Public Finance Review

Data Visualization Tool

Application to Indian States

WORLD BANK GROUP
Macroeconomics, Trade & Investment

Emilia Skrok (Practice Manager)
Rishabh Choudhary (Economist)
Fiscal Policy and Sustainable Growth Unit

Outline

- Public Finance Reviews: What, Why and How?
- Country-level Applications
- Subnational Customization (Phase 1)
- Subnational Customization (Phase 2)

Public Finance Reviews

What? Why? How?

What are Public Finance Reviews?

Public Finance Reviews (PFRs) are a core diagnostic tool for	analyzing the efficiency and effectiveness of public expenditure,
	building capacity for growth-enhancing and equitable domestic revenue mobilization, and
	strengthening budget institutions

Why are PFRs important?

PFRs ensure fiscal sustainability, economic growth, development, and transparency.

Fiscal Sustainability and Efficiency:

Identifies inefficiencies in public spending and revenue collection, allowing for better allocation of resources and improved fiscal discipline; ensures fiscal sustainability.

Economic Growth and Development:

Helps in identifying and prioritizing investments in critical sectors such as infrastructure, education, and healthcare

Transparency and Accountability:

Conducting a public finance review promotes transparency and accountability in the management of public funds.

How to conduct a Public Finance Review?

A PFR must include a core macro and public finance profile, with an optional deep dive into key thematic areas relevant to the State.

Macro-fiscal framework

Highlight the main macro-fiscal challenges, fiscal sustainability, fiscal risks, and the effectiveness of fiscal policy in supporting stabilization and development.

Revenue and Expenditure:

Scope for increasing revenue mobilization, simplifying the tax system & enhancing its efficiency, and improving public spending for growth, efficiency, and equity.

Deep dive on thematic areas:

Green transition: Macro-fiscal implications of an increase in electricity duty? Impact of EV subsidy?

Other themes: Public sector wage bill reform, Managing fiscal risks (pensions), Design of effective fiscal rules.

The Macro-fiscal framework

What are the main macro-fiscal challenges?

- Drivers of growth, inflation
- Poverty and income distribution
- Public debt

Is the current fiscal stance conducive to fiscal sustainability

- Fiscal trends, balance and its drivers
- Debt sustainability and fiscal consolidation scenarios

What are the main fiscal risks?

- Medium to long-term impact of demographic transition on pensions
- Debt composition
- Impact of climate change (physical and transition)

Is fiscal policy supporting output stabilization and addressing development challenges?

- Cyclically adjusted balance
- Progress in meeting SDGs

Analyzing Revenues

Is there scope to increase revenues?

- Tax performance, trends and components
- Tax effort, Tax buoyancy
- Revenue gains from closing tax gaps

How can efficiency of the system be enhanced?

- Tax productivity, VAT C efficiency (peer benchmarking)
- Tax expenditure analysis

How can efficiency of the system be enhanced?

- Tax expenditure management
- Compliance burdens

Is the tax system effective in correcting for externalities?

- Total carbon price, including subsidies, taxes, and explicit carbon pricing
- Externalities including air pollution, CC damages.
- Model estimates of consumption changes due to Tobacco, alcohol taxation

Evaluating Spending

Can public spending better support sustainable, long-term growth?

- Levels, trends, composition, and execution rates of spending, by economic and functional classification, benchmarked against peers;
- Rigidity of public spending;
- Fiscal multipliers, Infrastructure financing gaps

Can public expenditures be made more efficient?

- Spending efficiency gaps across key sectors, versus peers,;
- Potential gains in select development outcomes associated with efficiency improvements

How can efficiency of the system be enhanced?

- Public spending on social protection vs. key socio-economic outcomes (multi-dimensional poverty rates, etc.), over time and vs. peers;
- Adequacy, composition, incidence, efficiency, and targeting of social protection transfers.

Policy Recommendations

Table 1. Recommendations should be presented in a systematic way

Model of recommendations

			Impact on:		
Policy Context	**Policy Action**	**Fiscal Impact**	**Efficiency**	**Equity**	**Climate Change**
Policy context—describing the current policy weaknesses as revealed by the analysis in the PFR	Policy action—a policy option that addresses the weakness	Expressed as a share of GDP	expected impact, expressed simply as positive (+), negative (-), or neutral/not appliable (n.a.) or quantified if the data allows.		
Policy Context	Policy Action	X% of GDP	+/-/n.a.	+/-/n.a.	+/-/n.a.

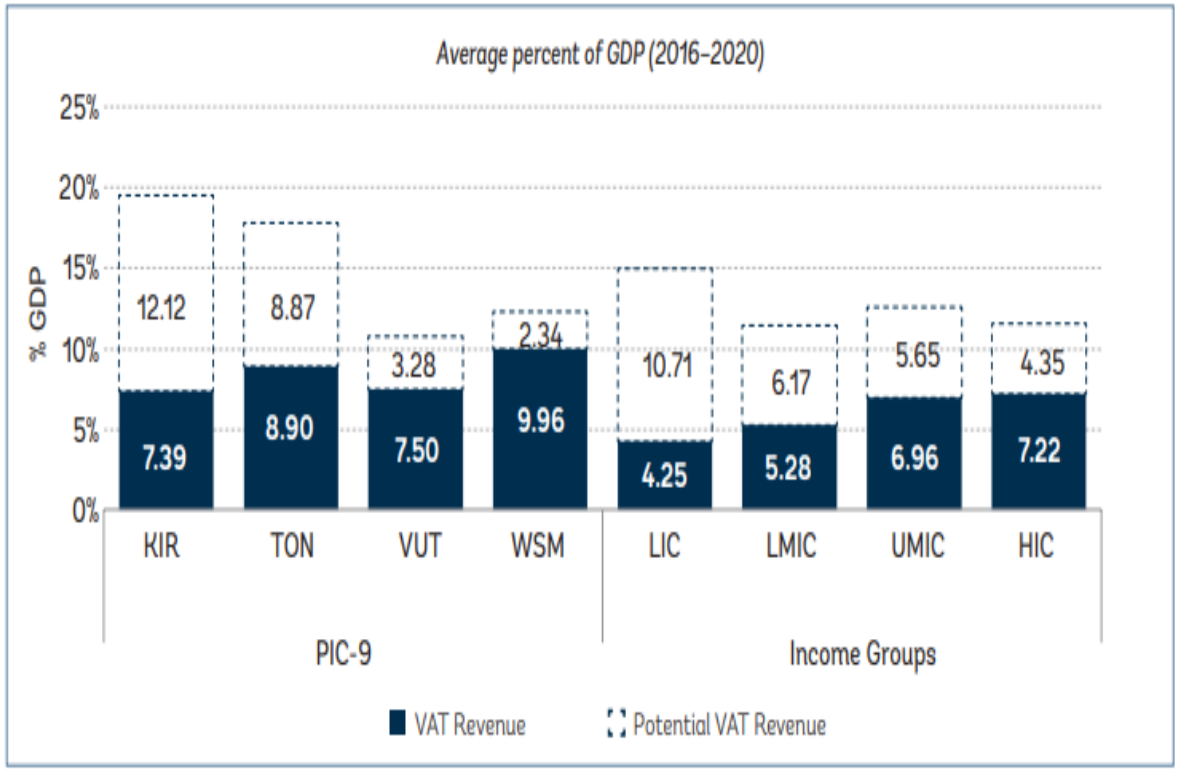
Country Level Applications

Nine Pacific Islands, Poland, Türkiye, Bulgaria

Review of nine Pacific island countries

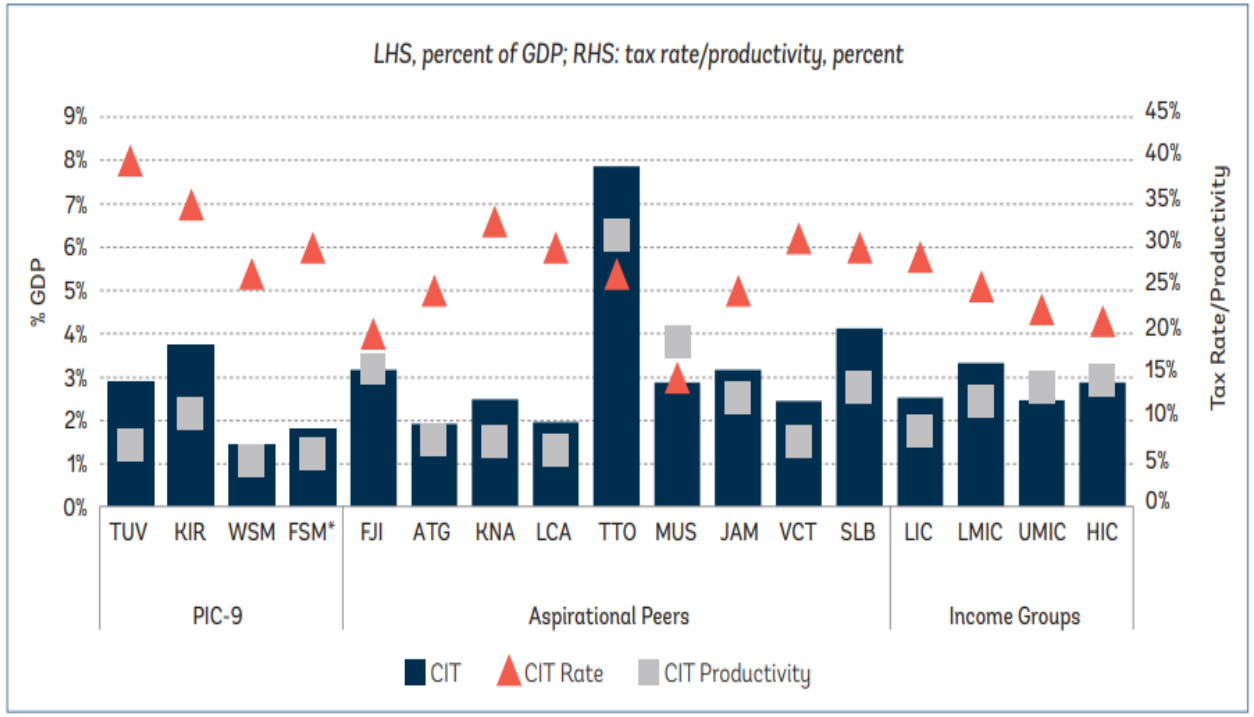
Closing large tax gaps need to be at the heart of the countries' medium-term revenue strategies.

Higher VAT efficiency can help close the VAT gap



Source: Authors' analysis, WDI, UNU Wider, KPMG.

Low CIT productivity, dragging down CIT revenue collections



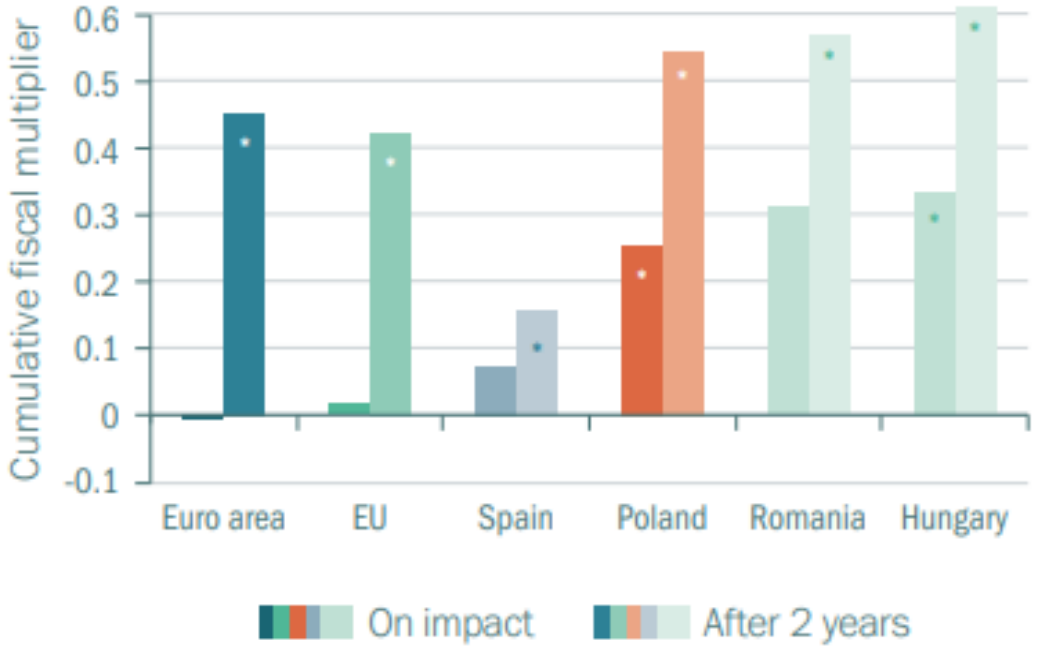
* FSM data from 2016 due to data limitations. FSM CIT applies to international firms only.
Source: Authors' analysis, UNU Wider, KPMG.

Source: World Bank 2023.

Poland's Public Finance Review:

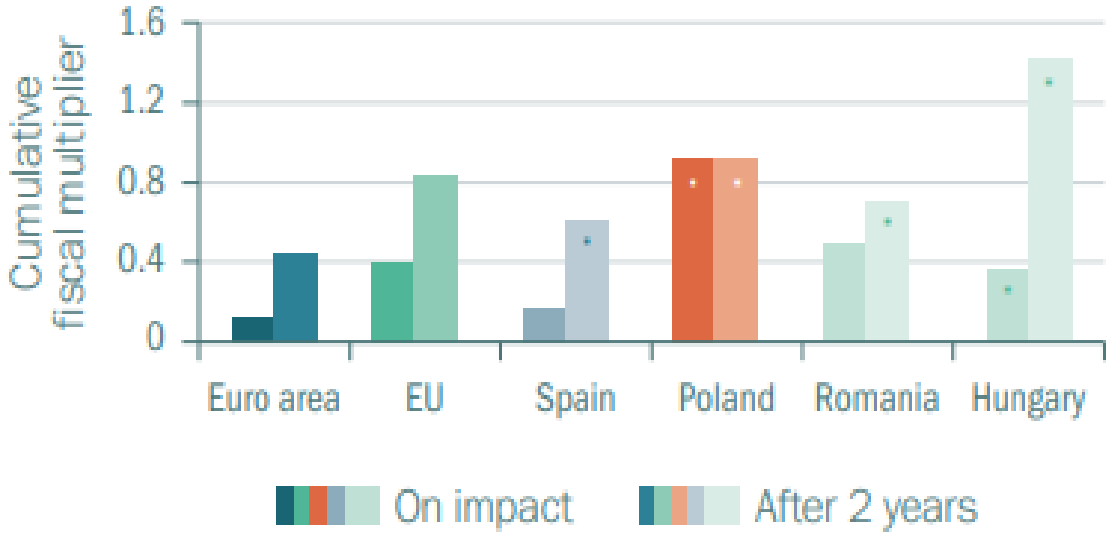
Fiscal Consolidation

Figure 1.32 Total expenditure multipliers



Sources: David and Leigh (2018); Eurostat; World Bank.

Figure 1.33 Capital expenditure multipliers



Sources: David and Leigh (2018); Eurostat; World Bank.

