



SOUTH AFRICA

SELECTED ISSUES

June 2023

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SELECTED ISSUES

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THE LINK BETWEEN SOCIAL GRANTS AND EMPLOYMENT IN SOUTH AFRICA¹

The literature has analyzed the link between social grants, means-tested and unconditional on employment, and employment in South Africa. The country's social grant expenditure is relatively large amid persistently high unemployment. This study uses a large panel household survey spanning a decade to find that old-age and disability grant recipients are less in employment as intended by the social program, consistent with the literature. The study adds to the literature by showing that, among "indirect recipients," younger members typically have lower employment prospects than other indirect recipients. There could be various explanation for this finding, including that the youth are more discouraged from seeking jobs, face larger constraints in the labor market, or have less job opportunities.

A. Introduction

1. Social grants have played an important role in alleviating poverty and inequality in South Africa (World Bank, 2021). The nation's social grants are extensive compared with its peers (Figure 1, left panel; World Bank, 2018). Social grants are means-tested, unconditional on employment status, and well-targeted, with approximately one in three South Africans being a direct beneficiary of social grants. The World Bank estimates that transfers are equivalent to about 60 percent of household expenditure for the poorest 20 percent of the population, significantly above the 7 percent estimated for the entire population. Table 1 shows that in the survey data used for this study, grants represent 18 percent (6 percent) of the total income of households receiving grants (all households). Amid high poverty, inequality, and unemployment (right panel), grants have supported livelihoods of the most vulnerable, including during the pandemic. Social grants are estimated to reduce the poverty rate by between 10 and 40 percentage points, depending on the choice of official poverty line, and lower the Gini coefficient, a measure of inequality, by about 7 percentage points, according to the World Bank.

2. As well-targeted grants help improve the livelihoods of direct recipients, those of family members also benefit from income sharing. In addition to one in three South Africans that directly receive grants, another one-third of the population are indirectly beneficiaries, that is, benefit indirectly from grants paid to eligible household members (World Bank, 2021). In this context, low labor force participation and persistently high unemployment have raised the question of whether grants discourage job search among those who indirectly benefit from them through households' income sharing mechanisms, and thus lower employment.²

¹ Prepared by Ken Miyajima. A forthcoming paper will include greater details. The author would like to thank the participants of the National Treasury-South African Reserve Bank-IMF workshop held virtually on November 14, 2022, for helpful comments.

² See Loewald, Makrelov, and Wörgötter (2021) for a comprehensive study of the factors behind low labor utilization in South Africa.

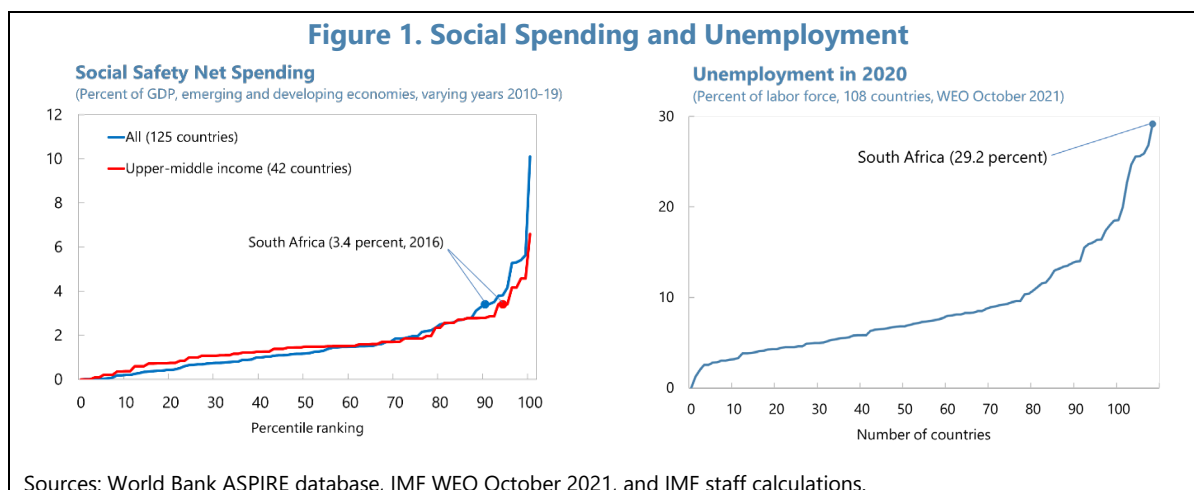


Table 1. South Africa: Average Per-capita Monthly Household Income and Expenditure
(In rand)

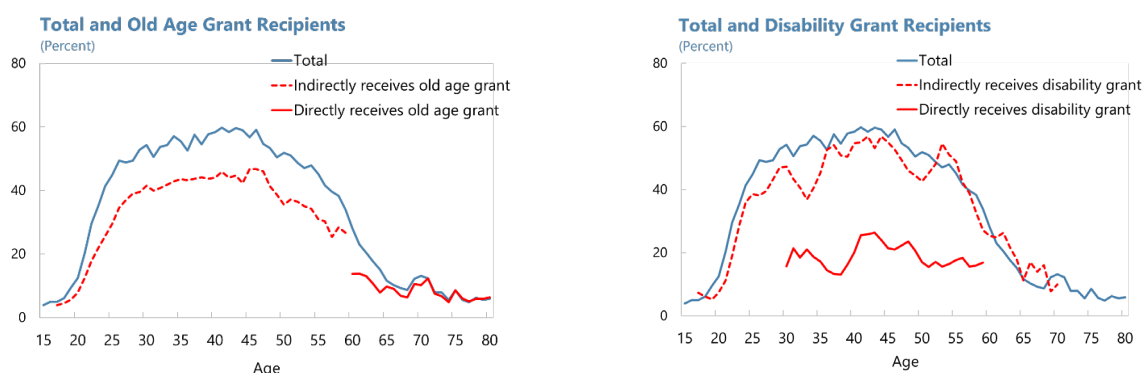
	NIDS Wave 5		National Account
	Households receiving grants	Households not receiving grants	
Total income	1,881	7,853	4,674
Grants	320	0	...
Wages	1,184	6,314	...
Other	377	1,539	...
Expenditure	1,276	5,760	...
<i>Memorandum item :</i>			
Average household size	5.2	2.3	...

Sources: National Income Dynamic Study Wave 5 (2017) and IMF staff calculations.

Note: Households in wave 5 are restricted to those reporting wages, income, and expenditure. Household size as reported in NIDS. Data for econometric analysis are restricted to adults successfully surveyed in all 5 waves and differ from those reported in Table 1. "Other" income is calculated from total, grants, and wages. Total income from National Account is "Disposable income per capita of households" in 2017 divided by 12.

