: Government Revenues

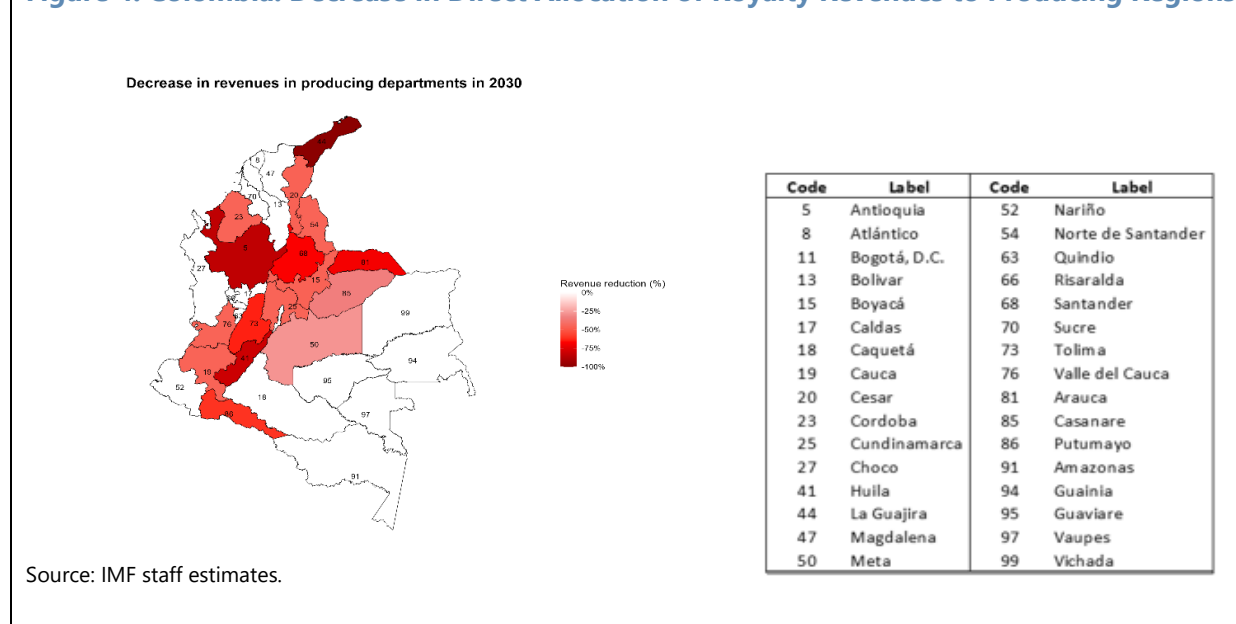


Source: Hacienda and IMF staff estimates

⁵ The forecasted decline in production is calibrated to align with the IEA forecasted production from Central and South America in 2030 and 2050 assuming Colombia continues to account for approximately 88 percent of regional production, the average over last 10 years.

11. In addition, declining fossil fuel production would also have a significant impact on subnational governments. Royalties from coal and oil are distributed to subnational departments and municipalities according to a revenue sharing formula which factors population, poverty, and unemployment levels in each area. Figure 4 shows the decrease in revenue by 2030 across producing regions because of declining commodity prices and production under the APS scenario. Analysis suggests that regions such as Antioquia, La Guajira and Huila will see more marked decline in revenues due to mine closures and depletion of oil fields. Major oil and coal regions such as Meta, Casanare and Cesar are more insulated due to their wider production bases, but nonetheless would see a decrease in their direct allocation of royalties in the range of 38 to 46 percent.

Figure 4. Colombia: Decrease in Direct Allocation of Royalty Revenues to Producing Regions



12. The direct employment impact in oil and coal production is limited. Estimates for 2023 suggest that there were only around 105,000 jobs in both sectors, accounting for about 1 percent of Colombia's total labor force, well below the contribution to the labor market of other sectors like trade (18 percent) and agriculture (14 percent). That said, this excludes employment in related upstream and downstream industries.

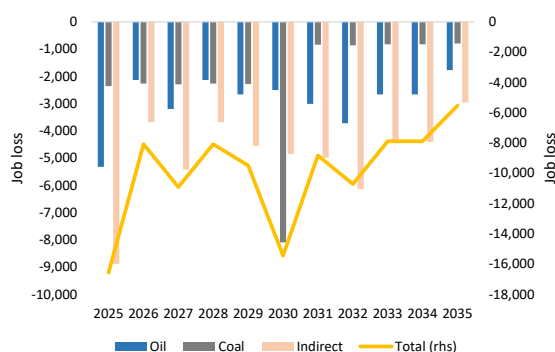
13. The employment impact, however, could be larger after considering interlinkages between the oil and coal sectors and other industries. Many industries benefit from oil operations through input provision, including support services for extractive industries, land transportation, and oil refining and fuel blending (75 percent of the total value of inputs). Downstream, oil refining and fuel blending and gas distribution account for 91 percent of the total value of outputs. For coal, storage and complementary transport services, support services for extractive industries, oil refining and fuel blending, land transport and vehicle repair and maintenance account for 70 percent of inputs, while oil refining and electricity generation account for more than 80 percent of total outputs.