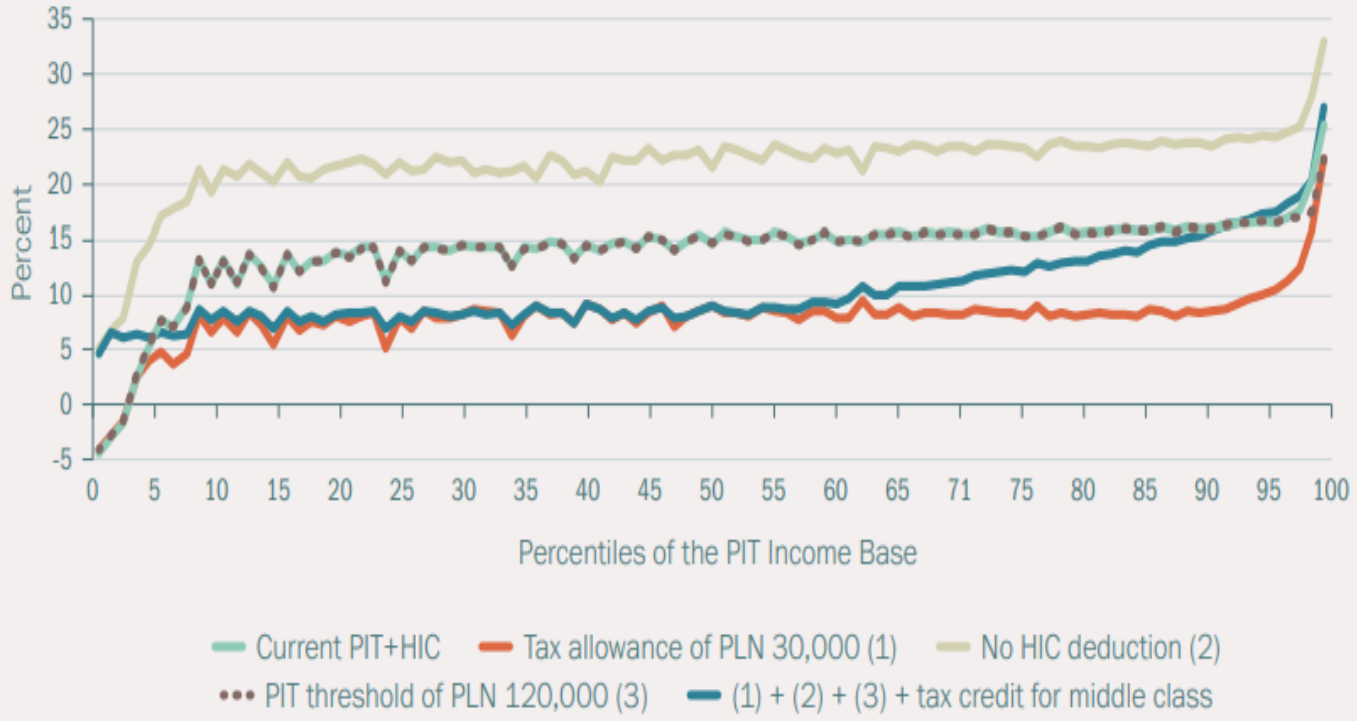
Notes: "*" indicate significance at 10% significance level; EU and euro area refers to aggregates for the European Union and euro area, respectively.

Source: World Bank 2021, Poland Public Finance Review.

Poland's Public Finance Review

Redistributive effect of PIT and HIC reforms

Figure B2.1.1 Average joint PIT and HIC burden by PIT income base percentiles: current scheme and "New Deal" proposals' simulation.



Source: Own preparation based on Poland CEQ 2020

On May 15, 2021, the government decided to:

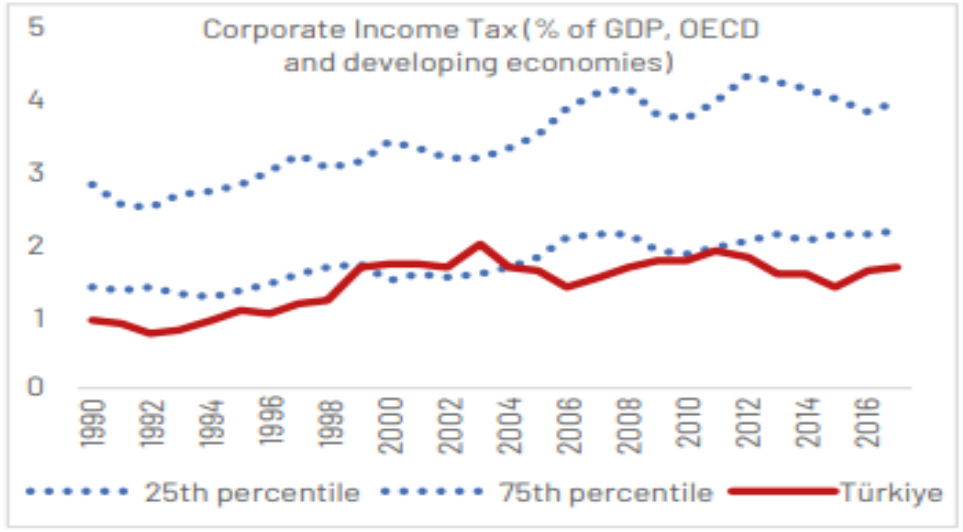
- an increase in the PIT tax allowance,
- an increase in the first PIT threshold
- the abolition of HIC deductibility from the taxpayers' PIT liability
- and the homogenization of HIC across sources of income

Source: World Bank 2021, Poland Publ
Finance Review.

Türkiye Public Finance Review

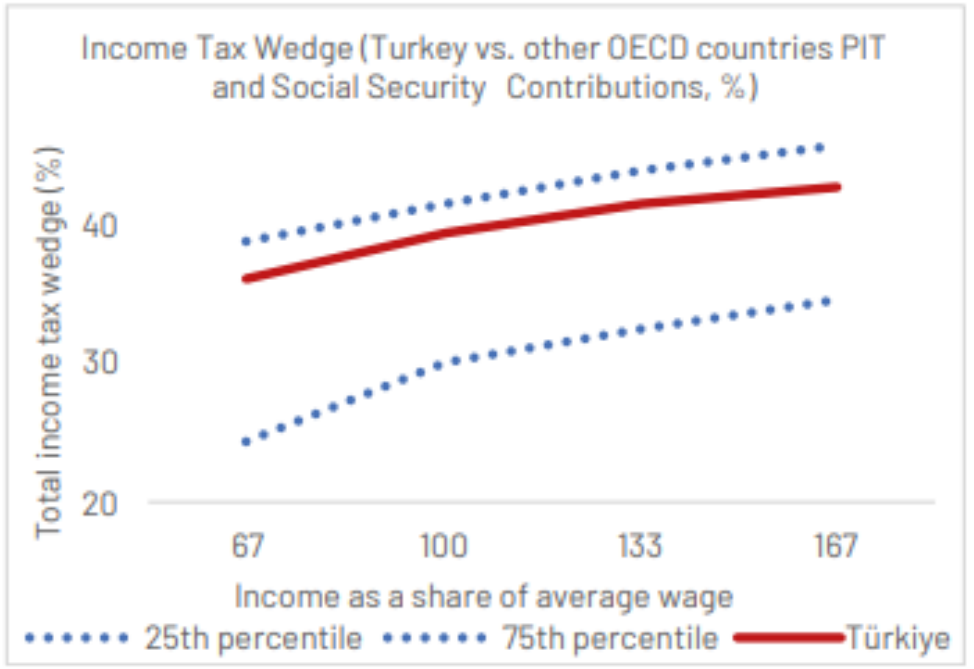
Leveraging fiscal resources

And CIT collections well below potential



Sources: OECD Tax Database, WB Staff estimates

But labor tax wedge leads to non-compliance



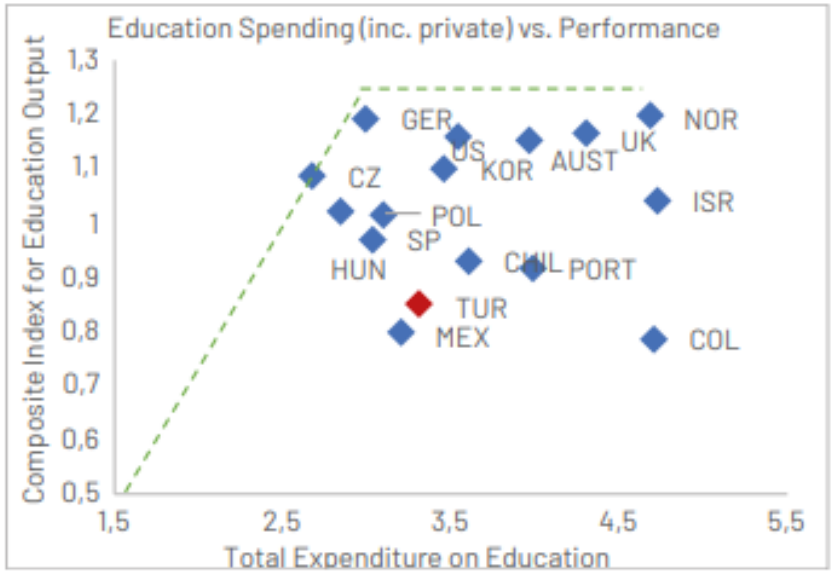
Sources: OECD Tax Database, WB Staff estimates

Source: World Bank 2023, Türkiye PFR.

Türkiye Public Finance Review:

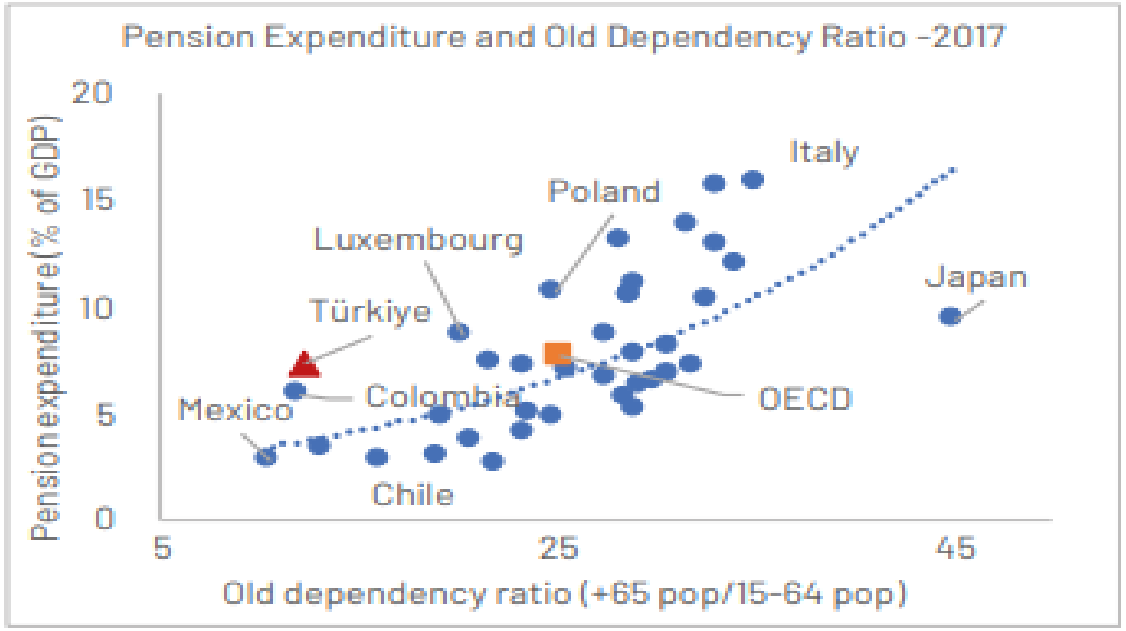
Spending better....

Scope to improve efficiency



Sources: WB Staff, various sources (see chapter 3)

Big pressures from pensions



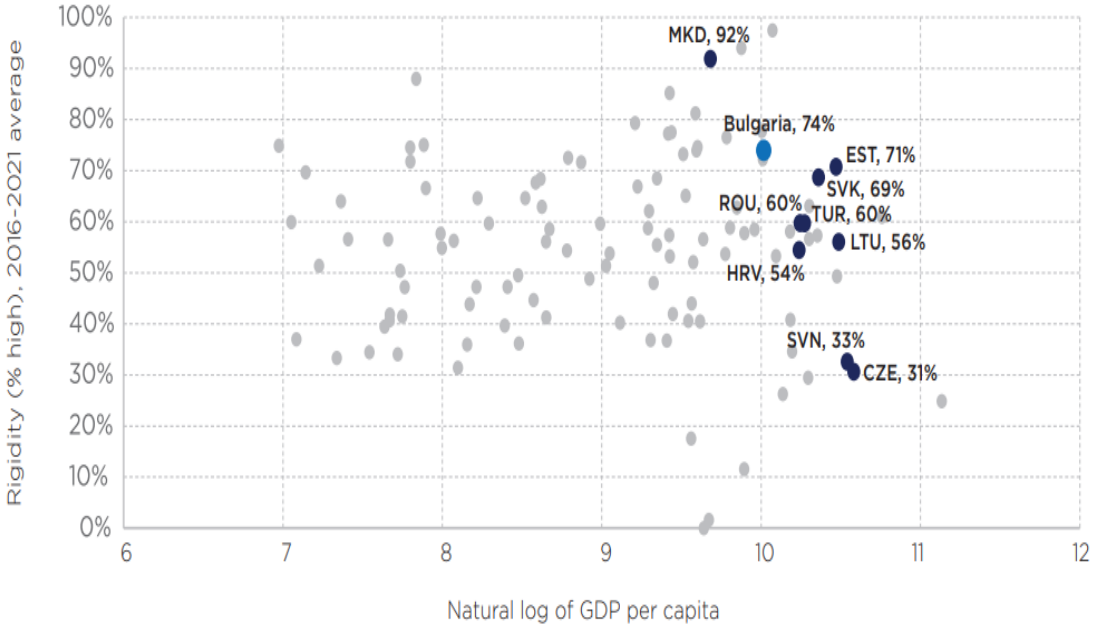
Source: WDI World Bank and OECD

Source: World Bank 2023, Türkiye PFR.

Bulgaria PFR: Spending rigidity and countercyclicality

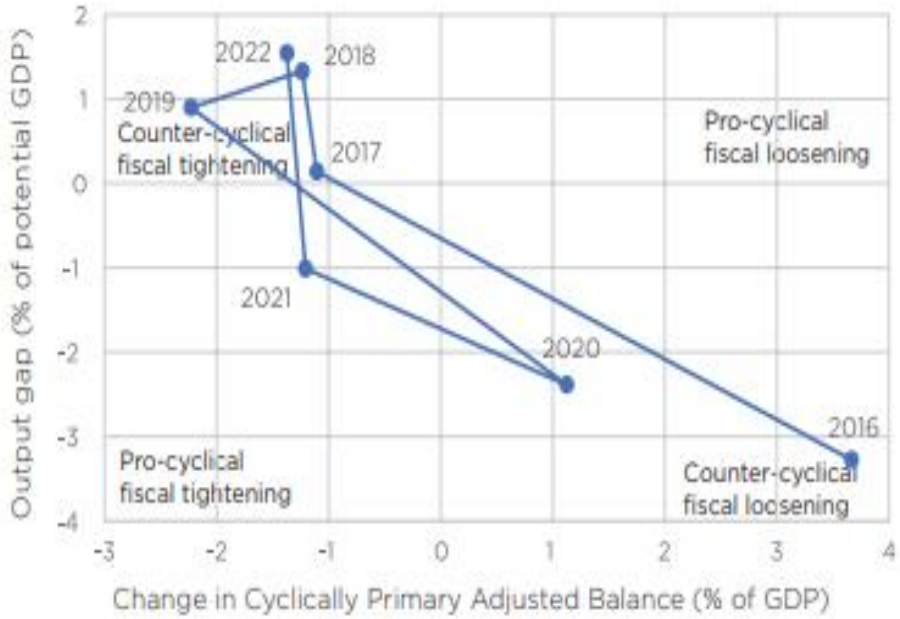
- Despite the relatively high expenditure rigidity of Bulgaria, the country's fiscal stance has remained largely countercyclical.

Figure 1.8. High rigidity versus income



Source: World Bank BOOST fiscal database.