3. Data on grants and employment show that some of indirect grant recipients may indeed leave employment. Direct recipients of old age and disability grants, two of the three major types of grants in size, tend to have lower employment prospects than those that do not, which is as intended (even though some of the recipients remain in employment; Figure 2, solid red lines). Probably more intriguing is that indirect recipients have lower employment prospects than the total sample as well, even though the gap is less pronounced than for direct recipients (dashed red lines). This is consistent with findings in the literature that the old age and disability grants tend to prompt direct recipients or of the members living in the same household, that is, indirect recipients, to stop working (Ranchhod, 2006; Bertrand et al, 2003; Abel, 2019; Mutasa, 2012). This may also reflect potentially that those out of employment move into households with grant recipients. Understanding the link between grants and the willingness to look for a job could help shed light on the ongoing discussions around the extension or lack thereof of the social relief of distress (SRD) grant, introduced at the start of the COVID-19 pandemic, after it expires in March 2024.

Figure 2. Employment Probability by Age: Overall and Grant Recipients
(Percent)



Sources: NIDS and IMF staff calculations.

Note: Indirect recipients 3 year moving average for readability. Left panel = For old age grant showing indirect recipients up to age 59 after which sample size falls significantly, probably as some of the individuals start receiving directly; and direct recipients from eligible age of 60 (before which data include a small number of recipients). Right panel = For disability grants showing indirect recipients up to age 70 after which sample size falls; and direct recipients from age 30 before which sample size is small, and up to 59 after which sample size falls due likely to migration to old age grant.

4. Thus, this note assesses the impact of grants on employment in South Africa. It looks at all types of grants, and both direct and indirect recipients, using a large panel of household data spanning a decade. Recognizing that direct grant recipients could have lower employment prospects because a large fraction of them are naturally out of workforce (relatively old or individuals with disability), this note pays particular attention to potential channels through which grants tend to reduce employment probabilities. Robustness is checked looking at whether estimated results capture causality. The rest of the note summarizes the literature, discusses the data and methodology, estimation, and results. It concludes with a summary discussion.

B. The Literature

5. The impact of grants on employment in South Africa has been studied extensively and findings are mixed. The results vary with the datasets used--cross section data, data from different regions, and time series data by chaining national household surveys--and types of grants.³

- **Old age grant:** Also known as the state old-age pension, it is meant to help older residents (citizens, permanent residents, or refugees) 60 years or older cope financially during their old age. The maximum monthly amount was increased to R1,990 in October 2022 (those over 75 years of age receive R20 additionally). The old age grant is perhaps the most extensively studied type for its size. Findings are mixed--some studies find that grants reduce the labor supply of direct recipients (Ranchhod, 2006) and that of prime-age household members indirectly benefitting from grants via income sharing within the household (Bertrand et al, 2003; Abel, 2019). Others find a positive impact on employment as the old age grant

³ Banerjee et al (2017), an often-cited study arguing that grants have little impact on work incentive, is based on conditional cash transfers across different countries, different from unconditional grants in South Africa.

facilitates migration for employment (Posel et al, 2006; Ardington et al, 2009). Some studies find no employment effect as the recipient keeps the job amid poverty or the old age grant tends to crowd out intra-family transfers (Jensen, 2003).

- **Child support grant:** The child support grant is aimed at helping parents in lower-income households with the costs of the basic needs of their children. To qualify, a child under 18 years old needs to be living in South Africa with the primary caregiver-- a parent, grandparent, or anyone mainly responsible for looking after the child, but not paid to look after the child--who either is a South African citizen or has permanent residency. The maximum monthly amount is R480 per child, and an additional R240 top up was introduced in 2022. Studies tend to find positive effects of the child support grant on employment. One channel through which these positive effects may be playing out is that the grants allow mothers to pay for childcare and thus free time to look for employment (Eyal and Woolard, 2011; Williams, 2007). Other studies highlight favorable effects of the grant on the children's school attendance, educational attainment, and hunger (Heinrich et al, 2012; Williams, 2007).
- **Disability grant:** Those permanently unable to work, or temporarily unable to work for longer than 6 months due to a physical or mental disability, are eligible to apply for the disability grant. After one meets the legal requirements and receives confirmation by a medical assessment, the authorities make the final decision on awarding the grant. The maximum monthly amount is R1,990, same as the old age grant. The disability grant is relatively less studied than the two grants discussed above. Empirical studies tend to find that this type of grant has either negative or no effects on employment. The size of negative effects could be large, up to about a 20 percentage-point reduction in employment probability in some studies (Mutasa, 2012). Other studies find no effects on employment and conjecture that the disability grant absorbs those already out, sometimes for a long time, of labor force (Mitra, 2010).

6. High transportation costs are widely regarded as a key impediment to job search and employment in South Africa (Kerr, 2017; Loewald, Makrelov, and Wörgötter, 2021; Shah and Sturzenegger, 2022; Van Der Merwe and Krygsman, 2022). The average direct transport cost (excluding time spent) is close to 40 percent of after-tax labor income for those in the lowest per-capita household income quintile (Shah and Sturzenegger, 2022). Related observations in the NIDS data provides useful insight (even though the size of observations is too small for the econometric analysis in this paper). For instance, in wave 5, about 1/2 of those reporting transport cost during job search spent none. The other 1/2 reporting transport costs spent a median value of 100 rands per week, with the interquartile range of 60–200 rands (Table 2). This is equivalent to about 30 percent of total grants received by the household (interquartile range of about 15–80 percent). The share exceeds 180 percent when transport costs are scaled by per-capita household grants (that is, total household grants adjusted for household size).⁴

⁴ A family member in or outside the household is the main source of funds for transport during job search. See Annex Table 1.

Table 2. South Africa: Weekly Transport Cost for Job Search, Interquartile Range
(NIDS Wave 5)

Percentile	In rand	In percent of :	
		Total household grants	Per-capita household grants
25	58	14	81
50 (median)	100	30	184
75	200	79	418

Sources: NIDS and IMF staff calculations.

Note: Based on response to "amount spent on transport during job search in the past week." Household grants are reported per month in NIDS data and are divided by 4 before scaling weekly transport cost. Those reporting zero transport cost are not included in calculating interquartile range. In wave 5, 2,588 individuals report transport costs for job search. 1,261 individuals report non-zero costs and are age 15–74 years old. Wave 5 includes 29,027 individuals in the same age range of 15–74.

C. Data and Methodology

7. This study relies on the National Income Dynamics Study (NIDS) data. NIDS is the first national household panel study in South Africa. It started in 2008 with a nationally representative sample of over 28,000 individuals in 7,300 households across the country. The survey is conducted approximately every two years, tracking the livelihoods of the same individuals with unique IDs. At present, five waves are available: 2008, 2010–11, 2012, 2014–15, and 2017. The analysis in this paper uses all waves of data, 10 years in the time series dimension (2008–17), but cross-sectionally the sample is restricted to the adults who are successfully surveyed in all 5 waves (about 6,700 adults).

8. In the empirical model used in this note, the dependent variable is a binary indicator of employment status. Individual i 's employment status dummy at time t takes value of 1 when the individual is "employed" and zero otherwise (either "not economically active", "unemployed strict", "unemployed discouraged", or "refused" to respond). In the sampled data, the share of employed rises from around 35 percent to 45 percent as the job qualification of sampled individuals improves with age. In the comparable official data, the share of employment is steadier, at 40–45 percent of working age population (15–64 years old).