14. As such, total job losses from declining oil and coal production could rise sharply.⁶

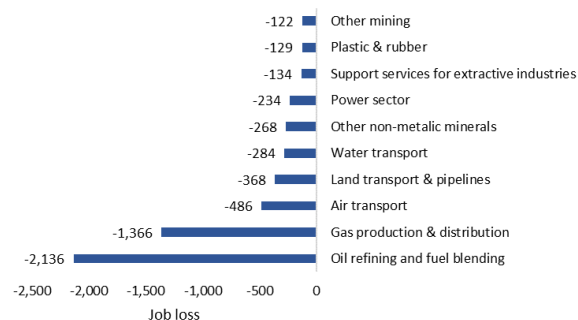
Preliminary estimates based on the production paths of the APS described earlier (Figure 5) suggest that annual job losses could average over 10,000 over the next decade, with the oil sector being the most impacted.⁷ Importantly, indirect job losses are equally relevant as they account for roughly half of the total job losses in any given year. Most indirect job losses happen in the sectors with largest upstream links, such as land transport and pipelines, support services for extractive industries, and storage and complementary transport, and downstream, such as oil refining, fuel blending, and gas distribution.

Figure 5. Colombia: Labor Market Impact of Declining Production of Coal and Oil Under APS Scenario

A. Job loss from Declining Oil and Coal Production and Upstream and Downstream Interlinkages



B. Indirect Job Losses in 2025, Top 10 Sectors



Source: IMF Staff using GEIH 2023 and DANE's IO.

Implications for the Electricity Sector and Renewable Energies

15. Colombia has a diversified electricity generation matrix and its capacity could increase by more than half in the next 15 years. Colombia's generation matrix is dominated by hydroelectric production, which accounts for about two thirds of total installed capacity. Hydro is complemented by thermal energy (30 percent of total installed capacity), mainly from natural gas and coal and liquids to a lesser extent. Solar and wind account for the remaining 4 percent. The Mining and Energy Planning Unit estimates that by 2037, the generation capacity could increase by almost 65 percent with respect to 2023 if renewable energy projects included in its indicative expansion [plan](#) (2023-2037) are completed timely to meet the increasing energy needs. In those

⁶ The paper uses the latest complete labor survey (2023) at the time of the analysis as a reference point.

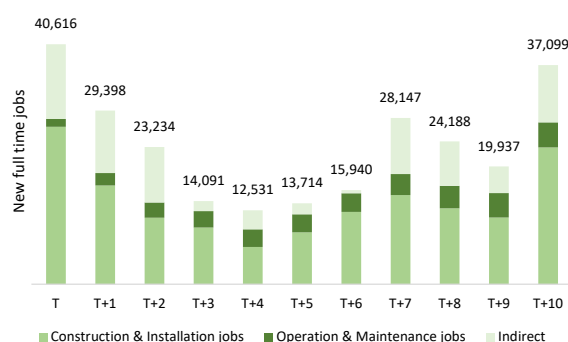
⁷ By 2030, key coal mines are assumed to be shut down.

plans, solar and wind would be the main source of expansion. Based on this indicative expansion plan, staff uses an average of four hypothetical scenarios of electricity generation capacity over the next 10 years, from year T to T+10.

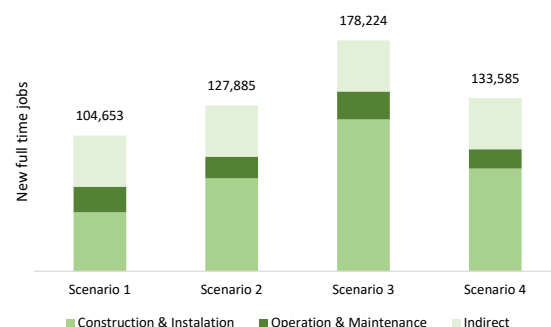
16. The expansion of the power sector and the energy transition could be associated with about 135 thousand additional jobs over the next 5 years, albeit with high degrees of uncertainty. Currently, nearly 70 thousand workers are employed in the power sector. Estimates suggest that an additional 40 thousand full-time jobs could be created if planned renewable projects are completed, which is subject to considerable degrees of uncertainty. In addition, only 3.3 percent would be permanent employments (in operation and maintenance, O&M). About 65 percent of the new job positions would come from construction and installation of plants that would start operating in subsequent years. Moreover, about one third of total new employment would come from indirect employment. In the subsequent decade, the average new job creation could reach 22 thousand per year. However, most of those jobs would be linked to construction and installation (Figure 6).