Figure 1.11. Cyclicality of fiscal policy stance, 2016–21

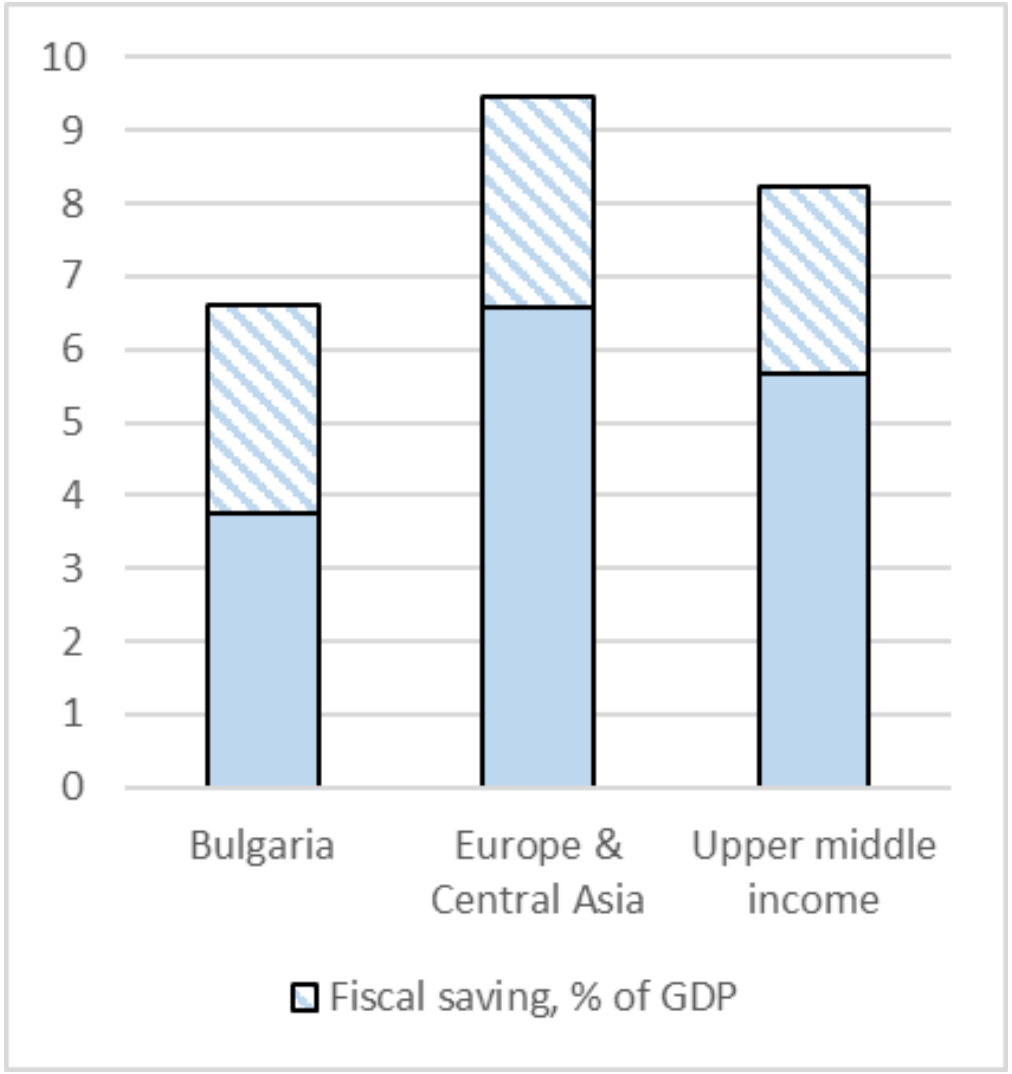


Source: World Bank BOOST fiscal database.

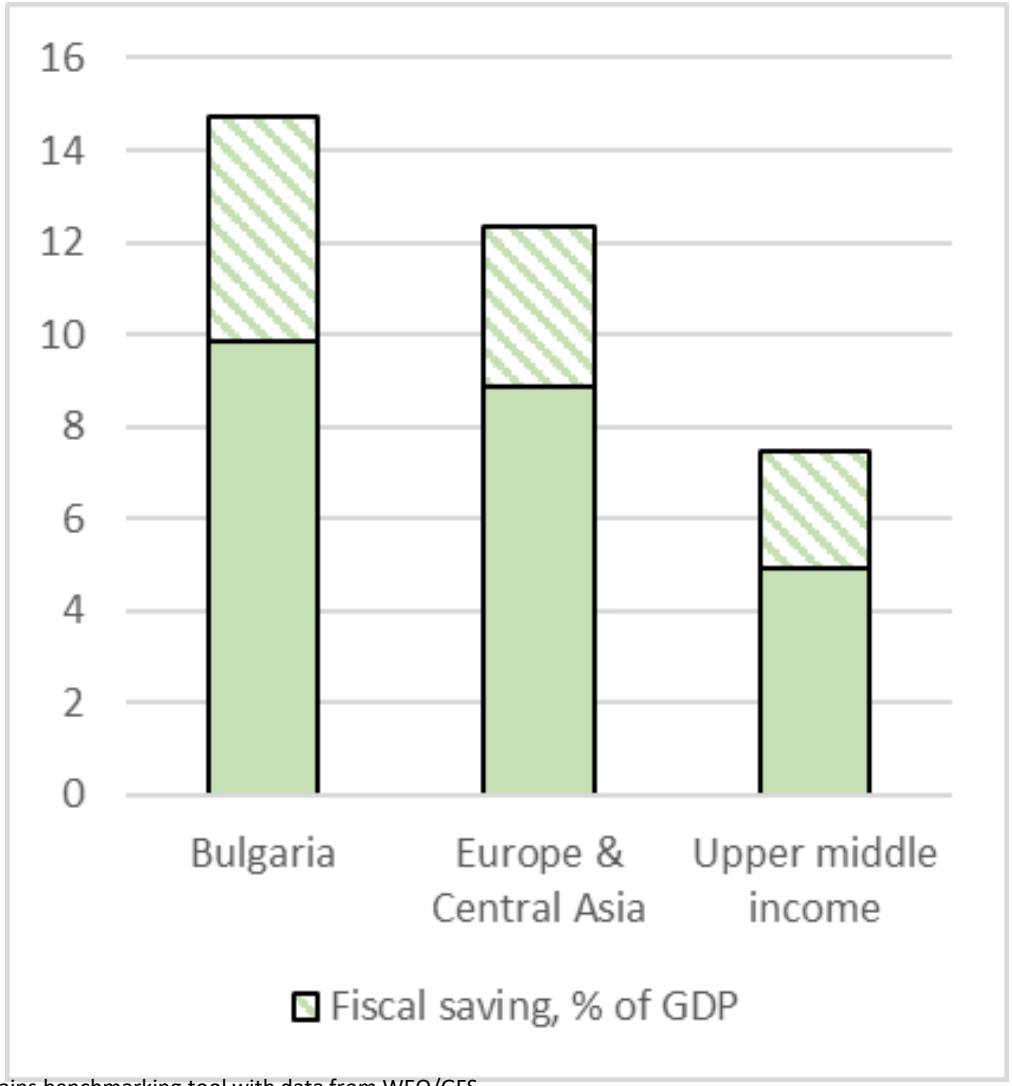
Source: World Bank 2023, Bulgaria PFR.

Bulgaria PFR: Potential fiscal gains

Potential savings from the wage bill



Potential savings from pension payments



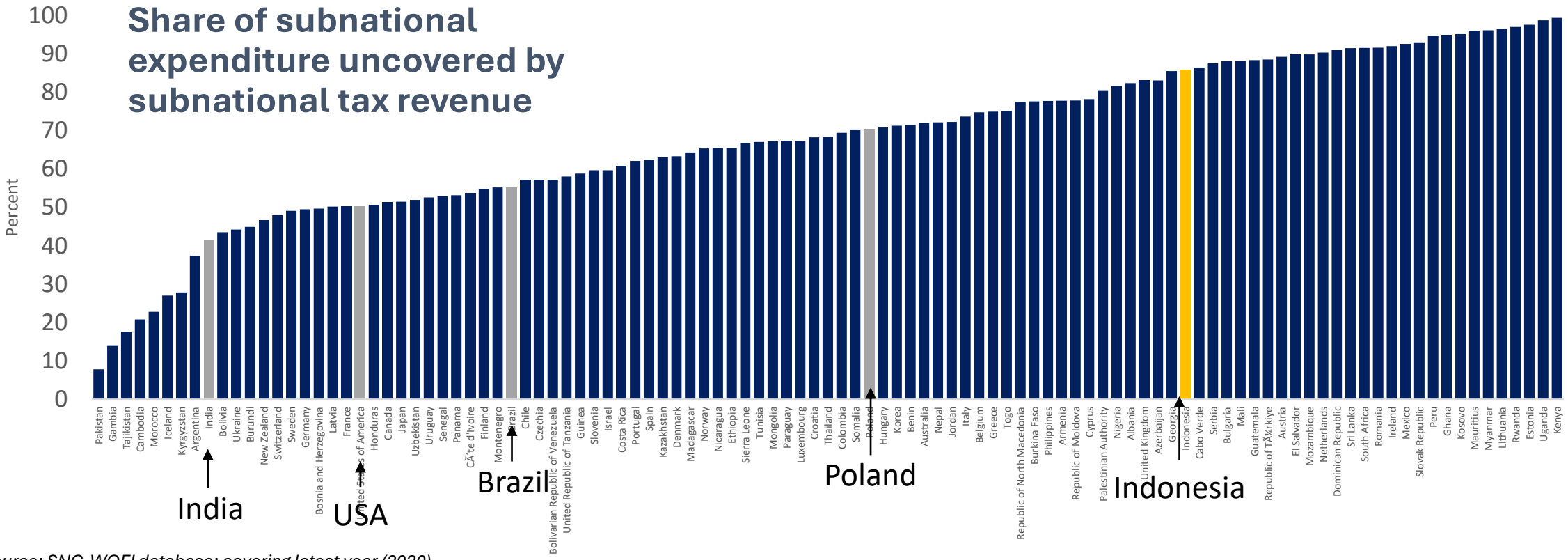
Source: EMFTX Fiscal Gains benchmarking tool with data from WEO/GFS

Subnational level

Indonesia, Brazil

Indonesia: vertical fiscal imbalances

- Fiscal Decentralization has often occurred on the expenditure and less on the revenue side, creating “vertical fiscal imbalances”, thereby limiting fiscal space
- Consequently, subnational governments must carefully assess their public finances.



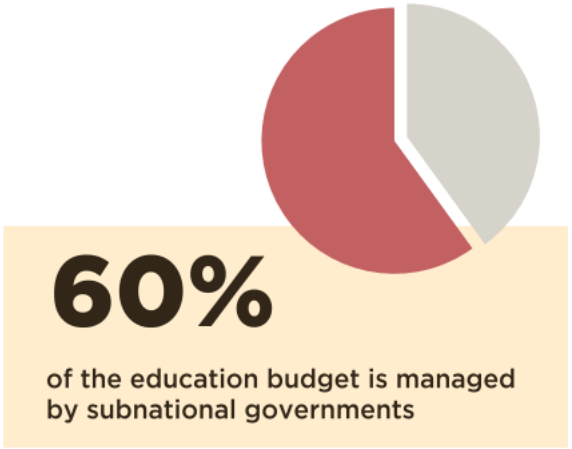
Source: SNG-WOFI database; covering latest year (2020)

Note: (1) 2020 is the only year with available data; *(2) VFI = (subnational expenditure - subnational tax revenue) / subnational expenditure; (3) Data available on subnational tax revenue only.*

Indonesia’s subnational education expenditure review

Why?

The role of subnational governments in education management increased, as they replaced central government in managing education service delivery in their respective jurisdictions.



Key recommendations

- Reassessing districts financial and technical capacity in delivering education services.
- Consolidate and prioritize education programs that are effective in increasing learning outcomes.
- Leverage technology to strengthen accountability.

Brazil: pension spending, pension system deficits and pension reform

Figure 5: Pension deficits (%NCR), 4 States estimated by World Bank (PROST)

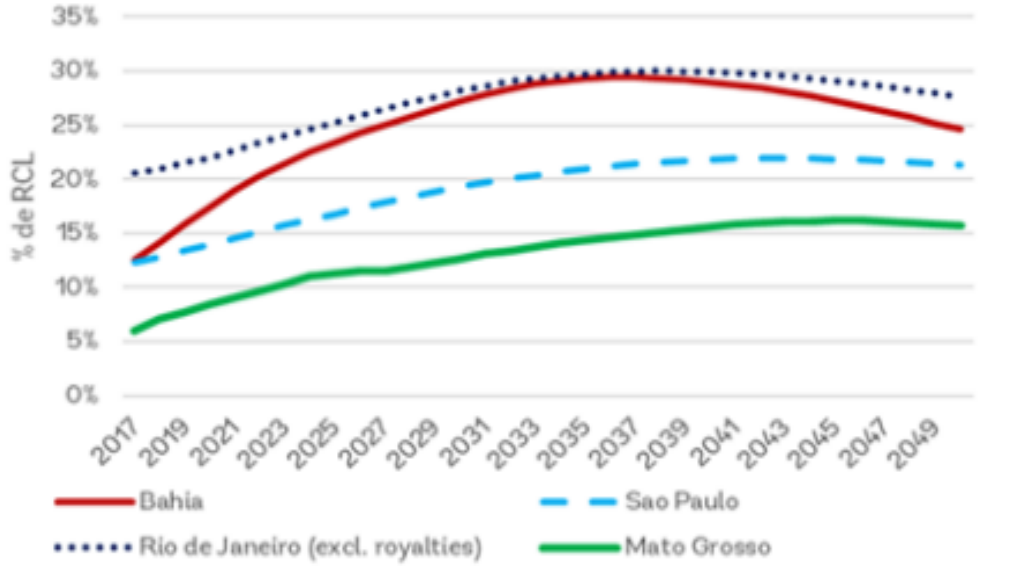
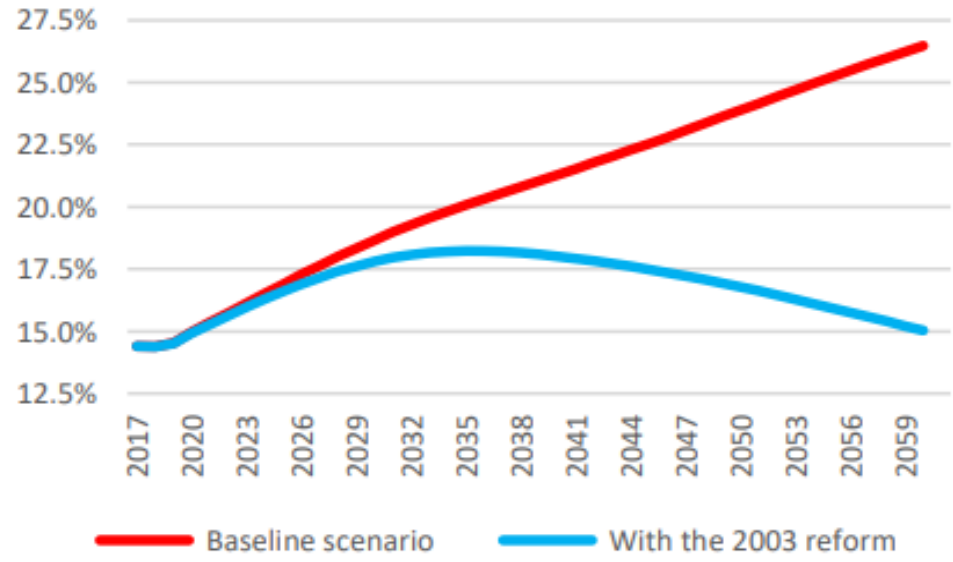


Figure A2.5: Rio de Janeiro Municipality, Projected Pension System Deficit (% of Net Current Revenues)



Source: World Bank

Subnational Customization

Phase 1

Sample Visualization: Application for Uttarakhand

Live demonstration of the tool

Sample Visualization

Application for Uttarakhand

Uttarakhand: Fiscal Policy for Growth and Development

Are we allocating sufficient funds to welfare schemes and capital outlays?

How does our spending on education and health compare to that of our peers?

Are we seeing significant returns on our investments in education and health? Should we increase spending or focus on improving the efficiency of existing expenditures?

How do our own tax revenues and support from the central government stack up against other states?

Is our macro-fiscal position resilient compared to our peers? Where are the gaps?