9. The explanatory variables aim at capturing a range of individual characteristics and macroeconomic conditions. Most of them are lagged by one period (or wave) to reduce the risk of reverse causality. For the variable of interest--the status of receiving grants--several sets of indicators are constructed. In our sample, about two-thirds of the individuals receive grants either directly or indirectly in each wave. One-third receive in all waves and 90 percent receive at least in one wave.

- **The total grant dummy** uses a household-level variable and takes value of 1 if any members of the household to which the individual belongs receive grants, any type, and 0 otherwise.⁵
- **The total grant direct dummy** is constructed using an individual-level variable showing whether the individual received grants. Using this, and the dummy above, indirect recipients of grants are identified and used to construct the total grant indirect dummy.
- **The grant type dummy** takes value of 1 if any member of the household to which the individual belongs receives one of the five types of grants--old age, child support, disability, foster care, and care dependency, and 0 otherwise. The social relief of distress (SRD) grant--or the COVID grant--is not used, as the COVID-19 rapid survey results are not included due to data limitations. Direct and indirect grant recipients are identified the same way as for the total grant dummy.
- **The total grant amount** captures the amount of grants received (any type) by individual i . Since there is no information on the whether and how much household members living with direct grant recipients benefit from income sharing, the note follows the approach used by Schotte et al. (2018) and Zizzamia (2020). Specifically, the total amount received by the household to which the individual belongs to is divided by the number of adults to capture income-sharing in multi-generational households. The variable is further adjusted for age, guided by by-age consumption data (Miyajima, 2021).⁶

10. Our assumptions as to how indirect grant recipients benefit from income sharing have limitations. The indicators of grants for individual i are constructed assuming that, when a household member receives grants, family members benefit equally (e.g., the total grant dummy) or in proportion to consumption by age (e.g., the grant amount). In reality, grants may be shared by the direct recipients to a lesser extent, systematically but differently than assumed, or less systematically. Therefore, results of this study need to be interpreted with this caveat in mind.

11. Indicators of educational attainment are created for 5 groups. These are no education (including "other" and "don't know"), lower primary (grades 1–7), upper primary (grades 8 and 9), secondary (grades 10–12, National Technical Certificate, and National Vocational Certificate), and tertiary (everything above secondary). In wave 5, the share of primary level education is the highest (36 percent), followed by secondary (32 percent), tertiary (19 percent), and no schooling (13 percent).

⁵ This, and how we compute individual-level expenditure, help capture household-level strategies, which extend to sending a migrant, choosing who to receive more education, saving and investing money, and starting small businesses.

⁶ Average consumption by age group is not available for South Africa and proxied by the U.S. Consumer Expenditure Survey. We use the data to adjust per-capita household consumption in South Africa for 7 age groups. For instance, adults in the 45–54 age group tend to consume the most, twice as much as those that consume the least (below 25 and above 75).

- 12. Other individual variables include the lagged dependent variable for individual i to control for persistence in employment status, geography, age, and household size.**⁷ Real expenditure level in log for individual i captures resource availability.⁸ Similar to some of the grant dummies, this variable is calculated as household-level consumption divided by the number of adults in the household, adjusted for age. The variable is further adjusted for the annual inflation index of the survey year--individuals are surveyed in different years even in the same wave. Time invariant individual-level controls include gender and ethnicity.
- 13. Macro-level conditions are controlled for by an estimated output gap, contemporaneously introduced assuming limited feedback from individual i 's decision.**

D. Estimation

- 14. To estimate the impact of grants on employment, a dynamic random-effects Probit model with unobservable heterogeneity is used.** Dynamic random-effects specifications are increasingly used in the literature dealing with the persistence of dichotomous outcomes. With unobserved effects, the treatment of the initial observations is an important theoretical and practical problem (Wooldridge, 2005). This note relies on an approach where unobservable heterogeneity is addressed by including the initial period value of the dependent variable and the initial period and within-unit averages of time-varying explanatory variables (Grotti and Cutuli, 2018).
- 15. The note conducts several analyses using dynamic random-effects Probit.** First, the impact of grants on employment is estimated using the total grant dummy, which combines all types of grants and recipients (direct and indirect). Second, grants are separated by type (care dependency, child support, foster care, state pension--or old age, and disability) to tease out each grant's idiosyncratic characteristics. The literature finds that a negative impact applies to the old age and disability grants. This note posits out that this negative impact reflects the intended effects of the grants which are paid to individuals who are either relatively old or less able to work. Third, the note considers how the size of grants and educational attainment affect the impact of grants (all types combined) on employment (all recipients combined). One view is that the negative impact would be stronger for those who receive relatively larger grants in size or with lower educational attainment. The literature suggests that the negative impact could also apply to indirect recipients. Therefore, as a final step, we unpack the negative impact among indirect recipients along the age spectrum, and find that the negative impact could be stronger among the youth as they face greater constraints to work.
- 16. To check the robustness of the causal relationship between grants and employment, we also implement Propensity Score Matching, or PSM, focusing on indirect recipients.** In this statistical technique, an artificial control group is constructed by matching each treated unit with a non-treated unit of similar characteristics to estimate the impact of an intervention. In our case, the

⁷ Informality in South Africa is relatively low, at about 20–25 percent along with Mauritius and Namibia, and significantly below 50–65 percent in Benin, Tanzania, and Nigeria (Medina et al, 2017).

⁸ Income data in the NIDS are less complete than expenditure data. Income data tend to be under reported.

sample is separated into two groups, those with grants and those without. From each group "similar" individuals are identified based on a set of characteristics. Finally, employment status in the next wave is compared between the similar individuals with grants and without. PSM is estimated using by-wave cross-section data focusing on indirect recipients (both total and the first age quantile, or the youngest). This reduces sample size relative to the panel time series estimation.