Figure 6. Colombia: Energy Transition Impact on Power Sector and Upstream/Downstream Industries

A. New Full-Time Jobs over Next 10 Years, Average Across the Four Scenarios



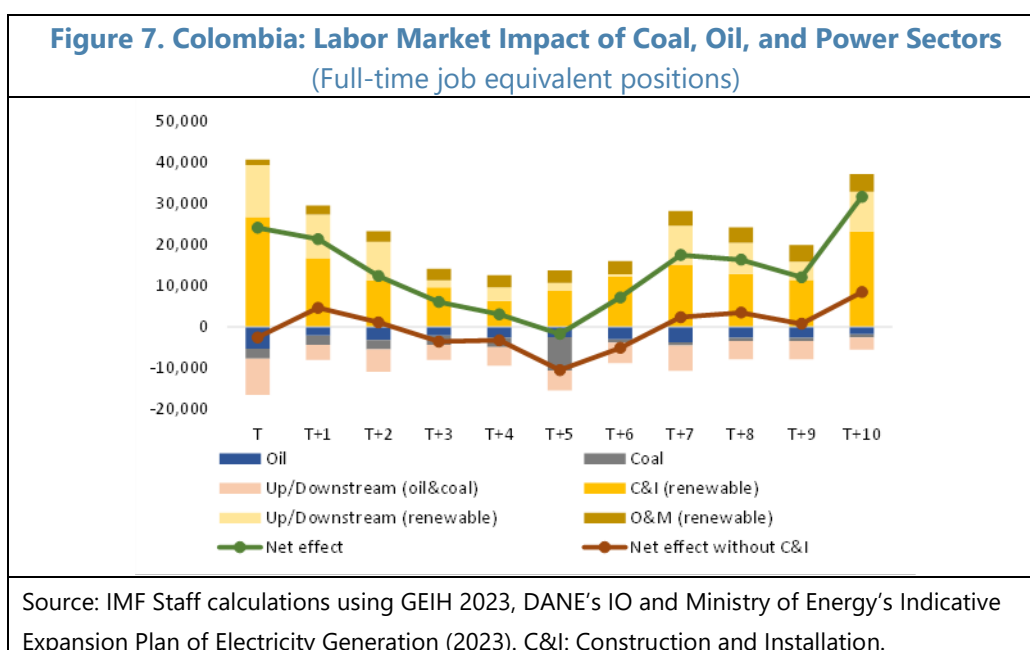
B. Cumulative New Full-Time Jobs over the Next 5 years, By Scenario



Source: IMF Staff using GEIH 2023, DANE's IO and Hanna et al. (2024).

17. The positive employment impact of the electricity sector expansion could outweigh job losses in the oil and coal industries, especially when jobs in construction and installation are factored in. Staff analysis suggests that, in year T, the net impact could be around 24 thousand new full-time jobs (Figure 7). The picture changes significantly if construction and installation (C&I) jobs are not considered (net loss of 2.5 thousand jobs). The results are mainly driven by the ambitious expansion of solar and wind, as they are more labor intensive than fossil-fuel based electricity generation. Thus, in the absence of such growth and green transition in the electricity sector, as reflected in the Ministry of Energy's Indicative Expansion Plan, the positive impact of the electricity sector would be lower. Targeted policies need to be addressed at workers from the oil and coal industries and related sectors. Reskilling programs and unemployment insurance should be strongly considered as part of a comprehensive active labor market policy in Colombia.

18. Regions in Colombia are set to experience heterogenous labor market impacts. The impacts would depend on each region's reliance on traditional fossil fuel-based jobs and the availability of renewable sources of energy such as wind and solar. The bulk of coal workers are concentrated in La Guajira, Cesar, Boyacá, and Cundinamarca. For oil, workers concentrate on Santander, Meta, Casanare, Putumayo, Antioquia, and Bogota. Regarding solar and wind energy potential, Angel-Sanint et al. (2023) conducted a multi-criteria analysis to analyze the financial, political, and social feasibility of renewable energy development. The results of their analysis show that wind energy potential is concentrated in La Guajira, while solar potential is more distributed across departments, including Santander, Tolima, Atlántico, Magdalena, Cesar, and La Guajira.



19. Most regions facing job losses from the energy transition in the expanding electricity sector may see a net increase in jobs. The subnational analysis relies on national input-output tables and assumptions about electricity generation expansion, and it is subject to uncertainties. Staff evaluates solar and wind potential using data from Angel-Sanint et al. (2023) alongside the ERA5 Copernicus dataset, while biomass, biogas, and hydro resources are mapped according to UPME's energy atlas. A limitation is the assumption that renewable projects will proceed as planned by UPME, despite significant local opposition to projects like wind energy in La Guajira, potentially leading to unbalanced job impacts between sectors. The analysis is limited to three years due to uncertainties in renewable energy development. Job losses in La Guajira and Cesar could be offset by new electricity sector jobs if projects proceed as planned, with Antioquia and Tolima also likely benefiting from their hydroelectric and solar potential. The authorities should assess skill gaps to ensure the workforce can take advantage of these opportunities. Conversely, departments like Boyacá, Huila, Norte de Santander, and Bogotá are expected to face net job losses without compensation from the electricity sector. In these regions, governments should focus on diversification, developing new advantages, and strengthening social safety nets for affected households.