Identifying peers for benchmarking

Himalayan Peers

- Himachal Pradesh
- North-eastern states
- J&K

Neighbors

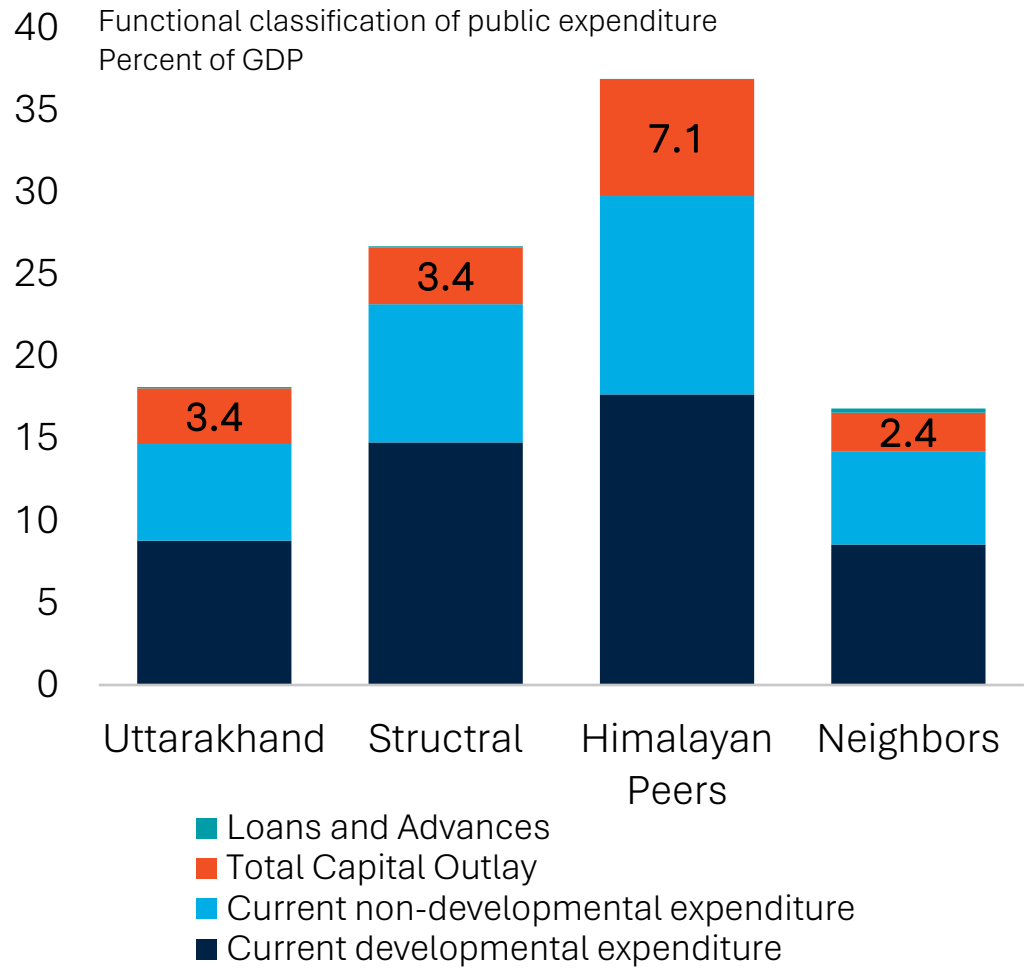
- Haryana
- Himachal Pradesh
- Delhi
- Punjab
- Uttar Pradesh

Structural Peers**

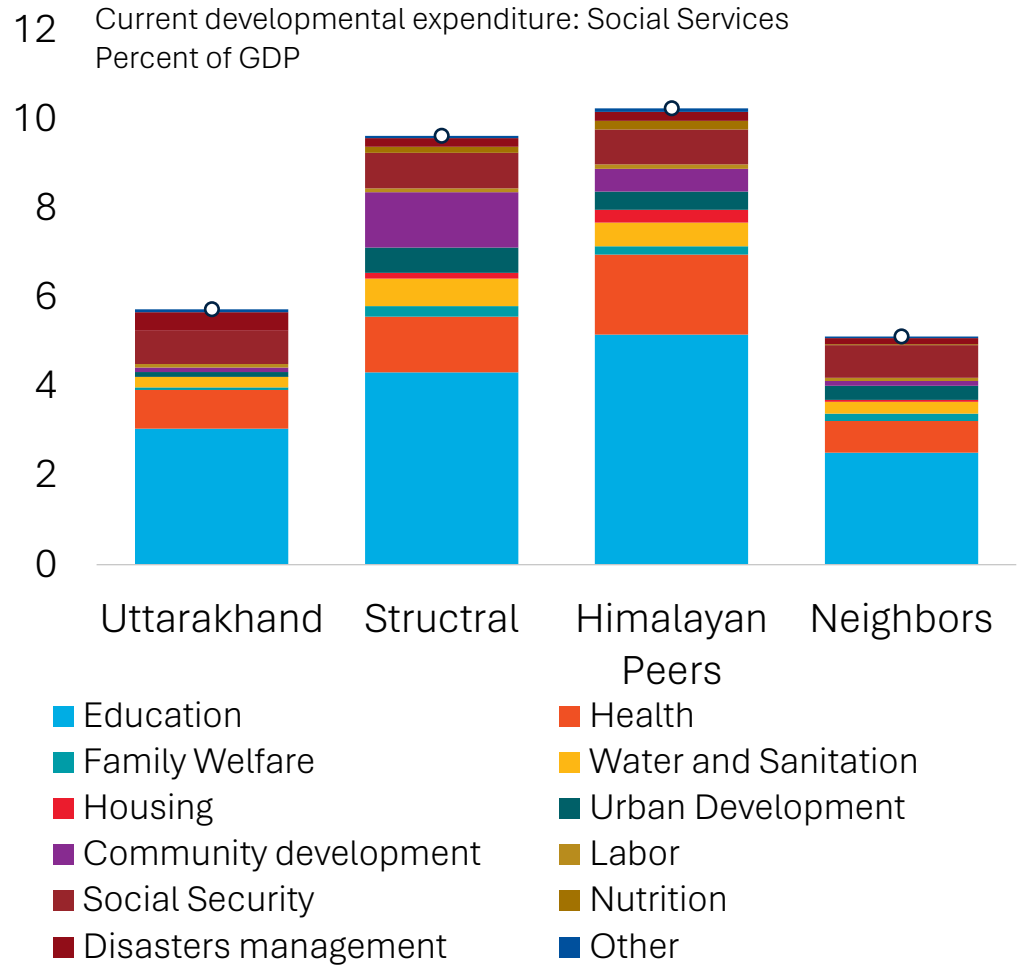
- Andhra Pradesh
- Himachal Pradesh
- Mizoram

Note: **Preliminary identification based on per capita income and population.

Q1: Are we allocating sufficient funds to welfare schemes and capital outlays?



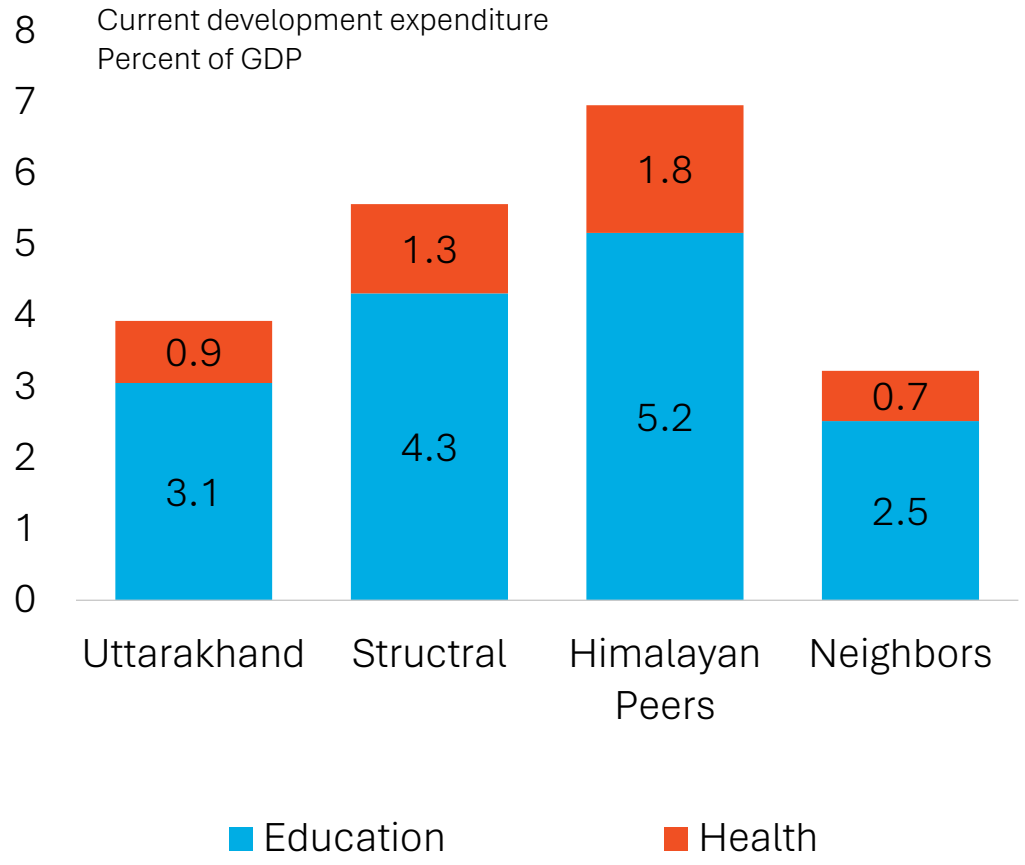
Source: RBI



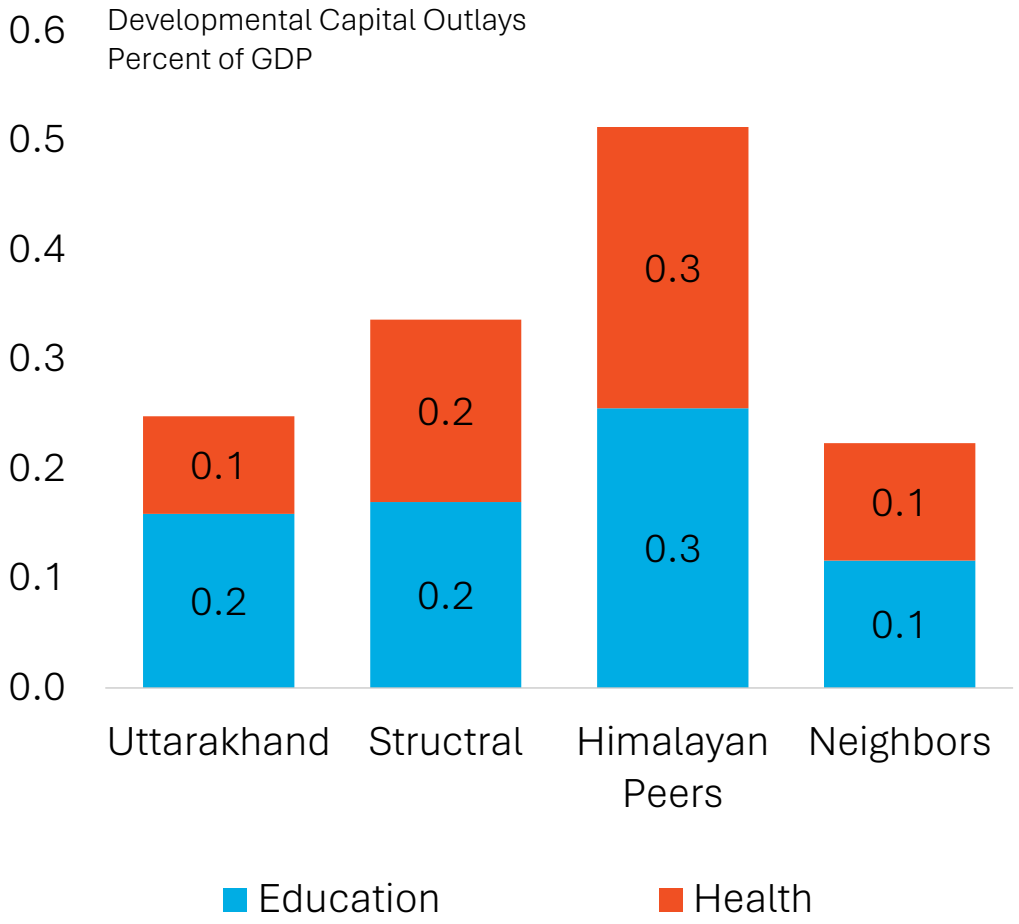
Source: RBI

Note: All charts based on averages over 2021-23 unless otherwise stated.

Q2: How does our spending on education and health compare to that of our peers?



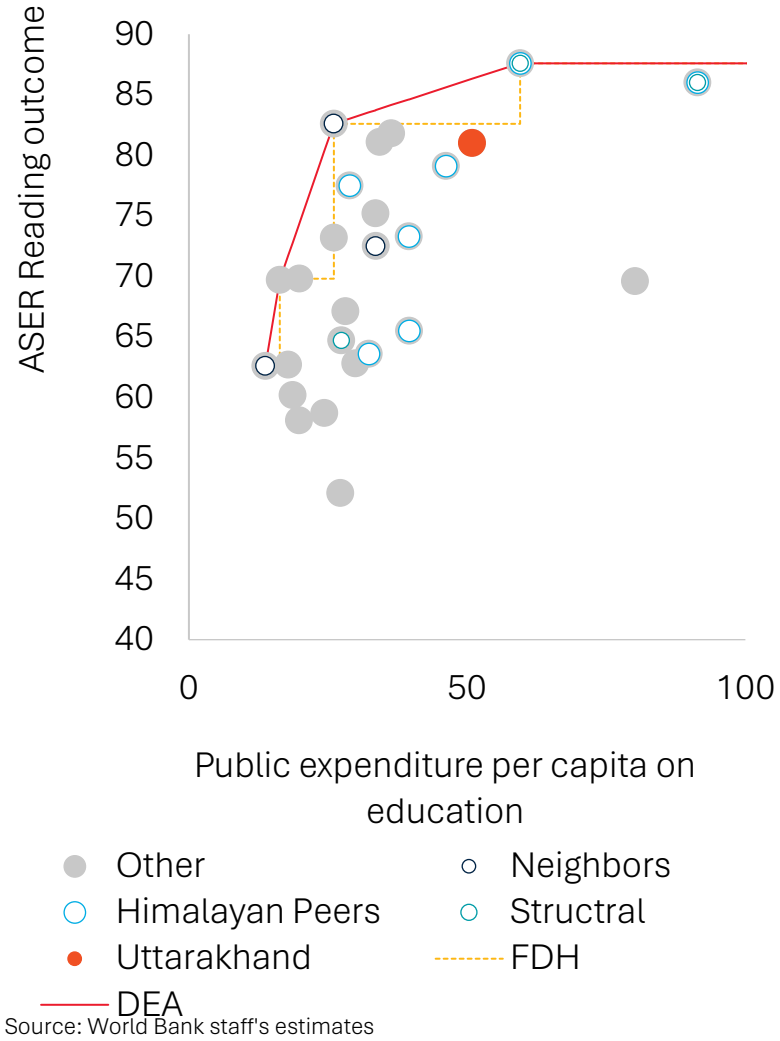
Source: RBI



Source: RBI

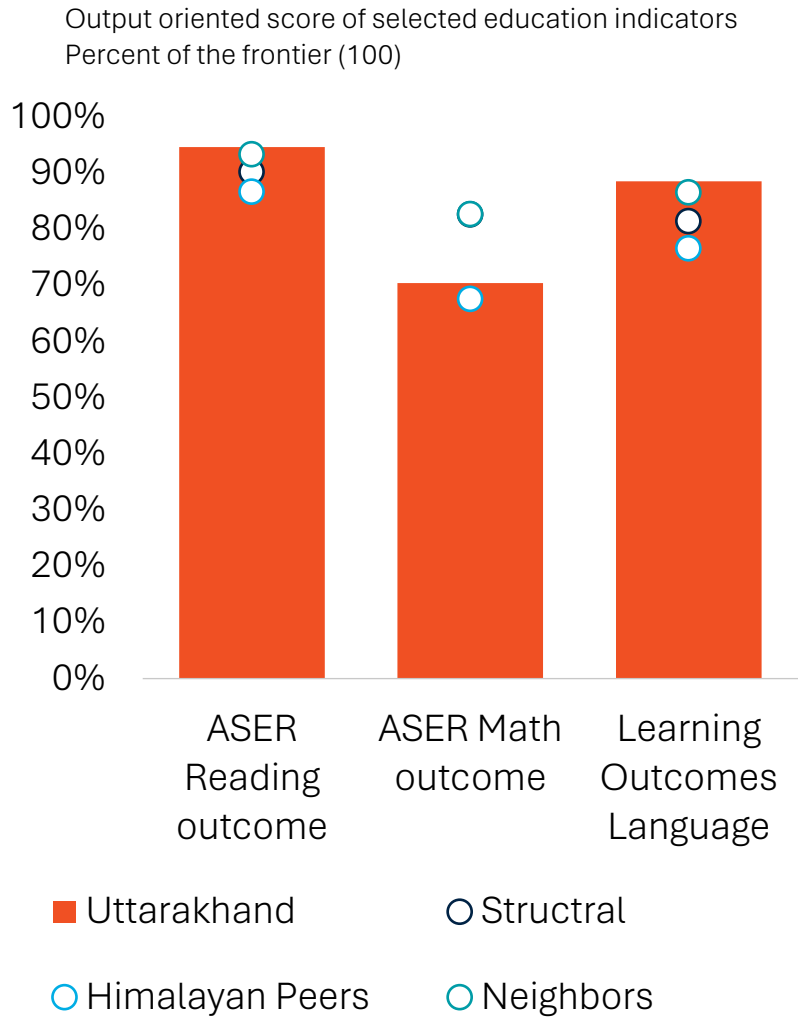
Q3: Should we increase spending or focus on improving the efficiency of existing expenditures?