E. Results From Dynamic Random-Effects Probit

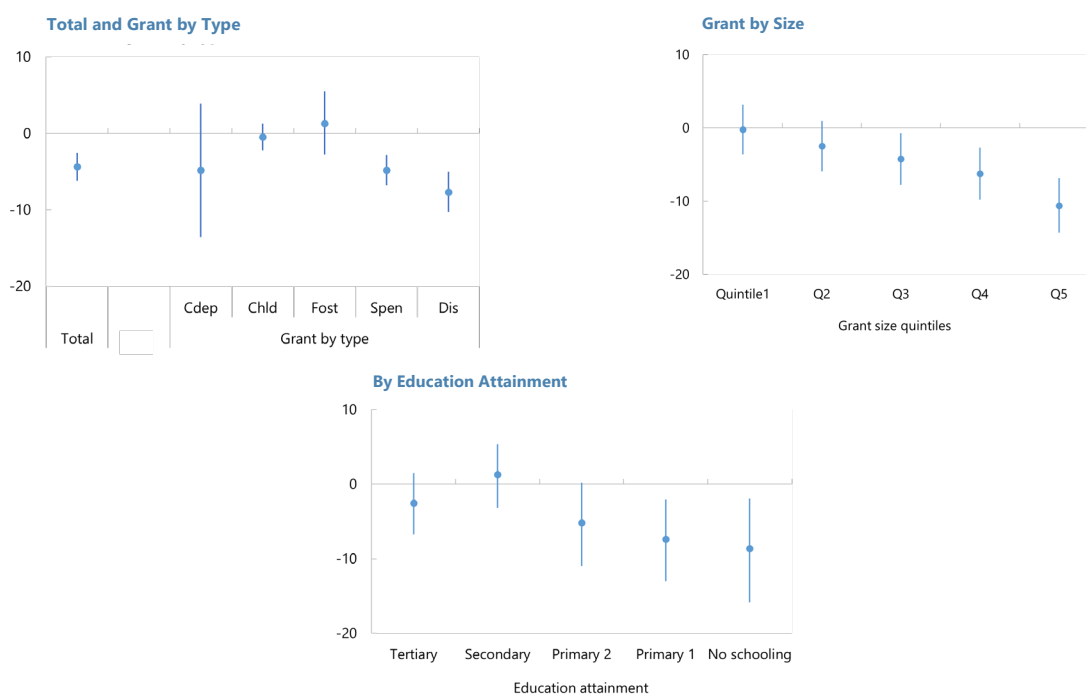
17. The old age and disability grants are doing what they were designed to do, gauging from the negative association between grants and employment. Those receiving grants of any kind, directly or indirectly, tend to have on average 4 percentage points lower probability of being employed in the next period (Figure 3a, upper left panel). This negative association applies to the old-age and disability grants (-8 and -5 percentage points, respectively). By design, these grants support individuals less able to work due to age or physical conditions. The other three types of grants (care dependency, child support, and foster care) do not have statistically significant association with employment. This is in contrast to findings in the literature that indicate a positive link between grants and employment among recipients of the child support grant (Eyal and Woolard, 2011; Williams, 2007).

18. While most of them may be naturally out of employment, grants also tend to reduce employment probabilities through several channels. In particular, individuals, both direct and indirect recipients combined, either receiving larger grants in size or with lower education attainment (likely earning lower wages) tend to leave employment (Figure 3a, upper right and lower panels). No association is found between grants and employment when grants are small in size (quintiles 1 and 2). As grants become larger in size (quintiles 3–5), the extent of the negative association increases. Those receiving largest grants in size (quintile 5) have lower employment probability by 10 percentage points than those with no grants. When the education dummies are interacted with the grant dummy, no association is found for those with relatively high education attainment (upper primary, secondary, and tertiary education). The association however is negative for those with lower levels of education (lower primary education and no schooling), between -8 to -10 percentage points.

19. For indirect recipients, the negative association mainly applies to the youth. Those receiving grants directly tend to have a stronger negative association (-6 percentage points) than those indirectly (-3 percentage points). Among indirect recipients, the negative association applies to those in the lowest age quintile (-7 percentage points)--those 17, 19, 21, 24, or 27 years old or below in wave 1, 2, 3, 4, or 5, broadly comparable to the age ranges of 15–24 and 15–34 years old used for official youth unemployment statistics in South Africa. No association is found for those in higher age quintiles (2–5).

Figure 3a. Impact of Grants on Employment Probability

(Percentage point change in employment probability derived from Probit coefficient, by type, size, and education)

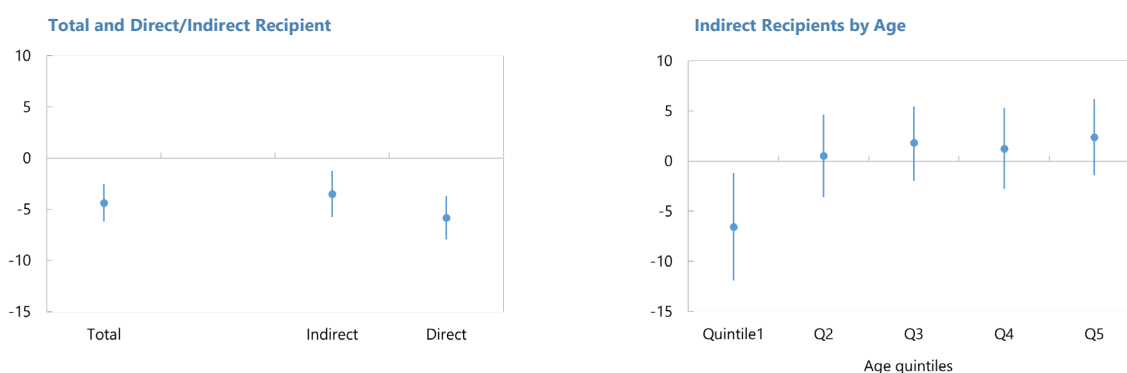


Sources: NIDS and IMF staff calculations.

Note: The vertical bars represent the 95 percent confidence intervals. Cdep = Care dependency grant. Child = Child support grant. Fost = Foster care grant. Spen = state pension, or old age grant. Dis = Disability grant.

Figure 3b. Impact of Grants on Employment Probability

(Percentage point change in employment probability derived from Probit coefficient, direct and indirect)



Sources: NIDS and IMF staff calculations.

Note: The vertical bars represent the 95 percent confidence intervals.

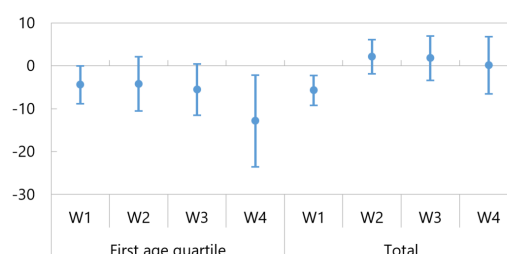
F. Results From Propensity Score Matching

20. Results from PSM are mixed but continue to suggest that grants reduce the

employment probability of younger, indirect

recipients. For younger individuals (the first age quartile), grants reduce employment probability by about 5 percent in waves 1 and 3 (both results are borderline at the 95 percent confidence level) and 12 percent in wave 4. Results suggest no systematic impact in wave 2. By contrast, for total indirect recipients, grants have no systematic impact on employment probability (waves 2–4). Only in wave 1 employment probability falls by about 5 percent. The small sample size may reduce precision and make results more sensitive to model specifications. Results are available for up to wave 4 where employment status in wave 5 is used.

Figure 4. Impact of Grants on Indirect Recipient's Employment Probability
(Percentage age point change)



Sources: NIDS and IMF staff calculations.

Note: The vertical bars represent the 95 percent confidence intervals.

G. Discussion

21. This study analyzes the impact of grants on employment. It uses NIDS, large panel household data spanning a decade and covering over six thousand individuals in our sample. The study adds to the literature by focusing on individuals indirectly receiving grants through potential income sharing within households. Since there is no information on the extent to which direct grant recipients share income within the households, this study follows the literature in making specific assumptions. The results should be interpreted with this caveat in mind.

22. The old age and disability grants support those who are less able work. This intended effect is captured in the results by the negative association between grants and employment probability, which is consistent with the literature. While most of them may be naturally out of employment, this study finds a link between grants and lower employment probabilities through several channels—grant recipients who either needs to (because grants are relatively small in size) or can (as higher education attainment helps find and/or maintain a better paying) tend to remain in employment.