20. For the energy transition to positively impact the labor market, two key issues must be addressed: developing future skills and securing local community support. While the expansion of the electricity sector may surpass job losses in oil and coal, the government must actively cultivate a skilled workforce to meet industry demands. This transition also presents a chance to tackle gender inequalities in energy markets. Ensuring local indigenous communities support the construction of generation plants and transmission lines is crucial. Monetary compensation, like the 'Electricity Transfer,' would be insufficient; targeted skill programs and tailored support addressing community concerns, alongside effective communication, are necessary to maximize local benefits.

21. Without appropriate support, energy transition policies could face a risk of reversal. In the short run, Colombia can leverage on its social safety net to limit the impact on vulnerable households, while setting up reskilling programs to ensure that those households rejoin the labor force in the medium term. Government's support would be most effective if its conditional to the participation in reskilling programs. This is a necessary condition so that no one is left behind as Colombia makes progress in its energy transition and to build support for other reforms.

The Role of Reforms in Mitigating Energy Transition Costs

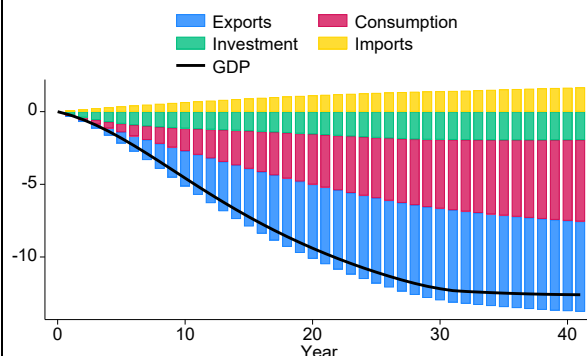
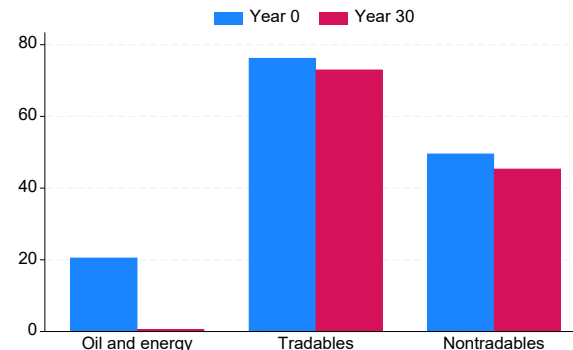
22. The Global Integrated Monetary and Fiscal Model (GIMF-GVC) is used to model the macroeconomic impacts of oil depletion over the next 30 years and how policies can help reduce these losses. In the baseline scenario, oil production declines by 95 percent over 30 years. The depletion is fully anticipated by forward-looking agents. Investment and consumption decisions therefore already factor in these long-run changes. The exchange rate incorporates news about future oil depletion so that equilibrium conditions on traded goods markets determine its path absent other changes. Impulse responses are calculated as deviations from a counterfactual scenario where oil production remains constant at current levels. This allows us to illustrate both the macroeconomic impacts of oil depletion, in addition to policies that could be implemented to compensate for these losses.

23. Results suggest that real GDP would be 12 percent lower compared to a counterfactual scenario in which oil production remains constant at current production levels. Potential growth would decline by 0.4 percentage point annually over 30 years. The decline in exports, consumption, and investment lower GDP by 6 percent, 5 and 2 percent, respectively. The total impact on GDP reflects the direct and indirect losses of capital in the aggregate production function. Capital in the oil, coal, and energy sector would decline by 20 percent of GDP. With a capital income share of 23 percent, this explains around half of the long-term losses in GDP.⁸ Employment in Colombia's oil, coal, and energy sectors is projected to fall sharply, reducing total labor supply by 0.8 percent as workers shift to tradables and nontradables. GDP losses of 9 percent are attributable to lower labor productivity overall while 3 percent are attributable to labor reallocation away from oil, coal, and energy (Figure 8, Panels A-D).

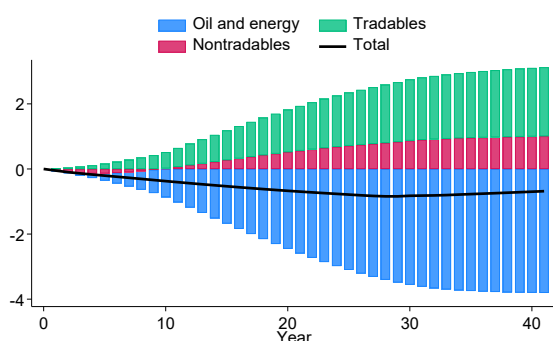
⁸ The oil, coal, and energy sector in the model also includes immediate downstream sectors that will be directly impacted by the loss of production such as petroleum refining, coking and distribution of gas. In total, the sectors accounted for 6.3 percent of GDP in 2023 (4 percent for oil and coal and 2.3 percent for downstream sectors).