Education

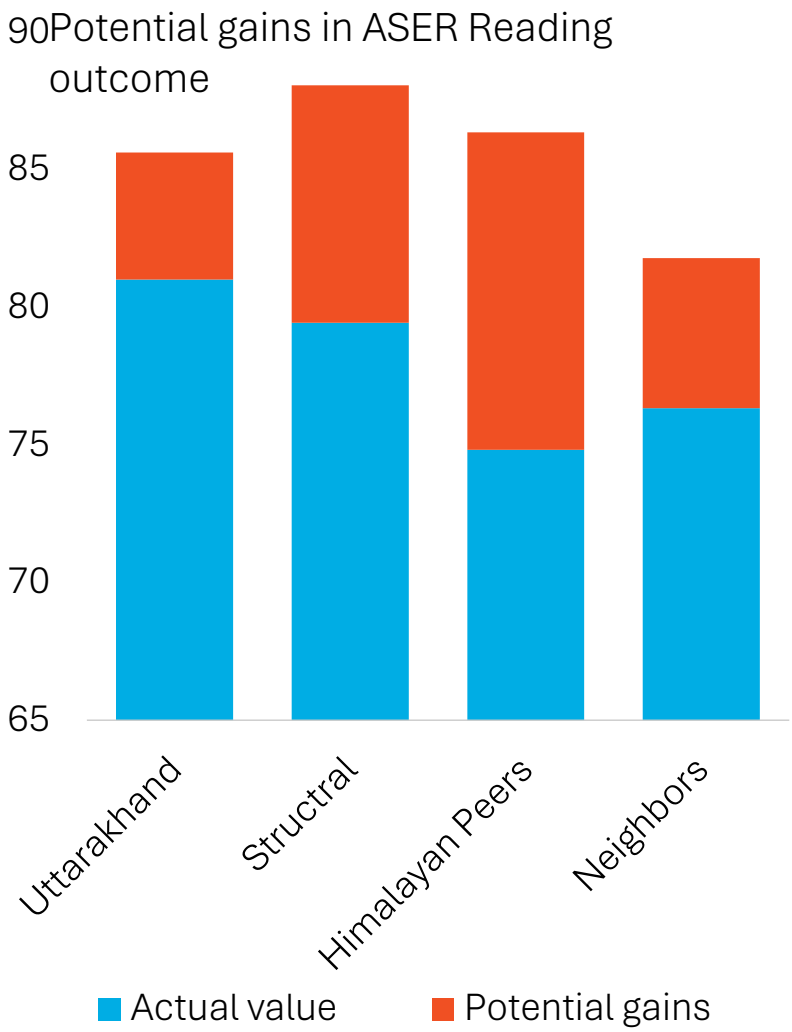


Source: World Bank staff's estimates

Note: Based on averages over 2018/19, 2019/20.

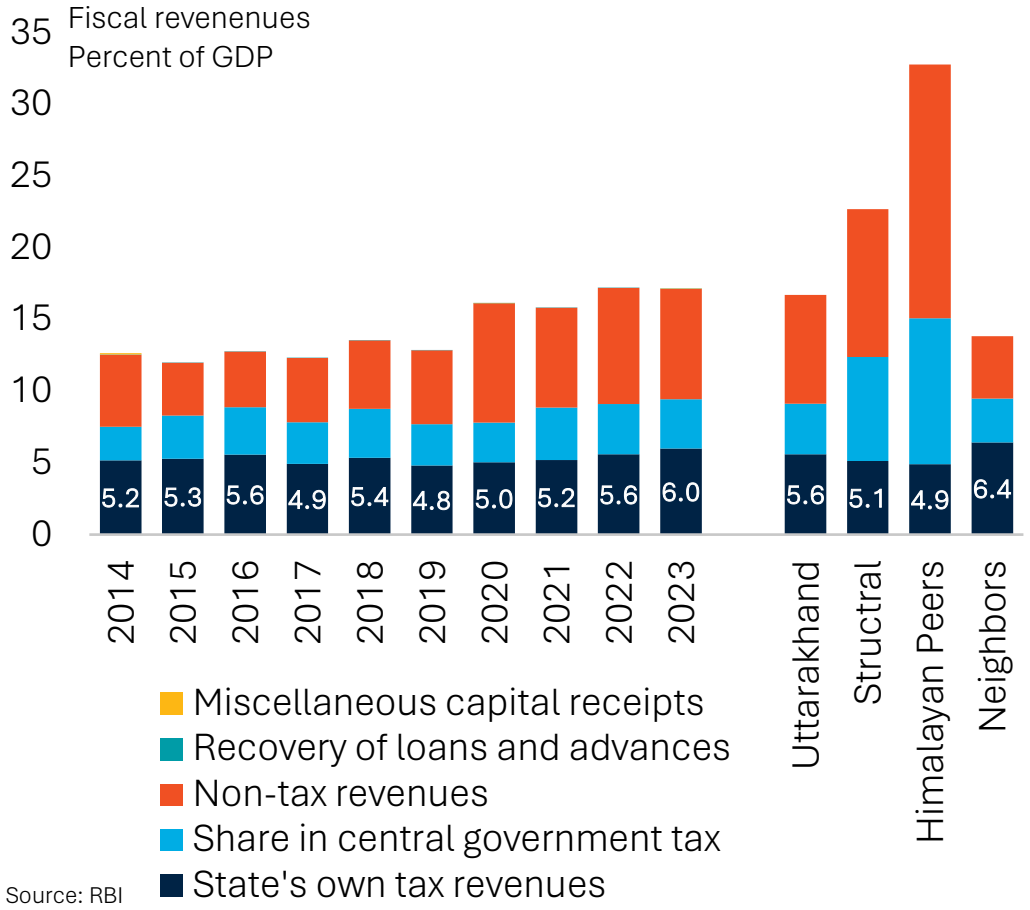


Source: World Bank staff's estimates

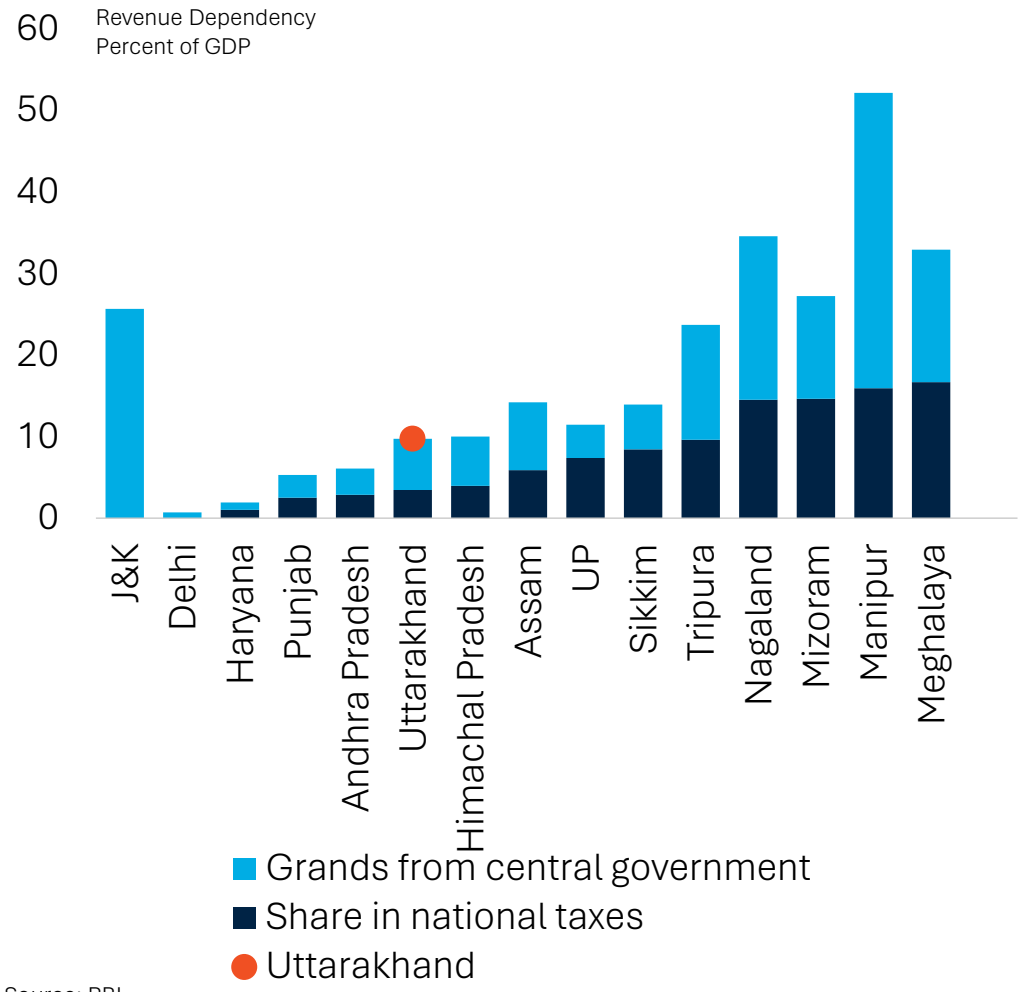


Source: World Bank staff's estimates

Q4: How do our own tax revenues and support from the central government stack up against other states?



Source: RBI



Source: RBI

Q5: Is our macro-fiscal position resilient compared to our peers? Where are the gaps?

Key economic indicators

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Period average, 21-23			
											Uttarakhand	Structral	Himalayan Peers	Neighbors
Growth of real per capita income	5.4	7.0	9.1	6.6	1.5	0.4	-15.3	9.8	6.6	6.5	7.6	8.5	6.6	6.7
GDP growth, percent	5.3	8.1	9.8	7.9	2.8	2.0	-12.1	10.5	7.6	7.6	8.6	9.1	8.1	7.9
Sector decomposition, percentage points														
Agriculture	0.0	-0.2	0.4	0.0	0.2	0.3	0.1	0.0	-0.2	0.1	0.0	0.6	0.3	0.6
Industry	1.6	3.7	5.0	3.8	0.3	-0.5	-6.0	5.1	3.7	4.3	4.4	3.7	3.1	2.4
Services	4.8	5.8	4.5	4.2	2.9	3.4	-6.7	7.2	5.5	4.2	5.6	5.7	5.5	5.0
Other	-1.1	-1.2	-0.1	-0.1	-0.6	-1.3	0.5	-1.8	-1.3	-1.0	-1.4	-0.9	-0.7	0.0
Inflation	5.0	3.2	3.7	3.9	4.0	5.8	8.1	5.1	6.5	5.6	5.7	5.8	5.1	5.4
Fiscal revenues, percent of GDP	12.7	12.0	12.8	12.3	13.6	12.8	16.1	15.8	17.2	17.2	16.7	22.8	32.8	13.9
Total expenditures	16.3	15.5	15.6	15.9	16.7	16.0	18.4	17.2	19.9	19.9	19.0	26.7	37.2	17.2
Total current expenditure	13.1	13.0	13.0	13.2	14.0	13.7	15.7	14.3	16.4	15.8	15.5	23.2	30.0	14.6
o.w. interest payments	1.5	1.7	1.9	1.8	1.9	1.9	2.0	1.8	2.0	1.9	1.9	2.1	2.3	2.0
Capital Outlay	3.1	2.4	2.5	2.7	2.7	2.3	2.8	2.8	3.5	3.9	3.4	3.4	7.1	2.4
Loans and Advances by State Governments	0.1	0.0	0.1	0.0	0.1	0.1	0.0	0.1	0.0	0.1	0.1	0.1	0.0	0.3
Fiscal balance	-3.6	-3.5	-2.8	-3.6	-3.2	-3.2	-2.3	-1.4	-2.7	-2.7	-2.3	-4.0	-4.3	-3.3
Primary balance	-2.1	-1.8	-0.9	-1.8	-1.2	-1.3	-0.3	0.4	-0.7	-0.9	-0.4	-1.9	-2.0	-1.3
Total liabilities	21.1	22.7	22.8	24.1	25.8	28.2	31.8	29.4	29.2		29.3	38.9	36.8	30.1
GDP per capita (in '000)	141.3	152.7	167.7	181.0	186.1	189.7	166.8	184.3	198.3	213.4	198.7	307.2	78.6	625.1
Multilateral porvety index		17.7				9.7			6.9		6.9	3.9	9.0	6.8
Climate Vulnerability Index								0.5			0.47	0.55	0.54	0.50

Source: MOSPI, RBI State Finance Database, NITI, DST.

A bouquet of policy advise

Priority **expenditures**, where to spend, increase spending, reforms to improve efficiency

Improving domestic resource mobilization. Identify potential areas for **revenue** enhancements

Building a resilient **macro-fiscal** profile: how to fix the gaps?

Live demonstration of the tool

Subnational Customization

Phase 2

Analytical inputs: Tax potential and tax effort, Tax buoyancy, Spending efficiency, Fiscal policy cyclicality, Total carbon pricing

International benchmarking

Potential extensions of the tool

We could do more and better…

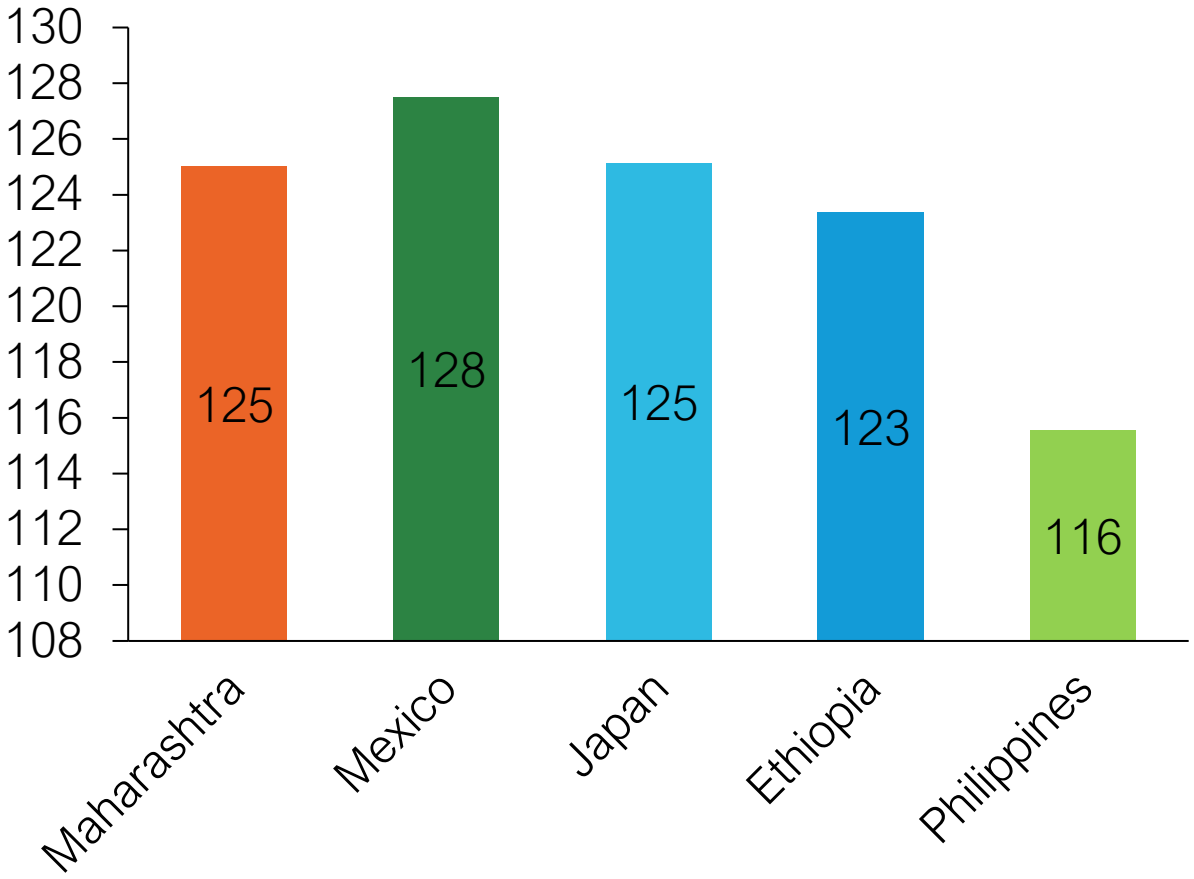
- Cyclical adjusted balance
- Tax potential
- Tax efficiency
- Tax buoyancy
- Total Carbon Pricing
- Sectoral spending efficiency
- Budget rigidity