23. A novel finding is that younger household members indirectly receiving grants through income sharing tend to have lower employment probability than other indirect recipients. This finding could reflect the fact that the youth face limited job opportunities and are discouraged from seeking jobs. To the extent that the youth tend to have lower skills and earnings, additional income can create greater disincentive to seek employment. This effect would be further amplified for those facing spatial inequality that raise cost of job search.

24. These findings also highlight the importance of implementing measures to reduce the cost of job search, boost labor supply, and job creation. Policies to durably raise employment

and lower costs to job creation include addressing school-to-job transitions, improving the employability of the inactive population, and making job search more effective. Interventions to increase entrepreneurial capacity, lift the basic education level, and reform social housing policies would increase the participation in economic activity of people living in remote and traditional settlement areas (Loewald, Makrelov, and Wörgötter. 2021). These measures would complement policies to reduce rigidities and increase competition in the product and labor markets, boost growth, and enhance demand for labor.

Annex I. Data Summary

Table AI.1. South Africa: Source of Funds for Transport During Job Search
(NIDS Wave 5)

	Frequency	Percent of total
A family member in the household	779	62
A family member outside the household	221	18
Own savings	97	8
A friend outside the household	79	6
Own grants	74	6
A friend in the household	8	1
A money lender	3	0
Total	1261	100

Sources: NIDS and IMF staff calculations.

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PUBLIC PROCUREMENT IN SOUTH AFRICA: ISSUES AND REFORM OPTIONS¹

The 2015 Supply Chain Management Review lays out a sound agenda for procurement reform. The ongoing work on a new procurement bill and regulations are an important opportunity to spearhead procurement reform and step-up implementation. Several important reform aspects worth prioritizing are the simplification and standardization of procurement procedures, the standardization of transparency requirements through the adoption of the Open Contracting Data Standards, transitioning to a new e-procurement system that is linked to the government's integrated financial management information system (IFMIS) and other systems, making preferential procurement more cost effective and goal oriented, and strengthening staff capacity to carry out procurement. Opportunities to centralize procurement should be further explored to leverage and develop limited capacity.

A. Introduction

- 1. Sound public procurement practices are an important determinant of the growth impact of public spending and expenditure efficiency.** Public procurement processes affect how much the government pays for the inputs it buys to deliver its services, the quality-of-service delivery (i.e., the extent to which goods and services are delivered in the right quantities, with the right quality, at the right time, and in the right place), and the cost of doing business (e.g., the extent to which the economy has well-maintained economic infrastructure to support private sector activity). Countries also use public procurement to pursue secondary objectives (including preferential objectives such as promoting SMEs) but usually at a cost in terms of expenditure efficiency and other unintended consequences that require careful monitoring.
- 2. Given South Africa's need to consolidate, strengthening its public procurement is essential to make spending more efficient and achieve savings.** The 2015 Supply Chain Management Review (SCMR) suggested that savings from improving procurement practices could be sizable, up to 20 percent of the cost of goods and services procured (3 percent of GDP or 12.7 billion US dollars),² if use of strategic sourcing is increased (i.e., having differentiated but standardized procurement processes throughout the public sector that optimize procurement strategies for different groups of goods and services). Other research, such as IMF (2018), also points to opportunities to improve spending efficiency in health and education as South Africa spends considerably more than comparator countries but achieves worse outcomes.
- 3. This paper seeks to take stock of main procurement issues and reform progress since the SCMR with a view to identifying areas to prioritize reforms.** Section B discusses key

¹ Prepared by Alejandro Simone and Vybhavi Balasundharam.

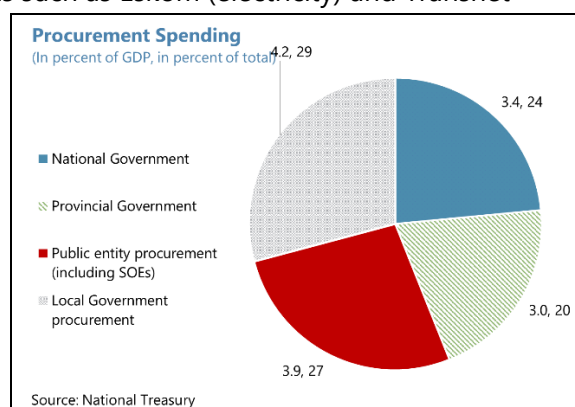
² Estimated assuming total fiscal year procurement spending of about 15 percentage points of GDP at the public sector level, the FY GDP for FY 2021/22, and the average rand per US dollar exchange rate for FY 21/22.

characteristics of the South African procurement system, summarizes the challenges identified by the SCMR, and takes stock of the progress made to address them. Section C discusses the experience with procurement reforms mainly in other emerging markets and draws on international procurement best practices to identify reforms that could be implemented to address the challenges that the South African procurement system is facing. Section D discusses the extent to which the new procurement bill, which is pending finalization and submission to the Cabinet, addresses the procurement system challenges. Section E concludes by outlining key procurement reform priorities going forward.

B. The South African Procurement System: Key Characteristics, Issues, and Reform Progress

Key Characteristics

4. Public procurement spending was 15 percent of GDP in FY21/22. Local and provincial governments and public entities, including large SOEs such as Eskom (electricity) and Transnet (logistics), carried out about 76 percent of public procurement expenditure with the national government accounting for the remaining 24 percent. More detailed breakdowns of this expenditure (e.g., top 5 largest spending categories), or the characteristics of the firms that delivered the goods and services (e.g., the size and ownership characteristics of the firms), are only available to a varying degree for the national government and the provincial governments.



5. Public procurement is highly decentralized at the institutional level. Each government entity has significant latitude to decide how it procures the goods, services, and public works it needs to carry out its functions. This implies different procurement requirements, forms, and processes across institutions. This is also reflected in fragmented legislation, where 80 different legal instruments govern public procurement across the public sector with their accompanying regulations.

6. The variety of procurement processes are accompanied by multiple IT systems and significant manual processing of procurement transactions. While the national government and a fraction of provincial governments use one IT system (Logis), local governments use a variety of different IT systems. Moreover, these systems only tend cover the early stages of procurement (i.e., procurement plan and tendering) and are not compatible with each other and other IT government systems (e.g., budget systems). The latter implies that time consuming and more error prone manual processes are needed to extract information from them, which also may be difficult to consolidate with information produced by other systems. More generally, the SCMR estimated that about 45 percent of procurement activities were still conducted through manual processes.

7. A variety of preferential objectives are pursued with the procurement system in addition to traditional primary objectives. The secondary objectives are included in preferential procurement legislation and include favoring SMEs, historically disadvantaged groups, and local enterprise development including through local content requirements. Section 217(2) of the Constitution of South Africa (CSA) also provides for "categories of preference in the allocation of contracts" and "the protection or advancement of persons, or categories of persons, disadvantaged by unfair discrimination". Section 217 (1) of the CSA establishes the more traditional primary procurement objectives indicating that public procurement should be "in accordance with a system which is fair, equitable, transparent, competitive, and cost-effective".