Figure 8. Colombia: Macroeconomic Impact of Oil Depletion: Counterfactual Analysis**A. Change in GDP and Contributions by Components**

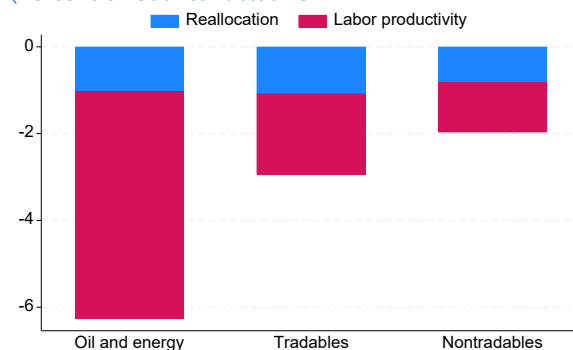
(Percent of Counterfactual GDP)

**B. Change in Capital Stocks by Sector**
(Percent of Counterfactual GDP)**C. Changes in Total and Sectoral Labor Supply**

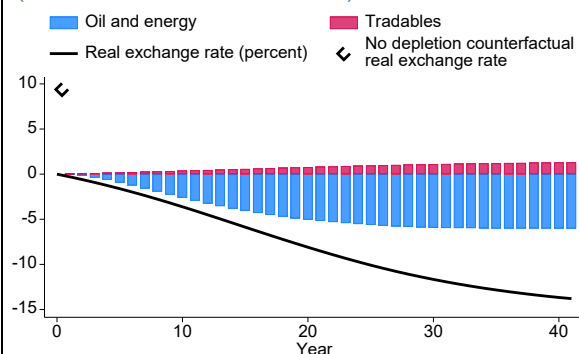
(Percent of Counterfactual GDP)

**D. GDP Losses from Labor Productivity and Reallocation**

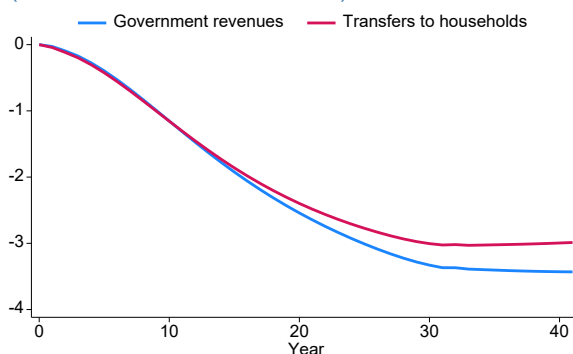
(Percent of Counterfactual GDP)

**E. Changes in Real Exchange Rate and Exports**

(Percent of Counterfactual GDP)

**F. Changes in Government Revenues and Transfers to Households**

(Percent of Counterfactual GDP)



Source: IMF staff estimates.

24. In addition, the real exchange rate would weaken by about 12 percent over the same period. Importantly this depreciation is relative to a point in time when markets have already priced in the oil depletion. When including the “news” effects of future depletion, the total depreciation is

21 percent. This helps boost exports of tradables, but the effect is small compared to export losses from oil, coal, and energy (Figure 8, Panel E). Despite revenue losses of about 3 percent of GDP, government debt would remain broadly stable under the fiscal rule, but reduced transfers would lower consumption among liquidity-constrained households (Figure 8, Panel F).