International Benchmarking

Benchmarking Indian states to countries as peers

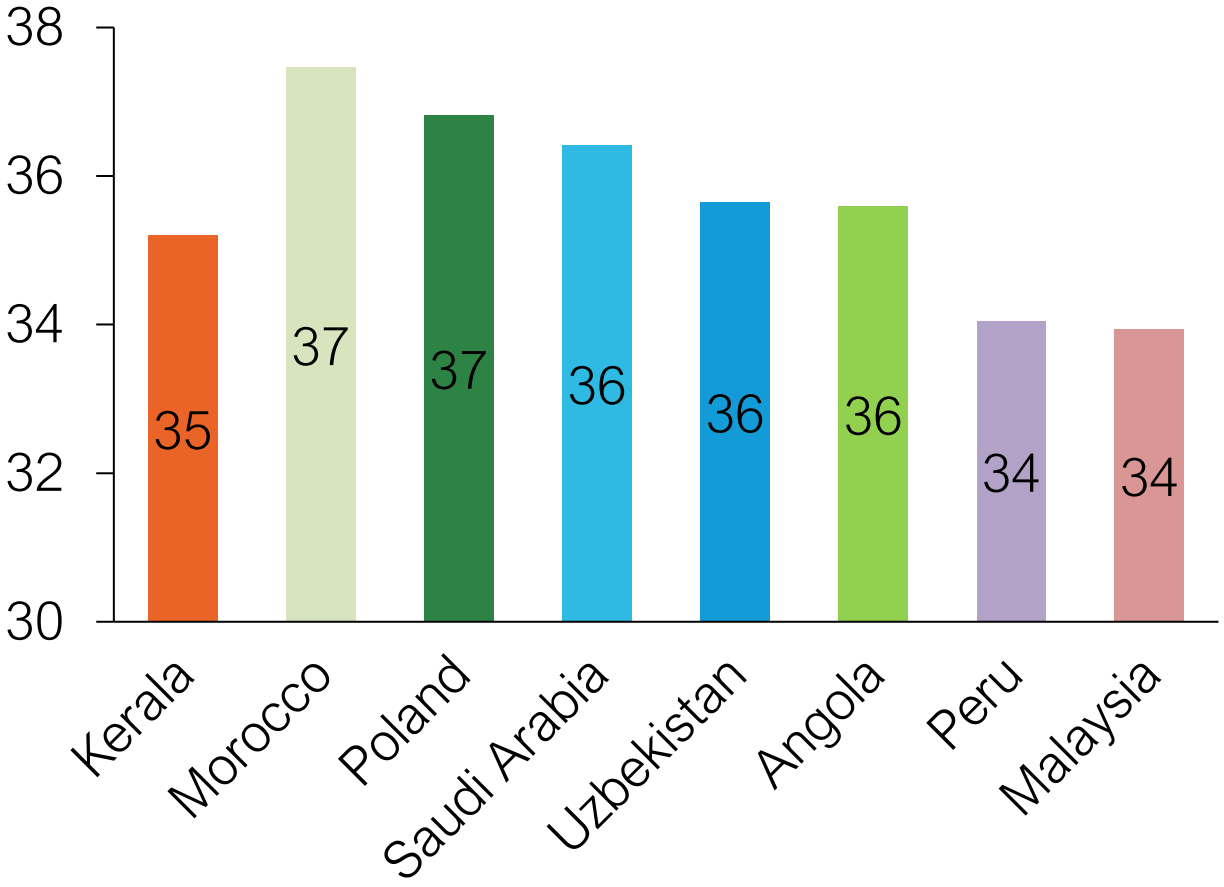
Can MH and Kerala be benchmarked against countries with identical population?

Population, millions, 2022



Source: WDI, CEIC, MOSPI.

Population, millions, 2022

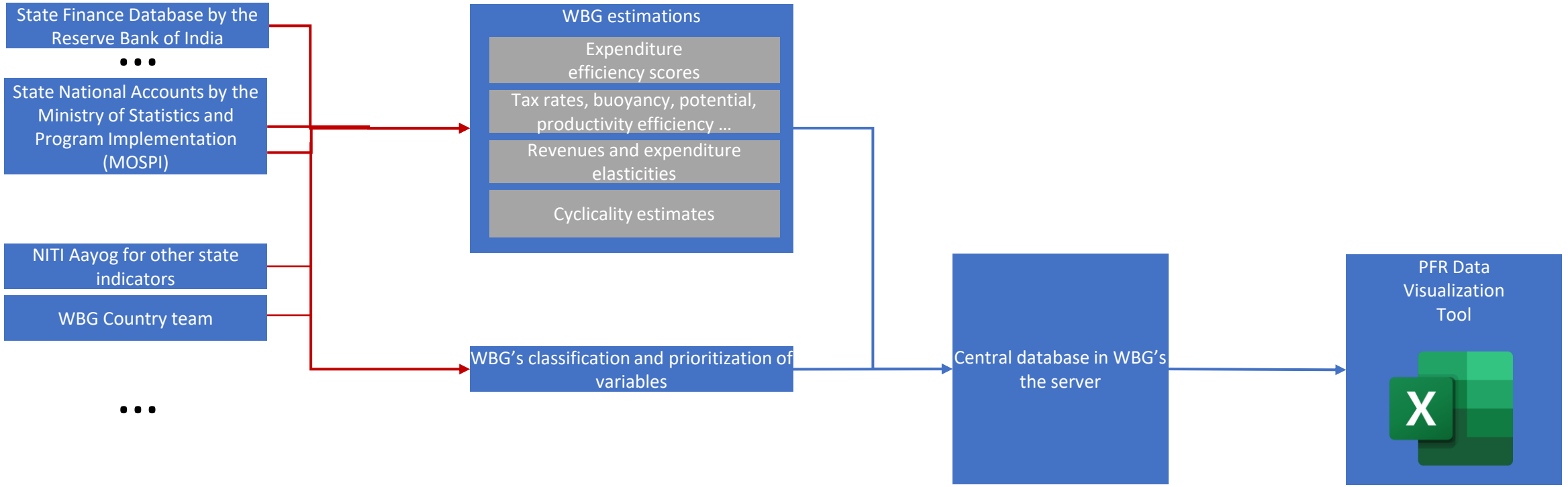


Source: WDI, CEIC, MOSPI.

Thank you

Annexure

Primary data is retrieved from the official sources



Original data sources

The Bank team pulls this information from many data sources, including official sources such as the RBI and MOSPI.

Process carried out by WBG

The team also classifies and prioritizes any variables that are going to be used in the tool to keep the visualization tool as simple as possible.

Central dataset in the server

WBG is then able to consolidate the data into a central database hosted on a server, and this is used to update the information in the tool.

PFT data Visualization tool

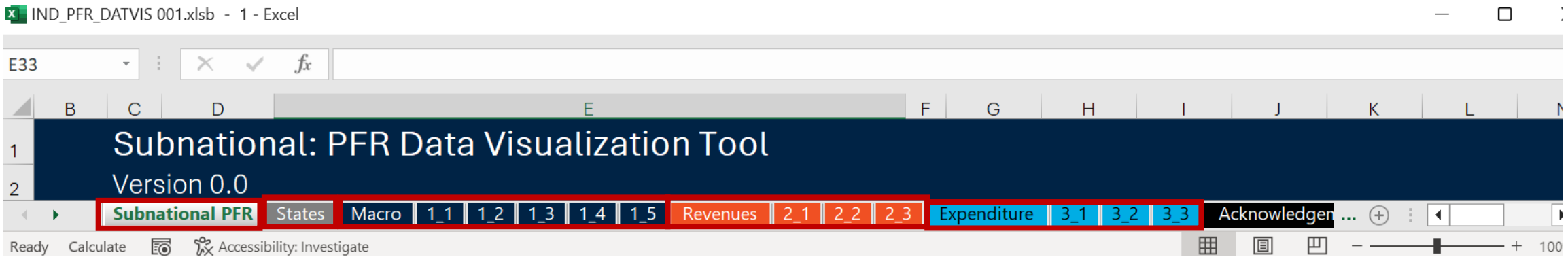
In summary, the PFD data Visualization tool retrieves the information from the server and processes it to produce a set of standard tables and charts for the user.

List of datasets used

Data	Source
State's public finance data including expenditure (functional classification) and revenue categories	RBI State finance database
State's macroeconomic data: GDP, Sectoral GVA (Agri, industry, services)	MOSPI, CEIC
Statewise Population	MOSPI
State Consumer price index	MOSPI
Multidimensional poverty index	NITI
State wise total liabilities	RBI
Wages and Salaries, Expenditure on Operations and Maintenance, Social sector expenditure	RBI
Climate Vulnerability Index	DST
State Energy and Climate index with 6 dimensions: DISCOM_Performance, Access_affordability_reliability, Clean_Energy_Initiatives, Energy_Efficiency, Environment_Sustainability, New_Initiatives	NITI
Cyclical component of current spending, capital outlays, loans and advances, real GSDP	WBG Staff Estimates
Potential component of current spending, capital outlays, loans and advances, real GSDP	WBG Staff Estimates

File structure
and organization

The Data Visualization Tool is organized into five worksheet groups.



The “Subnational PFR” sheet contains the table of contents and some boxes explaining critical issues for understanding and using the tool.

The “States” sheet allows the user to define the State to be analyzed as well as any comparison states.

The next three worksheet groups suggest standard tables and charts for preparing the three core PFR chapters: Macro-fiscal profile, revenues, and expenditures.

- The macro group, in dark blue, contains a series of graphs and tables designed to evaluate the main macro-fiscal trends and to understand the role of fiscal policy in other country's development challenges.
- The revenue group, in orange, offers tables and charts to assess the performance of fiscal revenues and complementary variables.
- The expenditure group, in light blue, presents a series and tables of charts to evaluate the performance of public expenditure and related variables.

Note: The international version of the tool has an “Analysis” group which allows the user to select a variable to be evaluated in-depth (for instance, tax buoyancy, spending efficiency etc.) using different visualizations.

Subnational: PFR Data Visualization Tool

Version 0.0

Link	Sheet name	Content
Link	States	Select your country and its peers
Link	Macro	Macro-fiscal chapter
Link	1_1	Key indicators
Link	1_2	Drivers of fiscal balance: GFS
Link	1_3	Main fiscal Risks
Link	1_4	Evaluating the revenue and expenditures elasticities to GDP
Link	1_5	Other development challenges: Climate change
Link	Revenues	Revenue chapter
Link	2_1	Fiscal revenues
Link	2_2	Current revenues
Link	2_3	Dependency from the central government
Link	Expenditure	Expenditure chapter
Link	3_1	Public expenditure, GFS
Link	3_2	Current expenditure
Link	3_3	Total Capital Outlay
Link	Acknowledge	Acknowledgements

- Within each of the core groups, each sheet contains one or more data modules about a specific issue, as noted in the PFR sheet's table of contents.
- This **table of contents** provides the name and the content of each worksheet as well as links to the sheets to facilitate navigation within the tool.
- The user can go back to the PFR sheet by clicking on the **house icon** on the top left of each sheet.

The PRF sheet has a series of light blue boxes that provide information to understand and navigate the tools. Similar boxes are inserted across the tool to explain features as they appear.

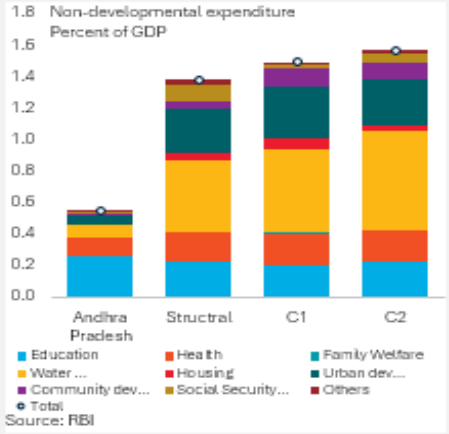
Drivers of fiscal balance: GFS

Changes in the fiscal balance

Percent and percentage points of GDP

	2014	2019	2023
Revenues	18.2	12.5	14.2
State's own tax revenues	8.1	6.2	7.1
Share in central government tax	2.9	3.1	2.9
State's Own Non-Tax Revenue	2.1	0.4	1.1
Grants from the Centre	4.1	2.4	3.2
Recovery of loans and advances	1.0	0.5	0.0

Development capital outlay: social services



Variables

Variable i	Variable i	Stylized name	Last	Count 1	Count 2	Count 3
Social Se	EXP_CAI	Total	2023	5/5	19/19	19/19
Educatio	EXP_CAI	Education	2023	5/5	19/19	19/19
Medical a	EXP_CAI	Health	2023	5/5	19/19	19/19
Family W	EXP_CAI	Family Welfare	2023	5/5	19/19	19/19
Water Su	EXP_CAI	Water ...	2023	5/5	19/19	19/19
Housing	EXP_CAI	Housing	2023	5/5	19/19	19/19
Urban De	EXP_CAI	Urban dev...	2023	5/5	19/19	19/19
Welfare c	EXP_CAI	Community dev...	2023	5/5	19/19	19/19
Social Se	EXP_CAI	Social Security...	2023	5/5	19/19	19/19
Others	EXP_CAI	Others	2023	5/5	19/19	19/19

Title and sources

Title	Development capital outlay: social services
Unit	Percent of GDP
Source	Source: RBI
	Development capital outlay: social servicesPercent of GDP
	Source: RBI

New parameters

Initial year	Final year	Calculation
2021	2023	Period average

Methodological note

...

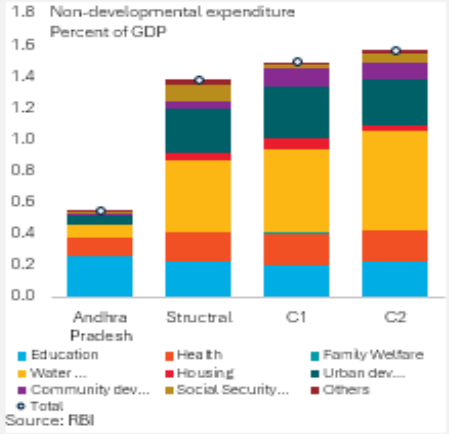
Data

	Andhra F	Structral	C1	C2
Total	0.5	1.4	1.5	1.6
Educatio	0.3	0.2	0.2	0.2
Health	0.1	0.2	0.2	0.2
Family W	0.0	0.0	0.0	0.0
Water ...	0.1	0.5	0.5	0.6

Within each sheet, the information is distributed in data modules that contain at least one table or chart, such as the one shown on your left, designed for a comprehensive and organized presentation of information.

Each of these data modules has four sections:

Development capital outlay: social services



Variables

Variable i	Variable i	Stylized name	Last	Count 1	Count 2	Count 3
Social Se	EXP_CA	Total	2023	5/5	19/19	19/19
Educatio	EXP_CA	Education	2023	5/5	19/19	19/19
Medical a	EXP_CA	Health	2023	5/5	19/19	19/19
Family W	EXP_CA	Family Welfare	2023	5/5	19/19	19/19
Water Su	EXP_CA	Water ...	2023	5/5	19/19	19/19
Housing	EXP_CA	Housing	2023	5/5	19/19	19/19
Urban De	EXP_CA	Urban dev...	2023	5/5	19/19	19/19
Welfare c	EXP_CA	Community dev...	2023	5/5	19/19	19/19
Social Se	EXP_CA	Social Security...	2023	5/5	19/19	19/19
Others	EXP_CA	Others	2023	5/5	19/19	19/19

Title and sources

Title	Development capital outlay: social services
Unit	Percent of GDP
Source	Source: RBI

Development capital outlay: social servicesPercent of GDP
Source: RBI

New parameters

Initial year	Final year	Calculation
2021	2023	Period average

Methodological note

...

Data

	Andhra F	Structral	C1	C2
Total	0.5	1.4	1.5	1.6
Educatio	0.3	0.2	0.2	0.2
Health	0.1	0.2	0.2	0.2
Family W	0.0	0.0	0.0	0.0
Water ...	0.1	0.5	0.5	0.6

The suggested visualization (table or figures), i.e., the outcome of each data module.

The light orange boxes contain the list of variables, labels, and parameters used in the module.