8. Capacity to carry out procurement efficiently varies considerably across the public sector. Apart from most large metro area municipalities, information available suggests that in general staff capacity to execute procurement declines with the level of government. Municipalities have the weakest capacity, especially those that are in poor financial conditions, which often coincide with sub-par service delivery. Moreover, as identified in the Zondo Commission Reports, governance issues in SOEs are another important factor undermining procurement efficiency (Annex XIX. State Capture Commission).

9. The Office of the Chief Procurement Officer (OCPO) has broad responsibilities in the reform and maintenance of the procurement system. The Office was created in 2013 within the National Treasury to ensure that public sector organizations in South Africa honor the provisions of section 217 of the CSA. It is responsible for managing procurement reforms, enhancing, and maintaining the procurement system, and overseeing how government conducts business with the private sector. The execution of procurement remains the responsibility of accounting officers and public entity authorities more broadly to avoid conflicts of interest.

Procurement System Challenges

10. The fragmentation of legislation and regulation results in significant inefficiencies. Different procurement practices are followed to procure the same type of goods and services involving the same suppliers leading to different prices being paid across the public sector for the same goods and services and suppliers. The multiplicity of procurement processes makes compliance with procurement requirements burdensome for suppliers, especially for SMEs. Moreover, it creates uncertainty on the applicable procurement standard complicating court enforcement of public procurement rules, and it makes public procurement personnel training more difficult.

11. Weak enforcement of existing procurement legislation and regulations result in repeated serious procurement violations. While this in part stems for the fragmented legal and regulatory framework, failure by institutions to enforce procurement procedures, is also an important problem. According to SCMR, this results in repeated violations such as bribery and nepotism, fraud and theft of resources, conflict of interest, collusion and bid rigging, abuse and manipulation of information and processes, discriminatory treatment, and waste and abuse of public resources as suppliers take advantage of enforcement weakness. The 2020–21 Auditor General

report suggests that the most frequent procurement concern, even in institutions that have clean audits, is an uncompetitive or unfair procurement process. There are also concerns on whether institutions select adequate procurement methods and properly justify exceptions to competitive procurement.

12. The lack of integration and multiple IT systems lead to fragmented procurement data and of insufficient quality. Insufficient detailed standardized transactions level data on which to build relevant aggregate data creates significant difficulties in monitoring the efficiency of procurement across levels of government and at the different stages of the procurement process, including at the contract and delivery management stage. This, combined with the significant manual processing of procurement transactions and the weak compliance with procurement procedures, increases the likelihood of errors and inaccuracies undermining data reliability. These data weaknesses also limit the ability to enforce compliance with procurement rules.

13. Insufficient transparency throughout the different stages of public procurement facilitates corruption. In particular, the SCMR indicates that bid documents are not sufficiently published, bid committee evaluation minutes and standard contracts entered are not made available to the public, bids are not opened in public and published, the entire bid evaluation process is not open to scrutiny, and progress and contract implementation reports are not made publicly available.³

14. Procurement is carried out with limited strategic focus resulting in high procurement costs. Given insufficient data availability to monitor and assess the overall efficiency of the procurement system, procurement processes are not being optimized to get the best value for money depending on the good, service, or public work that needs to be procured and standardized throughout the public sector. The insufficiently strategic focus, combined with the inability to aggregate demand across public institutions to exploit the government's large buyer power, and lengthy procurement decision-making, results in high procurement costs and quality concerns.

15. The preferential procurement system is costly and ineffective. The cost concerns have arisen not only because of the trade-offs with competitive procurement, but also because the Zondo commission reports have illustrated how the preferential procurement system has been used as an avenue for corruption, state capture, and rent seeking. Moreover, while it is difficult to assess preferential procurement outcomes given procurement data limitations, the SCMR notes that the perception is that desired local and enterprise development has not been achieved and that the system favors established businesses, including businesses that were disadvantaged in the past but are no longer so, erecting barriers to entry.

³ Until 1 November 2022, Government institutions were only required to use the e-Tender Portal to advertise bids but not the value of tenders. For FY22/23, a total number of 30,062 were advertised on the portal, of which 11 percent was by National Departments and entities, 68 percent by provincial governments and the rest from local governments. Since November 2022, only the bid values of 796 contracts were reported, indicating low compliance.

16. Staff capacity to carry out procurement is limited. Many procurement practitioners do not have the skills, knowledge, experience, and motivation they need to perform their duties contributing to significant turnover. The multiplicity of procurement processes further exacerbates the training difficulties.

Progress in Addressing Procurement System Challenges

17. The SCMR proposed several reforms to address procurement system challenges. They included: (1) standardization and simplification of procurement forms, rules, and processes across the public sector by making changes to relevant legislation and regulations; (2) strengthening OCPO enforcement powers to improve compliance with procurement rules; (3) transitioning to an integrated financial management information system (IFMIS) to increase transparency, oversight, and data accuracy; (4) creation of a central supplier database to reduce the compliance burden and address data weaknesses; (5) standardization of procurement information dissemination through the creation of an e-tenders portal and publication of additional information in the OCPO website; (6) making procurement more strategic by expanding the use of framework agreements; (7) better alignment of preferential procurement with primary procurement goals by reviewing preferential procurement legislation, limiting cost premiums, and improved monitoring of policy outcomes; and (8) implementation of a procurement capacity development strategy to create a corps of competent and committed procurement professionals.

18. Implementation of SCMR reform proposals has been limited. Dissemination and reporting of tender information and more general procurement information was improved with the creation of an e-tenders portal and through expanded publication in the OCPO website.⁴ A central supplier database was also created. The database currently has information on over a million suppliers but weak compliance with procurement rules still creates data quality issues (e.g., some supplier data is not entered as required). Some optimization of procurement was also implemented with increased use of framework agreements and an “Amazon like” IT platform (G-commerce) for buying entities to procure goods and services. Nevertheless, data suggests that the share of good and services procured through this route remains limited. The remaining SCMR reforms are still in progress with recent efforts geared to prepare a new procurement bill and corresponding regulations, and a revision of the preferential procurement framework.

C. International Experience with Procurement Reforms

19. Many of the procurement weaknesses identified in the SCMR have already been identified in OECD countries procurement systems more broadly. According to OECD (2016a), frequently identified weaknesses ordered by the percentage of countries that identified them as a problem include lack of capacity in procurement (e.g. numbers, knowledge, skills), deficiencies in the

⁴ Additional information published through the OCPO website includes demand and procurement plans for all purchases above R500 000 and quarterly reporting against such plans, deviations from competitive procurement processes, and variations or extensions of existing contracts. Organs of State were also required to submit information on awards above R100 000 to the OCPO to populate a contract register.

legislative framework to guarantee that procurement is conducted in a fair and transparent manner, limitations in the remedy and review system of procurement decisions (e.g. timeliness of review of complaints), lack of effective mechanisms to monitor procurement and identify irregularities and potential corruption (e.g. whistle blowing), abuse of exceptions to competitive tendering, lack of consistent information provided to potential suppliers and/or other relevant stakeholders (e.g. on laws and regulations, procurement opportunities), internal controls and/or audits problems (e.g. segregation of duties, obligations for internal reporting), and overly complicated or burdensome procurement legislation/framework.