25. That said, policy reforms could mitigate GDP losses associated with the energy transition.⁹

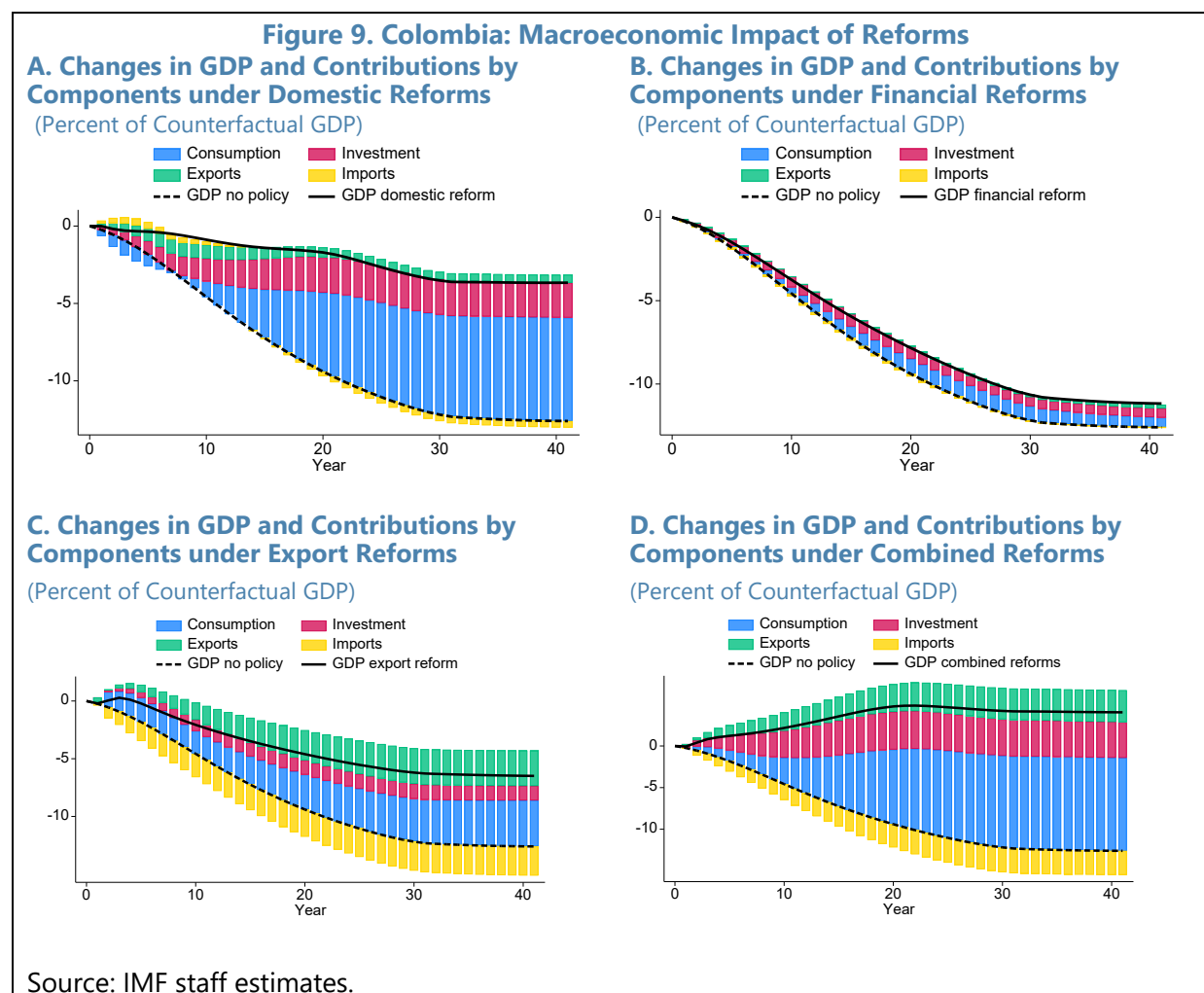
Three types of reforms are considered: (i) a domestic reform package implemented over a 30-year period that assumes higher TFP (5 percent) and labor productivity and lower markups in the tradables and non-tradables sectors; (ii) a financial reform package implemented over a 15-year period aimed at lowering verification costs and borrower riskiness (by 100 bps) in the tradables and non-tradables sectors; and (iii) an export reform package implemented over a 30-year period that increases Colombia's trade weights in partners' import demand for tradables by 50 percent, supporting more robust exports and a stronger exchange rate.

- (i) **Domestic reforms that increase productivity and market competition could alleviate much of the output losses from fossil fuel depletion.** Instead of losses of 12 percent, GDP would decline by only 4 percent over the next 30 years. This would entail higher consumption and investment, the result of positive income effects and higher returns to capital in the tradables and non-tradables sectors (Figure 9, Panel A). Higher productivity and lower markups in non-tradables push domestic inflation down, which further depreciates the real exchange rate. This also supports the current account balance over much for the reform period. Government debt declines from around 53 percent of GDP to around 49 percent of GDP.
- (ii) **Financial reforms improve GDP outcomes, although to a lesser extent than reforms that increase productivity and market competition.** Compared to the oil depletion with no policy scenario, GDP would be around 1.5 percent higher after 30 years, at around 10.5 percent below baseline GDP (Figure 9, Panel B). The improvement arises from higher consumption and investment in broadly equal proportion. Thus, compared to the domestic reform scenario, financial reforms allow for relatively stronger investment to support GDP. The impact on the real exchange rate is muted compared to the previous reform scenario.
- (iii) **Reforms that increase Colombia's export shares have a similar impact on GDP as the financial reform package.** GDP is 9.5 percent smaller than baseline after 30 years, with relatively larger contributions from consumption and exports (Figure 9, Panel C). The reforms also increase imports, a result of stronger demand for intermediate goods in the tradable sector. This reform supports the exchange rate which, instead of falling by 12 percent, declines by 4.5 percent after 30 years.

26. Importantly, a comprehensive reform package that combines various features of the proposed reforms would deliver output gains over the medium term. Specifically, when all three

⁹ For details on specific reforms, see staff previous work (IMF Selected Issues Papers) in the [2023](#) and [2024](#) Article IV Consultations.

reform packages are implemented together, real GDP recovers beyond the losses from oil depletion—instead of 12 percent losses, real GDP would be 0.8 percent larger than the baseline (Figure 9, Panel D). On the expenditure side, this is reflected in strong responses of consumption and investment, both of which exceed their baseline levels. About 40 percent of export losses from oil depletion are compensated by higher tradables exports. The peso depreciates by around 13 percent, broadly similar to the depreciation in the no-reform scenario.