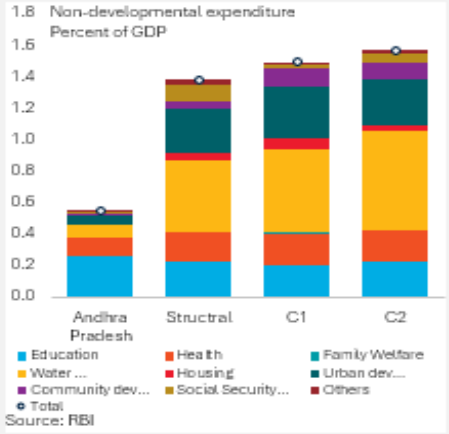
In the “variables” and “title and sources” boxes, the user can modify the orange cells to improve or translate the visualization labels.

In the “parameter” box, the user can modify the dropdown list boxes in a darker shade of orange to change the period of the visualization or set the time aggregation protocol, generally the period average of the last available figure.

The light blue boxes contain methodological notes regarding variables and data sources, which could be useful for interpreting results and noticing any caveats. These boxes also include links to useful documents and alternative sources of information.

One or more data sections with headers in pink that present the figures used by the visualization.

Development capital outlay: social services



Variables

Variable	Variable	Stylized name	Last	Count 1	Count 2	Count 3
Social Se	EXP_CAI	Total	2023	5/5	19/19	19/19
Educatio	EXP_CAI	Education	2023	5/5	19/19	19/19
Medical a	EXP_CAI	Health	2023	5/5	19/19	19/19
Family W	EXP_CAI	Family Welfare	2023	5/5	19/19	19/19
Water Su	EXP_CAI	Water ...	2023	5/5	19/19	19/19
Housing	EXP_CAI	Housing	2023	5/5	19/19	19/19
Urban De	EXP_CAI	Urban dev...	2023	5/5	19/19	19/19
Welfare c	EXP_CAI	Community dev...	2023	5/5	19/19	19/19
Social Se	EXP_CAI	Social Security...	2023	5/5	19/19	19/19
Others	EXP_CAI	Others	2023	5/5	19/19	19/19

Title and sources

Title	Development capital outlay: social services
Unit	Percent of GDP
Source	Source: RBI
	Development capital outlay: social servicesPercent of GDP
	Source: RBI

New parameters

Initial year	Final year	Calculation
2021	2023	Period average

Methodological note

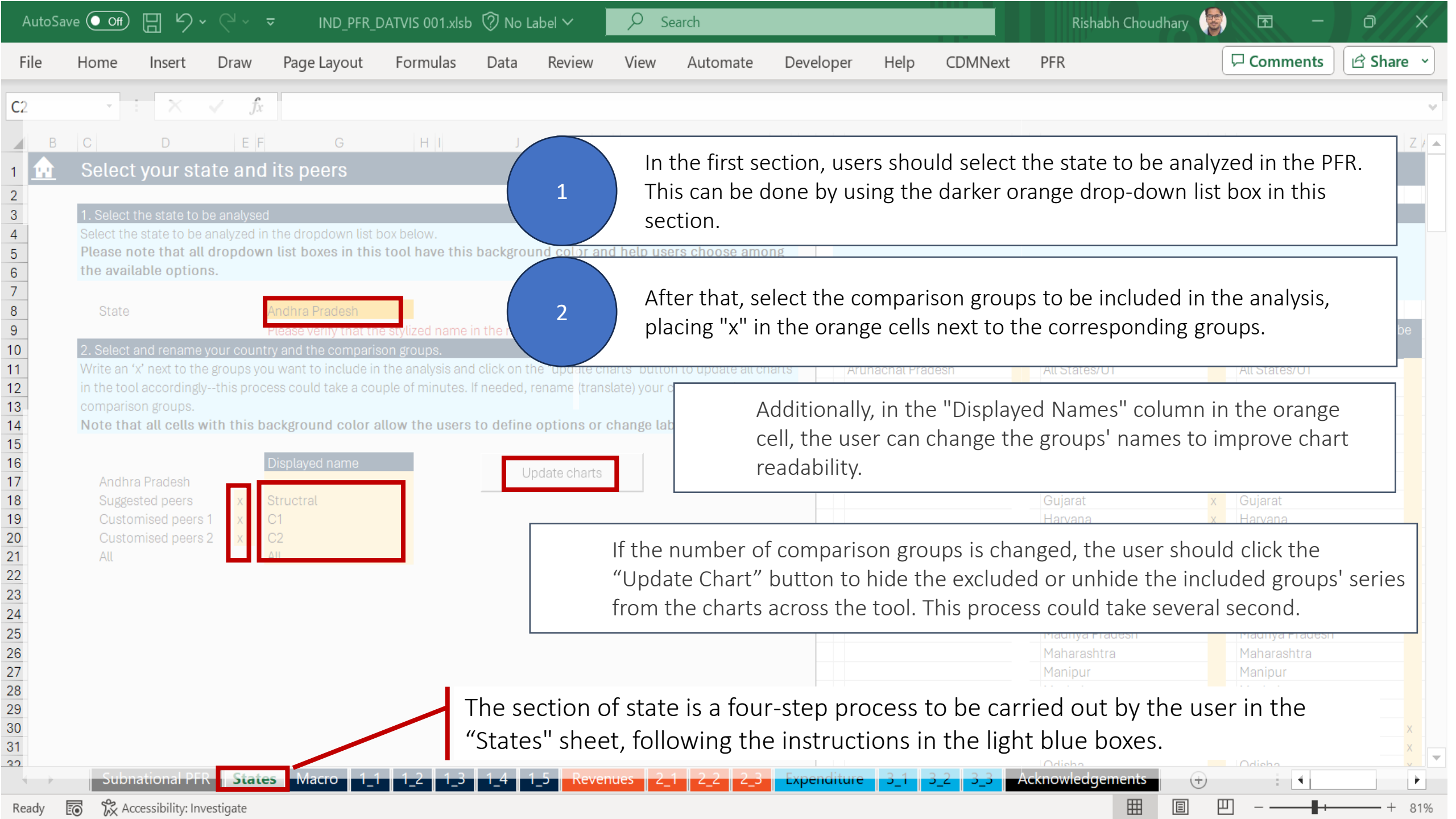
...

Data

	Andhra F	Structral	C1	C2
Total	0.5	1.4	1.5	1.6
Educatio	0.3	0.2	0.2	0.2
Health	0.1	0.2	0.2	0.2
Family W	0.0	0.0	0.0	0.0
Water ...	0.1	0.5	0.5	0.6

- Most of the data modules include some figures to evaluate the availability and density of data on each variable.
- These figures include the year of the latest available figures for the country of analysis, regardless of the user's selected analysis period. This information helps users determine if recent data on the country of interest is available and adjust the analysis period for a more accurate comparison.
- Additionally, the supplemental information comprises ratios, comparing the number of countries with available information in the user-selected period to the total number of countries in each group. These ratios help evaluate how representative the groups averages are.

Peers
selection



1

In the first section, users should select the state to be analyzed in the PFR. This can be done by using the darker orange drop-down list box in this section.

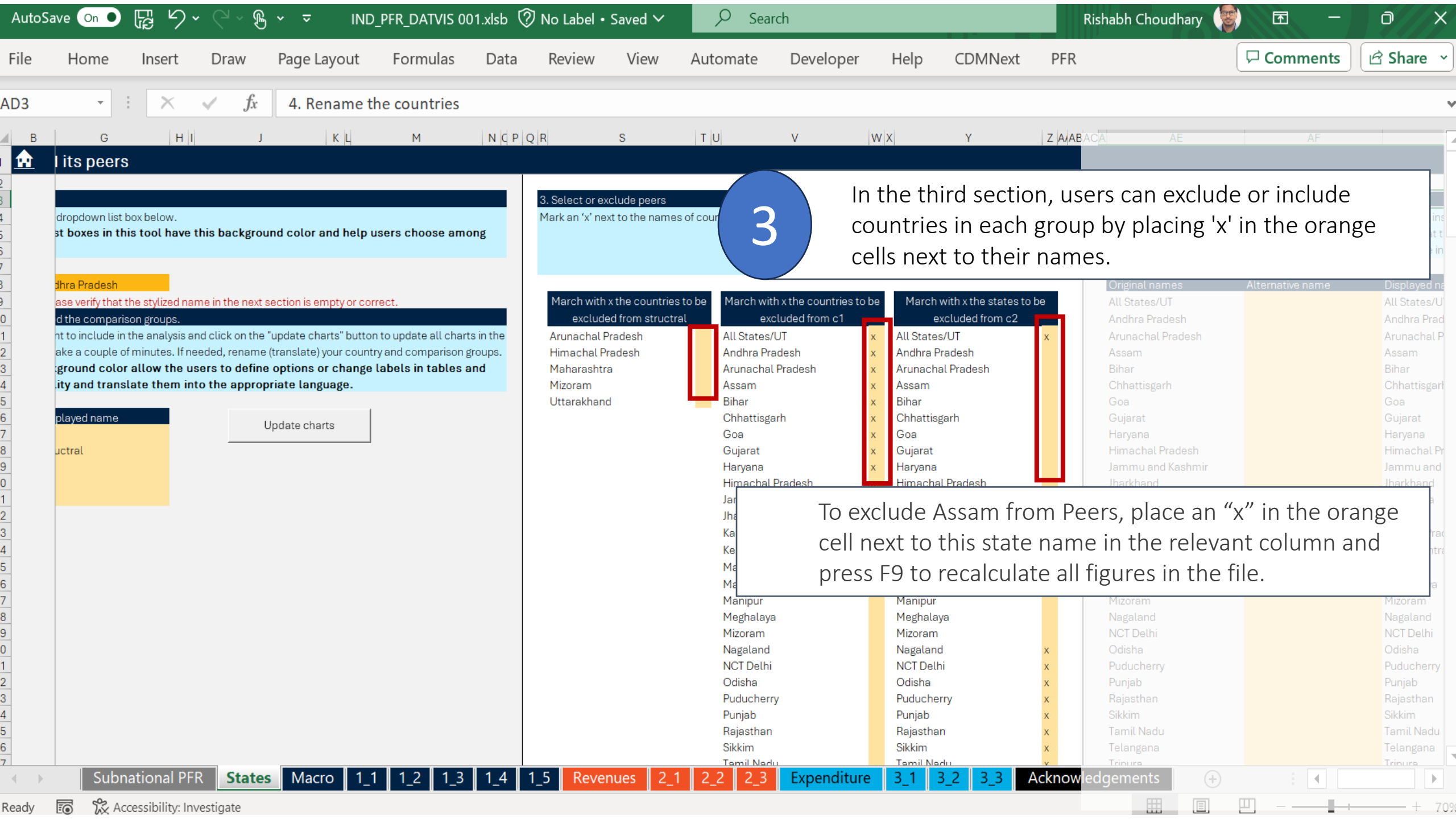
2

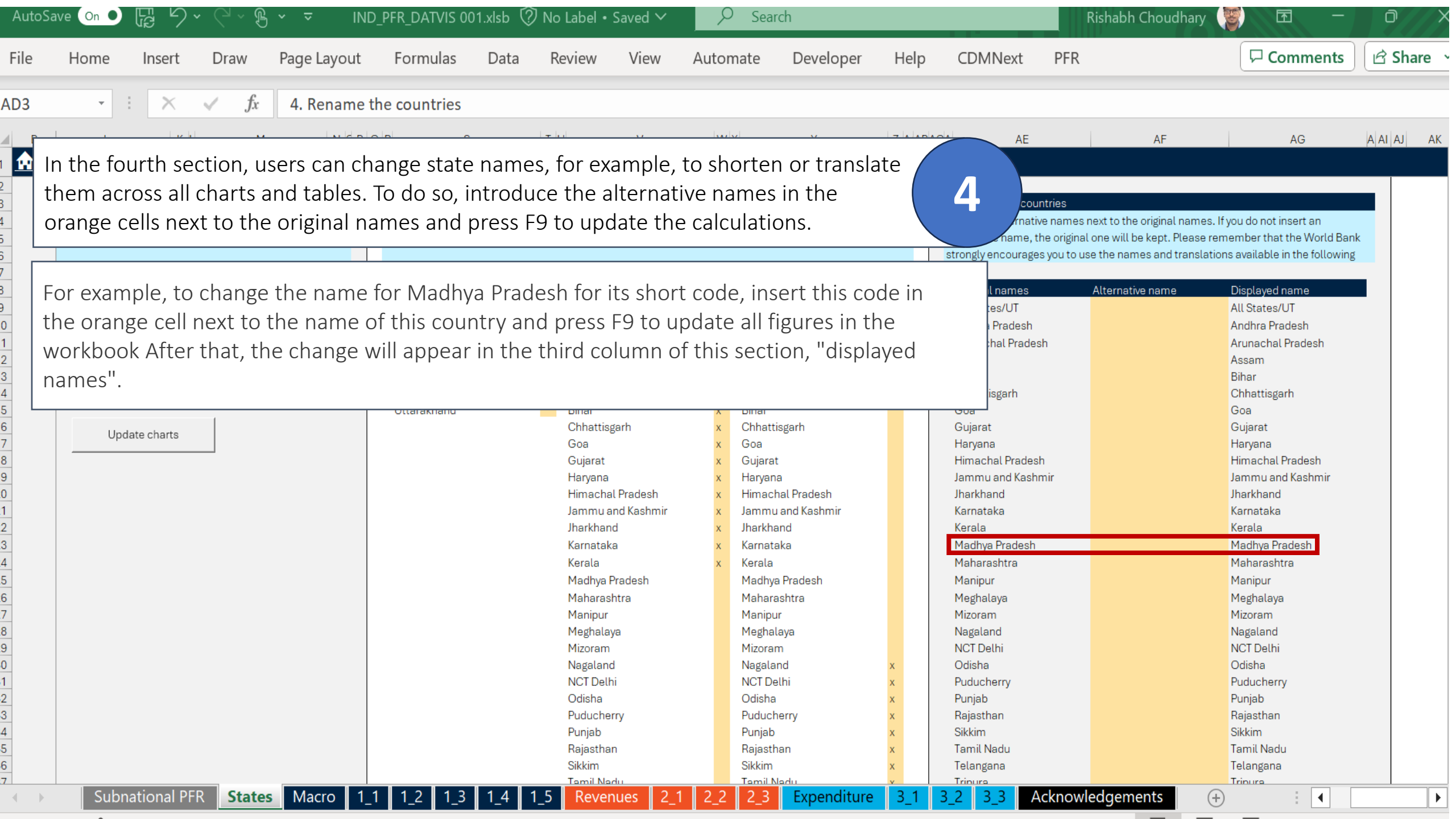
After that, select the comparison groups to be included in the analysis, placing "x" in the orange cells next to the corresponding groups.

Additionally, in the "Displayed Names" column in the orange cell, the user can change the groups' names to improve chart readability.

If the number of comparison groups is changed, the user should click the “Update Chart” button to hide the excluded or unhide the included groups' series from the charts across the tool. This process could take several second.

The section of state is a four-step process to be carried out by the user in the “States" sheet, following the instructions in the light blue boxes.