20. Countries have addressed these weaknesses with reforms that aim to fix several weaknesses simultaneously. Such reforms include:

- **Legal and regulatory reforms.** These reforms are used to standardize procurement procedures and documentation to lower transaction costs, help promote good procurement and related transparency practices, and lay the legal basis for the automation of those practices with e-procurement systems (Mexico and Chile).
- **E-procurement reforms.** These reforms are about automating procurement processes and related transparency arrangements with IT systems with several purposes: (1) reduce corruption by minimizing direct contact between public procurement officials and bidders, establishing electronic records of procurement operations for the purposes of audit and oversight, and facilitating compliance with procurement procedures (Mexico, India, Indonesia, Brazil, Ukraine);⁵ (2) inform efforts to optimize procurement by covering all stages of procurement (i.e., planning, tendering, awarding, contracting and implementation) and communicating with other important systems (e.g. budget systems) to produce reliable procurement data for analysis (Korea, Mexico); (3) identify risky procurement transactions for close monitoring in real time using the accurate data produced by e-procurement systems on risk indicators such as those in Abdou et. al (2022) (e.g., Korea's bid rigging detection system and Brazil's Public Spending Observatory where procurement expenditure data are cross-checked with other government databases as a means of identifying atypical situations).⁶
- **Centralization of purchasing.** These reforms entail creating central purchasing bodies (CPBs) which carry out procurement transactions on behalf of multiple public institutions based on their procurement plans (Korea, Finland, multiple countries). Their coverage varies across countries but, according to OECD (2016b), 90 percent of countries that have CPBs have them at the central level and 52 percent also have them at the regional level. CPBs

⁵Ukraine introduced a real-time e-procurement platform (ProZorro) as part of its procurement reform which helped save around 12% during its first year of operations. In absolute terms, the amount of savings reached US\$6 billion between 2017 and 2020, and fraud in public procurement decreased twofold.

⁶ Indicators referenced in the paper include single bidder contracts, non-open procedures, lack of publication of call for tenders, length of period of submitting bids, length of period of selecting the winning bid, spending concentration (by organization, by year), and the share of suppliers registered in jurisdictions offering limited company and banking transparency.

have several advantages: (1) they help create savings/better value for money by aggregating the demand by multiple public institutions for the same goods and services/public works; (2) they can yield greater transparency and accountability at a lower cost by helping enforce procurement rules and transparency standards over a large number of procurement transactions; and (3) they can help leverage scarce procurement resources and facilitate the development of central sources of expertise, e-procurement solutions, and training programs.

21. Countries have also combined or implemented separately reforms with more targeted objectives to address procurement weaknesses, such as:

- **Improving Transparency.** An important reform in this area is the adoption of Open Contracting Data Standards (OCDS). The OCDS facilitates the structured publication of shareable, reusable, and machine-readable data from all phases of the public procurement process that are suitable to a variety of stakeholders (e.g., contracting authorities, suppliers, civil society, audit bodies) being mindful of confidentiality constraints or possible unintended consequences.⁷ Publishing state procurement contracts and the names of the beneficial owners of firms receiving such contracts and conducting and publishing audits of spending also help enhance accountability. Countries have sought to publish all procurement documents including contracts signed by public entities with few exceptions (Slovakia, Georgia),⁸ the publication of lists to highlight non-performing and performing companies respectively (Georgia), and the publication of contracts above a certain size (Colombia).
- **Addressing corruption and unethical behavior.** Reforms include introducing a clear national definition of conflict of interest, creation of a specific conflict of interest policy and code of conduct for procurement officials, and asset disclosure requirements including beneficial ownership disclosure. Other reform examples include the signing of integrity pacts added to contracts (Indonesia) and a system of social witnesses (Philippines) that bring in citizens to observe different stages of the procurement process.
- **Improving the effectiveness and efficiency of public procurement.** Reforms include framework agreements, which are used in Chile and many other countries. These are agreements between multiple public entities and one or more suppliers for the purchase of a variety of goods and services. These are often managed by CPBs, such as in the case of Chile, and countries use them to streamline procurement, reduce administrative costs, increase purchasing power, and use procurement strategically. Another reform in this group is implementation of the support tool for effective procurement strategy (STEPS) for large

⁷ For example, disclosure of some contract information may facilitate collusion and should thus be avoided.

⁸ For example, in the case of Slovakia, there is a total of about 20 exemptions laid out in law such as employee contracts, national-security and privacy-based documents, contracts with foster parents, unemployment benefits contracts, any secret service contracts. Exemptions based on administrative cost include artists' work contracts with national TV. Expropriated land contracts of the national highway authority are also excluded.

infrastructure projects (Norway). STEPS uses economic theory to help design an optimal procurement process considering whether to make (use in house capabilities) or buy (outsource) and whether to bundle or not lifecycle phases like design and build.

- **Addressing limited procurement staff capacity.** Reforms seek to professionalize procurement through a variety of approaches include requiring enhanced qualification criteria for contracting authorities (CAs), where only CAs that meet the criteria are allowed to procure while other entities need to procure through them (Italy), specialized training for public procurement (France, Italy, Korea), establishment of dedicated competence centers to develop specialized skills in procurement (Germany), and professionalization of procurement workforce more generally (Peru, Norway). The latter involves the use of certification systems, training and work requirements, and the use of e-learning approaches to ensure proper knowledge and work experience to be able to carry out public procurement.
- **Improve dispute resolution.** Reform options include the use of pre-award opportunities for suppliers to address early sources of potential disputes, expanding pre-trial complaint resolution, and the creation of a specialized public procurement tribunal for pre-award and contractual disputes (Colombia, Peru, Germany).

22. With respect to preferential procurement objectives, countries seek to balance their potential benefits with the need to achieve value for money. Preferential procurement objectives among OECD countries often involve the promotion of SMEs, green procurement, and firms that produce innovative goods and services. A frequent concern is “objective overload”, or the ability to meet multiple preferential objectives with procurement. To address this concern, creating a list of preferential objectives with a view to streamlining or consolidating them may be helpful. Assessing whether the preferential objectives are either in conflict with other policy priorities and/or whether other non-procurement policy instruments may be more suitable to achieve them could help. For preferential objectives that will be retained as such, the 2015 OECD recommendation on public procurement suggests the need to take certain actions to ensure a proper balance with value for money: (1) evaluating the use of public procurement as one method of pursuing preferential policy objectives in accordance with clear national priorities, balancing the potential benefits against the need to achieve value for money; (2) developing an appropriate strategy for the integration of preferential policy objectives in public procurement systems; and (3) employing an appropriate impact assessment methodology to measure the effectiveness of procurement in achieving the preferential policy objectives.

23. Procurement reforms are usually accompanied by broad stakeholder consultations. Reform experiences suggest that it is critical to involve stakeholders into the reform discussion through institutions such as NGOs and business associations. This allows governments not only to identify concerns, minimize loopholes, and receive useful implementation suggestions but also helps secure the public support for reform and reduce potential reform pushback by vested interests. For example, OECD (2018) illustrates the importance of stakeholder consultations in Mexico’s e-procurement reforms.