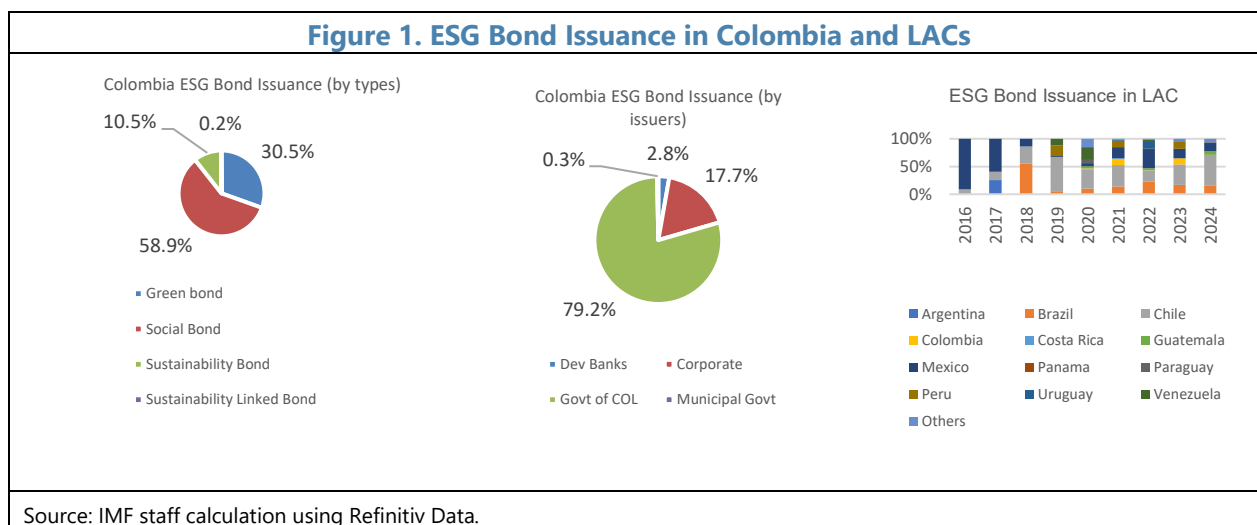
Annex I. Financing the Energy Transition

1. The development of new financial instruments is essential to mobilize resources for the energy transition. To finance the energy transition, Colombia would need about US\$92 billion in additional investment by 2050. This amount represents 1.2 percent of the country's discounted cumulative GDP over 2030-2050 (World Bank, 2023). However, the public sector would have limited resources to increase annual investment, sourced mainly through carbon pricing, higher taxes, and spending efficiency. Against this background, staff estimates that the private sector would need to contribute with at least 80 percent of Colombia's additional investment needs.

2. Colombia has strengthened its institutional framework and capacity building on ESG finance through several initiatives. The National Climate Change System coordinates climate finance management across national, regional, and local levels while Regional Climate Change Nodes link local governments, businesses, and financial institutions to mobilize regional finance. Since 2019, the SFC's biennial ESG and climate risks and opportunity survey has assessed financial institutions' progress in managing environmental risks, identified challenges and needs of supervised entities regarding environmental and social issues, prioritized the tools like the Green Taxonomy, and created supervisory expectations for incorporating ESG issues in various industries.

3. Despite the authorities' efforts, Colombia's climate finance remains below potential. As of 2023, the green portfolio accounted for 2.4 percent of total loans. Between 2020 and 2024, Colombia issued US\$15.3 billion in ESG bonds—nearly 60 percent in social bonds. Around 80 percent of ESG bonds were issued by the government, while the private sector accounted for 18 percent of total issuances. Despite rapid progress, Colombia ESG bonds market is underdeveloped compared to its regional peers, accounting for only 6 percent of total ESG issuance in LAC.

Figure 1. ESG Bond Issuance in Colombia and LACs



4. ESG labeling can lower costs for corporates in advancing sustainable finance. Although ESG bonds in LAC are relatively small and had a late start, they enjoy a pricing advantage relative to

conventional bonds. We collect 2105 bonds issued by 17 Latin American countries during 2016–2024¹ from Refinitiv Eikon. We first use a logit function to estimate a propensity score to predict the probability of being labeled ESG bonds and then match the ESG bond (treatment units) and non-ESG bonds (control units) using the estimated propensity score. The average treatment effect on the treated (ATT) indicates that ESG bonds have yields to maturity (YTM) that are, on average, 100 basis points lower than those of matched non-ESG bonds, after controlling for key bond characteristics (Annex I Table 1). This yield differential suggests that investors are willing to accept lower returns in exchange for exposure to sustainable assets. Moreover, while ESG and non-ESG bonds showed no significant yield differences before COVID-19, a notable premium emerged afterward, with ESG bonds yielding 190 basis points less. This shift likely reflects growing investor awareness of sustainability and resilience. The effect is strongest among corporate issuers, with no significant difference observed for government or supranational bonds.