AutoSave On
IND_PFR_DATVIS 001.xlsb
No Label • Saved
Search
Rishabh Choudhary
File Home Insert Draw Page Layout Formulas Data Review View Automate Developer Help CDMNext PFR
Comments
Share
AD3
4. Rename the countries
l its peers
dropdown list box below.
st boxes in this tool have this background color and help users choose among
dhra Pradesh
ase verify that the stylized name in the next section is empty or correct.
d the comparison groups.
nt to include in the analysis and click on the "update charts" button to update all charts in the
ake a couple of minutes. If needed, rename (translate) your country and comparison groups.
ground color allow the users to define options or change labels in tables and
ity and translate them into the appropriate language.
played name
uctral
Update charts
3. Select or exclude peers
Mark an 'x' next to the names of cou
3
In the third section, users can exclude or include countries in each group by placing 'x' in the orange cells next to their names.
March with x the countries to be excluded from structral
March with x the countries to be excluded from c1
March with x the states to be excluded from c2
Arunachal Pradesh
Himachal Pradesh
Maharashtra
Mizoram
Uttarakhand
All States/UT
Andhra Pradesh
Arunachal Pradesh
Assam
Bihar
Chhattisgarh
Goa
Gujarat
Haryana
Himachal Pradesh
Manipur
Meghalaya
Mizoram
Nagaland
NCT Delhi
Odisha
Puducherry
Punjab
Rajasthan
Sikkim
Tamil Nadu
To exclude Assam from Peers, place an "x" in the orange cell next to this state name in the relevant column and press F9 to recalculate all figures in the file.
Original names
Alternative name
Displayed na
Subnational PFR
States
Macro
1_1
1_2
1_3
1_4
1_5
Revenues
2_1
2_2
2_3
Expenditure
3_1
3_2
3_3
Acknowledgements
Ready
Accessibility: Investigate


AutoSave On
IND_PFR_DATVIS 001.xlsb
No Label • Saved
Search
Rishabh Choudhary
File Home Insert Draw Page Layout Formulas Data Review View Automate Developer Help CDMNext PFR
Comments
Share
AD3
4. Rename the countries
In the fourth section, users can change state names, for example, to shorten or translate them across all charts and tables. To do so, introduce the alternative names in the orange cells next to the original names and press F9 to update the calculations.
4
For example, to change the name for Madhya Pradesh for its short code, insert this code in the orange cell next to the name of this country and press F9 to update all figures in the workbook After that, the change will appear in the third column of this section, "displayed names".
countries
rnative names next to the original names. If you do not insert an name, the original one will be kept. Please remember that the World Bank strongly encourages you to use the names and translations available in the following
l names
Alternative name
Displayed name
Update charts
Chhattisgarh
Goa
Gujarat
Haryana
Himachal Pradesh
Jammu and Kashmir
Jharkhand
Karnataka
Kerala
Madhya Pradesh
Maharashtra
Manipur
Meghalaya
Mizoram
Nagaland
NCT Delhi
Odisha
Puducherry
Punjab
Rajasthan
Sikkim
Tamil Nadu
Telangana
Tripura
All States/UT
Andhra Pradesh
Arunachal Pradesh
Assam
Bihar
Chhattisgarh
Goa
Gujarat
Haryana
Himachal Pradesh
Jammu and Kashmir
Jharkhand
Karnataka
Kerala
Madhya Pradesh
Maharashtra
Manipur
Meghalaya
Mizoram
Nagaland
NCT Delhi
Odisha
Puducherry
Punjab
Rajasthan
Sikkim
Tamil Nadu
Telangana
Tripura
Subnational PFR
States
Macro
1_1
1_2
1_3
1_4
1_5
Revenues
2_1
2_2
2_3
Expenditure
3_1
3_2
3_3
Acknowledgements

Tax potential and tax effort

Several approaches can be used to determine tax effort for countries, differing in how they calculate the key variable of potential tax revenue.

Tax potential is estimated using a **Stochastic Frontier Approach**, largely a prediction of the maximum possible revenues that a country is expected to raise while accounting for country-specific characteristics

$$Y_{it} = \alpha_i + \beta' \mathbf{Z}_{it} + \tau time + v_{it} - \mu_{it} \qquad (1)$$

Where:

Y_{it} is the Tax-to-GDP ratio for country i at time t;[1] α_i is a country-specific fixed effect which controls for time-invariant country-specific characteristics which affect the tax-to-GDP ratio; $time$ is a time trend which captures the effect of time specific shocks, these shocks may not be directly observable but affect a country's tax revenues; $v_{it} - \mu_{it}$ is a composite error term for country i at time t, the error term includes both the inefficiency term (μ_{it}) and the random (stochastic) term;[2] and $\mathbf{Z}_{it}$ is a vector of time-varying determinates of the tax-to-GDP ratio for country i at time at time t.

The estimates from Equation (1) are used to predict the tax-to-GDP ratio ($\hat{Y}_{it}$) for country i at time t, which is interpreted as a country's tax potential. Consequently, the difference between the estimated tax potential and a country's actual tax collections ($\hat{Y}_{it} - Y_{it}$) can be interpreted as the overall tax gap; and a country's tax effort (TE) is estimated as the ratio of actual tax revenues to the country's tax potential $\left(TE_{it} = \frac{Y_{it}}{\hat{Y}_{it}} \right)$. The next section of the note briefly discusses the data.

The **time-varying determinates of tax to GDP ratio** used in this note are aligned with the literature and they include **GDP per capita** and its squared term, a measure of for **trade openness**, agricultural value added, **age dependency** ratio, and a measure of **government effectiveness**. Further estimates are considered with **informality** as a control variable.

Tax buoyancy

- Tax buoyancy measures the total response of tax revenues both to automatic changes to economic growth and to discretionary changes in tax policy.

- An examination of tax buoyancy is crucial for tax policy design
  - It illustrates the role of tax policy in stabilizing the economy over the business cycle in the short run, and in ensuring fiscal sustainability in the long run.
  - For instance, if the country has a buoyant tax system, it means that even during an economic downturn, tax revenues may not decline as sharply as economic output.
  - An understanding of the institutional and structural characteristics that affect tax buoyancy can help adjust expectations about tax buoyancy as these characteristics change.

Tax buoyancy: Empirical estimation

A commonly applied theoretical framework for estimating tax buoyancies starts from an autoregressive distributed lag model, ARDL (p, q), which allows for a dynamic relationship between tax revenue and GDP:

$$T_{i,t} = \sum_{j=1}^{p} \alpha_{i,j} T_{i,t-j} + \sum_{j=0}^{q} \beta_{i,j} GDP_{i,t-j} + \mu_i + \varepsilon_{i,t} \quad (1)$$

where $T_{i,t}$ and $GDP_{i,t}$ represent the natural logarithms of tax revenue and GDP, respectively, for country i in year t, μ_i is a country-specific fixed effect and $\varepsilon_{i,t}$ is the error term.

Based on Equation (1), changes in tax revenues can be explained by its own distributed lag of order p, and a distributed lag of order q of GDP.[2]

Applying ARDL (1,1), ECM (co-integration) and correction for cross-sectional dependence, we get

$$\Delta T_{i,t} = \lambda_i \left(T_{i,t-1} - \gamma_i GDP_{i,t-1}\right) + \beta_{i,0} \Delta GDP_{i,t} + \sum_{l=0}^{p_t} \zeta'_{i,l} \bar{z}_{t-l} + \mu_i + \varepsilon_{i,t} \quad (4)$$

where,

$\bar{z}_{t-l} = \left(ln\bar{T}_{i,t}, ln\overline{GDP}_{i,t}\right)'$ is a vector of cross-sectional averages of dependent and independent variables. In the case of the CCE estimator, $l = 0$, while for DCCE, $l > 0$.

where $\beta_{i,0}$ measures the short-run buoyancy (i.e., instantaneous response), $\lambda_i = -(1 - a_{i,1})$ measures the speed of adjustment between the short-run and the long-run buoyancy (i.e., speed at which buoyancy converges to its equilibrium), while $\gamma_i = \frac{\beta_{i,0} + \beta_{i,1}}{1 - a_{i,1}}$ measures the long-run tax buoyancy.

Fiscal policy cyclicality

How do we identify the fiscal policy stance?

- "Fiscal stance measures the government's discretionary budgetary decisions with respect to the stabilization of the economy."

- "The expansionary or contractionary implications for the economy of a government's budgetary policy." –*The New Palgrave Dictionary of Economics*

- Tool provides:
  - Five estimates of the output gap;
  - Cyclical properties of overall spending and revenue;
  - Estimates of the elasticity of revenue and expenditure to cyclical output using aggregate approach;
  - Cyclically-adjusted primary balance;
  - Fiscal impulse;

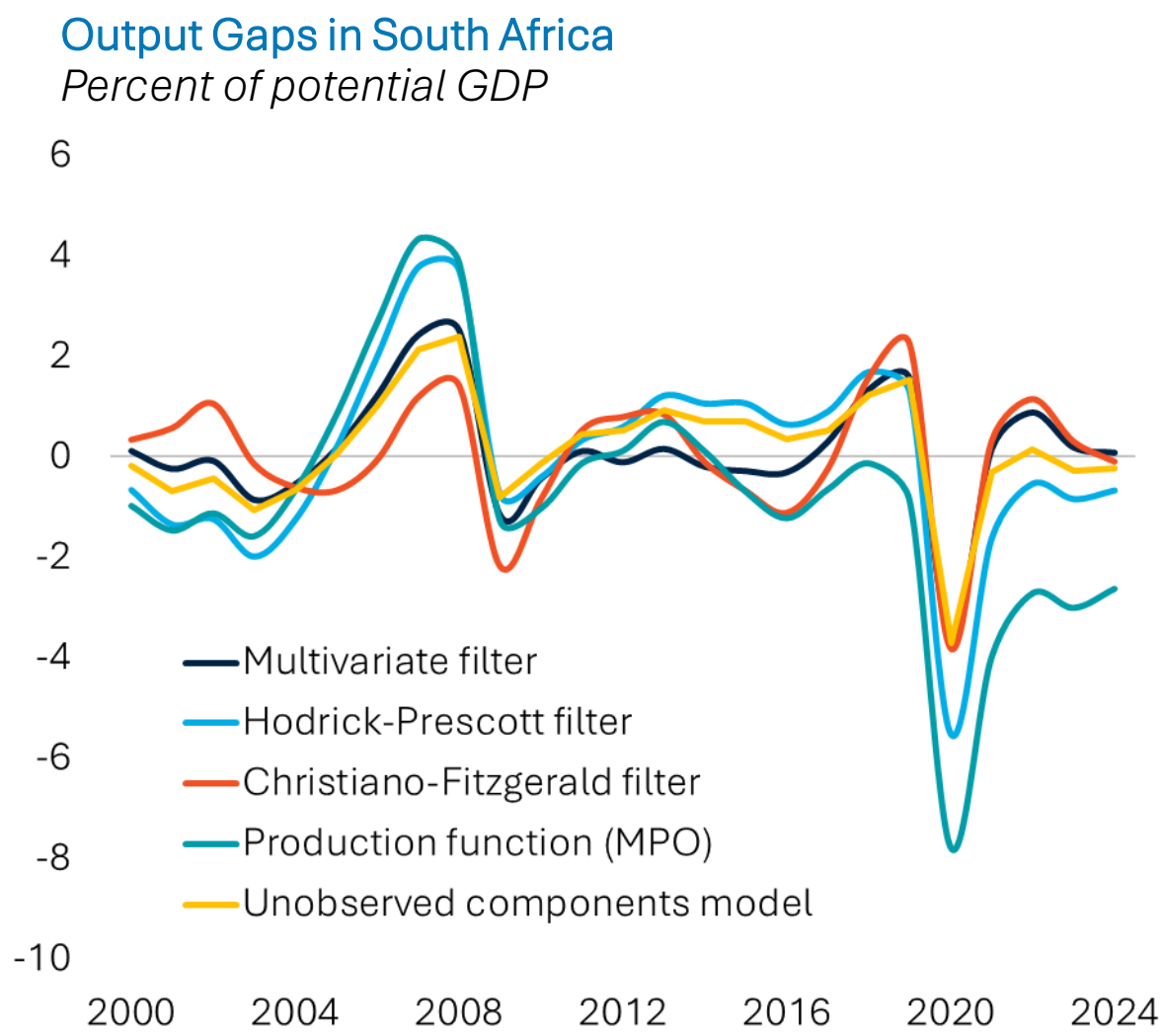
The business cycle in the PFR tool

Table: Output gap estimates in PFR tool

Name	Description	Method and Sources
Multivariate filter (MVF)	Kalman-filter-based with Philips curve, commodity prices, and domestic credit extension	See how to guide
Unobserved components model (UCM)	Kalman-filter-based univariate approach	See how to guide
HP-filter	Univariate filter	See Hodrick and Prescott (1997)
CF-filter	One-sided univariate filter	See Christiano and Fitzgerald (2003)
Production function	Cobb-Douglas production function	MPO; Burns *et al.* (2019)
Average	Simple average of MVF, UCM, HP-filter, CF-filter, and Production function approaches.	

- Output gap = difference between actual output and a benchmark measure of potential output.
- Potential output in this context is defined as the rate of growth in output that can be sustained at full employment and full capacity utilization.
- Alternatively, potential output can be thought of as the rate of output growth that is non-inflationary or keeps inflation at its target.

The business cycle in the PFR tool



Source: World Bank Staff's estimates.

Tips for choosing right gap

Uses most economic information	MVF & production function
Structural breaks	MVF & UCM
Constant supply shocks (drought, oil production cuts, labor strikes)	MVF & UCM
Significant commodity & financial cycles	MVF
Structural interpretation	Production function

Calculating the cyclically-adjusted budget balance

$$CAPB = \frac{Primary\ Balance}{GDP} - \eta * Output\ Gap$$

$$\eta = \varepsilon^R - \varepsilon^G$$

Semi-elasticity of revenue

$$\varepsilon^R = \frac{Revenue}{GDP}(1 - \theta^R)$$

Elasticity of revenue

$$r_{it}^c = \theta_i^R y_{it}^c + \epsilon_{it}$$

Cyclical component of revenue

Cyclical component of output

Semi-elasticity of spending

$$\varepsilon^G = \frac{Spending}{GDP}(1 - \theta^G)$$

Elasticity of spending

$$g_{it}^c = \theta_i^G y_{it}^c + \epsilon_{it}$$

Cyclical component of spending

Remove the cyclical components of revenue and expenditure using aggregated approach.

PFR Tool estimates elasticities for 186 economies from 1990 to 2022 (Simple rule of thumb is revenue elasticity is one and spending elasticity is 0).

Spending efficiency

Recommended measure: Average of all methods

- To minimize the methodological challenges associated with each approach, Kaspoli et al. (2023) propose a composite measure
- The measure takes a simple average of all the scores from the methodologies discussed.

$$\mathrm{CES}_i = \frac{1}{5}(FDH_i + FDHB_i + DEA_i + DEAB_i + SFA_i),$$

- X_i is the efficiency score from methodology *X* for country *i*.
- By construction, the overall composite score lies between 0 and 1, where unity is full efficiency and values below 1 represent some level of inefficiency.
- A composite efficiency score of 0.8 suggests that there is 20 percent output shortfall.

Spending efficiency

Sectors of interest

Education

- **Seven Indicators**
  - School enrollment
    - Primary & Secondary
    - Net & Gross
  - Youth Literacy
  - Average years of Schooling
  - Level of education skills

Health

- **Six indicators**
  - Life expectancy
  - Measles Immun.
  - DPT Immun.
  - Free TB
  - Maternal Survival
  - Infant Survival

Infrastructure

- **Eight Indices**
  - Overall infrastructure
  - Overall transport
  - Roads
  - Ports
  - Air
  - Railroad
  - Electricity
  - Logistic Performance

Spending efficiency

Efficiency means being able to spend less for the same gains or spending the same amount for higher gains.

Numerous techniques have been developed to estimate the unobservable efficient frontier

Methodology	Pros	Cons
DEA and FDH	• Requires no functional form, so not subject to model misspecification. Specifically, the DEA/FDH are non-parametric approaches; hence, the practitioner does not have to provide a parametric specification to compute efficiency scores. This eliminates the issue of model misspecification.	• Subject to sampling variations due to its deterministic nature. • Ignores noise coming from errors in measurement. Hence all deviations between observed input-output bundles and the frontier are due to inefficiency. • Cannot easily accommodate more inputs
DEA-Bootstrap and FDH-Bootstrap	• Requires no functional form, so not subject to model misspecification. • Less subject to sampling variations.	• Cannot easily accommodate multiple inputs.
SFA	• Accounts for all envisioned and relevant factors that may influence the output/outcome in question. • Disentangles technical inefficiency from measurement error. • Addresses outlier issues. • Regression-based nature allows for easy thought-experiments. • Allows for flexible robustness checks in the selection of different probability distribution of the composed error term, which increases the reliability of efficiency estimates.	• Requires an explicit assumption of a particular parametric functional form representing the underlying production frontier and the distribution of the error term

Total Carbon Price (TCP)

The TCP combines direct and indirect forms of carbon pricing in one metric that sheds light on the net carbon price signal in an economy

Table 1. Components of Total Carbon Price

Component	Instruments	Impact on TCP
Direct carbon pricing	Carbon tax	Positive
	ETS price	
Indirect carbon pricing	Fuel excise tax	
	Producer-side subsidies	Negative
	Consumer-side subsidies	
	VAT deviations (exemptions or reduced rate on specific fuel or sector)	

Source: Prepared by WB staff.

The TCP is particularly relevant for client countries that may be in any of the following policy contexts:

1. Undergoing/considering, for example:
   a. A (direct) carbon pricing reform (e.g., the introduction of a carbon tax and/or ETS), while simultaneously retaining in place fossil fuel subsidies (whether expenditure and/or tax subsidies).
   b. A fossil fuel subsidy reform.
   c. A conversion between the fuel excise tax rate and the carbon tax rate.
2. Considering a revenue-neutral tax reform that improves the efficiency and sustainability of the tax system.
3. Seeking to raise additional domestic revenue in a manner consistent with sustainable growth objectives.
4. Looking to accelerate the transition to a low-carbon economy as a means of generating new sources of productivity growth.