Annex I. Table 1. Colombia: Effects of ESG Labeling on Bond Yields to Maturity					
	ESG bond	Non-ESG bond	ATT	T-Statistics	P-Value
Full Sample	6.38	7.38	-1.0	-2.51	0.01
By Time					
Before Covid	7.9	7.67	0.24	0.18	0.86
After Covid	6.05	7.96	-1.9	-3.65	0.0
By Issuer					
Agency	5.08	1.64	3.44	1.31	0.2
Corporate	6.77	7.73	-0.97	-2.02	0.04
Government	5.5	5.94	-0.44	-0.62	0.54
Other Gov/Supra	7.08	5.81	1.27	0.6	0.55

Source: IMF staff estimation using Refinitiv Data.

5. Further analysis indicates that a more robust ESG disclosure framework is associated with lower spreads when issuing ESG bonds. To quantify ESG disclosure regulation across Latin American countries, we reviewed official documents and regional surveys of securities regulators for 8 LAC countries,² focusing on four core dimensions: disclosure approach, applicability, assurance requirements, and materiality perspective. Each core dimension was scored to reflect regulatory stringency, with higher values indicating greater rigor. We then applied Principal Component Analysis to aggregate these four dimensions into a single composite disclosure framework score for each country. We regress ESG bond spread—i.e., the yields to maturity (YTM) minus the yields of a similar-maturity US Treasury Bond—on ESG disclosure score while controlling for country effects, time effects and bond-level characteristics such as Fitch credit rating, maturity, amount of issuance, currency, coupon type, existence of external review, type of Issuers, and TRBC sector. The result shows that stronger ESG disclosure frameworks are significantly associated with an average

¹ Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, French Guiana, Guatemala, Honduras, Mexico, Panama, Paraguay, Peru, Suriname, Uruguay, and Venezuela.

² The selection of these 8 countries -- Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico, Panama, and Peru-- is primarily based on the availability of official documents on ESG disclosure and the surveys implemented by IDB and ECLAC (Economic Commission for Latin America and the Caribbean).

reduction of 33 basis points in ESG bond spreads, highlighting the role of regulatory transparency in lowering financing costs for sustainable issuers (Annex I Table 2, Panel A). Subsample analyses reveal that this effect is more pronounced post-COVID, particularly for agency issuers, domestic currency bonds, and high-yield instruments, suggesting that enhanced disclosure reduces investor uncertainty and risk premium, especially in riskier segments (Annex I Table 2, Panels A and B).

6. To strengthen Colombia's ESG financial market, key priorities include ensuring macro-financial stability, improving regulatory framework, and expanding issuer participation.

Standardized reporting and third-party verification will enhance transparency. Support for municipalities and SMEs through credit enhancement and technical assistance can lower borrowing costs. Regional and international cooperation, including integration with Latin American sustainable finance platforms and partnerships with multilateral institutions, can provide vital technical and financial support.

Annex I. Table 2. Colombia: Impact of Disclosure Framework on ESG Bond Spread

Panel A						
	By Time			By Issuer		
	Full Sample	Before COVID	After Covid	Agency	Corporate	Govt/Treasury/Central Bank
Disclosure	-0.33*** (-6.19)	-0.15 (-0.64)	-0.6*** (-8.35)	-0.72*** (-3.42)	-0.31*** (-4.67)	-0.31*** (-4.45)
Observations	1794	777	1017	69	1221	444
R-Squared	0.41	0.44	0.47	0.89	0.5	0.57
Control	Yes	Yes	Yes	Yes	Yes	Yes
Country Effects	Yes	Yes	Yes	Yes	Yes	Yes
Time Effects	Yes	Yes	Yes	Yes	Yes	Yes
Panel B						
	By Currency			By Credit Risk		
	Domestic Currency	Euro	US\$	Other Currencies	High Yield	Investment Grade
Disclosure	-0.65*** (-7.16)	-0.48*** (-4.43)	-0.33*** (-5.58)	-0.11 (-0.76)	-0.56*** (-3.92)	-0.24*** (-5.58)
Observations	494	58	1109	133	375	641
R-Squared	0.52	0.97	0.50	0.41	0.33	0.4
Control	Yes	Yes	Yes	Yes	Yes	Yes
Country Effects	Yes	Yes	Yes	Yes	Yes	Yes
Time Effects	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table reports the estimation of the impact of ESG disclosure regulatory index on bond spreads. The dependent variable is the spread of ESG bonds. t-statistics are computed using robust standard errors (reported in parentheses). ***, ** and * denote statistical significance at 1%, 5%, and 10% levels, respectively.

Source: IMF staff estimation using Refinitiv Data.

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