D. An Assessment of the Draft New Procurement Bill

24. The new draft procurement bill has worthy objectives. It seeks to standardize the framework for procurement and preferential procurement across public entities, strengthen integrity in the procurement process by limiting conflicts of interest and increasing sanctions for offenses including supplier debarment, and establish an independent administrative tribunal to speed up the processing of procurement disputes.

25. Nevertheless, there are several areas for improvement:

- **Standardization of procurement processes.** The bill still provides public entities with significant discretion on how to conduct their procurement processes limiting standardization opportunities which are a key source of efficiency gains and reduced compliance costs. The Online Bid Submission functionality (eSubmission) combined with the Transparency Dashboard, which were implemented in December 2022 on the eTenders Portal presents an opportunity to standardize the procedures and improve transparency.
- **Leveraging scarce procurement resources.** The bill replicates a resource intensive institutional structure across public entities by requiring the establishment of procurement units, bid specification, bid evaluation, and bid adjudication committees. While such structure may be needed in bodies that may remain decentralized in certain specialized procurement areas where such an approach could be desirable (e.g. construction and related consulting services) or due to geographical considerations, there should be further efforts to optimize the use of scarce procurement resources as has occurred in many OECD countries either by reducing the number of contracting authorities, such as by using CPBs, and/or expanding the use of framework agreements (which account for less than 2 percent of current procurement in South Africa).
- **Improving incentives to promote integrity in the system.** The bill has an insufficient focus on standardizing good practice transparency measures across all public entities which could be achieved by adopting OCDS to provide key stakeholders the data they need for each stage of the procurement process to enlist them in the fight against corruption. Moreover, the bill does not cover the publication of information on beneficial ownership, awardees, or independent audits.
- **Establishing procurement approaches available to public entities and concrete principles to guide the selection among them to ensure adequate levels of competition.** The bill does not define procurement approaches and circumstances for use unlike in good practice model procurement legislation, such as the UNCITRAL model

procurement law.⁹ This should ideally be covered in the law since deviations from competitive approaches are an important reason for procurement inefficiency at the international level. In particular, the bill does not establish open tendering as the default approach with other approaches to be used when the conditions for open tendering approach are not met.

- **Limiting policy discretion on important areas of public procurement.** A comparison with the UNCITRAL model procurement law suggests that the bill leaves many important procurement areas to be specified by regulation such as, the definition of procurement methods (including for preferential procurement) and circumstances for use, and the standardization of transparency standards among other areas covered in the general provisions.¹⁰ This risks exposing the procurement system to excessive regulatory discretion and insufficient public scrutiny of changes in key areas.
- **Ensuring the independence and impartiality of the administrative tribunal.** Even though the funding for the tribunal comes from fees and from funds allocated by the Parliament, the Minister of Finance's ability to appoint and dismiss the tribunal members raises questions on the tribunal's independence and impartiality.

E. Procurement Reform Priorities Going Forward

26. In completing the remaining reforms proposed by the SCMR, the following aspects are worth prioritizing:

- **Simplification/Standardization of Procurement procedures.** Updating and harmonization efforts should continue at all levels of government. This includes ensuring that central and municipal level procurement legislation is aligned and incorporates all public entities including majority owned SOEs. A wide stakeholder consultation should accompany the process to minimize loopholes and reduce potential reform pushback by vested interests. This reform serves many important purposes, including reducing compliance costs for businesses, facilitating the implementation of integrated E-Procurement tools, gathering consistent procurement transactions data across the public sector for monitoring and

⁹ The UNCITRAL model procurement law is a template available to governments seeking to introduce or reform public procurement legislation. It intends to provide all the essential procedures and principles for conducting various types of procurement proceedings and can be adapted to country specific circumstances. The model law also considers the provisions of other international procurement standards such as the WTO Agreement on Government Procurement, the European Union Directives (on procurement and remedies), the UN Convention Against Corruption, and the Procurement Guidelines and Consultant Guidelines of the World Bank.

¹⁰ The UNCITRAL model procurement law detailed index provides guidance on which topics should preferably be in legislation rather than regulation. This includes methods of procurement allowed and their conditions for use making open tendering the default method with other methods considered only under certain conditions requiring written justification for their use, specification of how open tendering and a variety of other procurement procedures should take place (e.g. restricted tendering, request for quotations, single source procurement), the use of electronic auctions, the procedures for open and closed framework agreements, and the challenge and appeal of decisions during the procurement process.

strategic procurement, ensuring that procurement methods are used consistently to improve value for money, and spearheading improvement in procurement practices in line with international good practice. With respect to the latter, conducting an assessment of the public procurement system against international standards using the Method of Assessing Procurement Systems Initiative (MAPS) tool would help identify recommendations for improving procurement practices.

- **Standardization of Transparency Requirements.** Making the OCDS the official standard and transitioning to them would significantly improve transparency. OCDS would facilitate the structured publication of information from all phases of the public procurement process, increase competition and lower the prices of procured goods, services, and public works, and provide the detailed/relevant data that a variety of stakeholders including civil society and audit institutions need to enlist them in the fight against corruption.
- **Transitioning to a new E-Procurement system linked to the IFMIS and other relevant systems.** An E-procurement system that covers all stages of the procurement process would allow real-time bidding, monitoring, and contracts awarding helping reduce procurement transactions costs and increasing competition. It would also eliminate the need to upload data from outside the system, and facilitate electronic cross checking with other government systems (e.g., IFMIS, tax administration systems, business registry) and private sector systems (e.g., banking systems for electronic bids, performance, and advance payment guarantees) increasing data quality. Anti-corruption efforts would also be enhanced as direct contact between public procurement officials and bidders is minimized and an electronic records of procurement operations is established. Moreover, a wealth of reliable transaction information will become available to stakeholders to monitor the system and inform procurement strategy. Staged introduction can ease implementation complications while generating visible results that will help increase public support.
- **Make preferential procurement more cost effective and goal oriented.** Conduct an impact assessment of the preferential procurement system by quantifying preferences offered to targeted groups of bidders, and benefits these brought to the country's economy. The assessment would then inform a review of the framework which is better linked to results that are easy to monitor and measure for their effectiveness (targets, groups, impact on the economy). In particular, beneficiaries of preferential procurement should not necessarily remain on the list of beneficiaries. Eligibility for such programs should be based on supplier performance and be temporary, so that firms can graduate from them once they are no longer disadvantaged. More generally, comparing the procurement cost under preferential procurement with that of the best value for money option in the evaluation process, regularly monitoring and quantifying preferential procurement objectives to assess progress towards their achievement, and putting together a list of preferential procurement objectives with a view to consolidate or streamline them are other steps that could be taken to improve effectiveness.

- **Strengthen staff capacity to carry out procurement.** The variety of approaches other countries have followed to achieve this goal include specialized training for public procurement, establishment of dedicated competence centers to develop specialized skills in procurement, and professionalization of the procurement workforce more generally.

27. Opportunities to centralize procurement should be further explored to leverage limited capacity and develop it. In addition to expanding the use of framework agreements as recommended by the SCMR, which could provide faster savings as the infrastructure for them has already been deployed, consider reducing the number of contracting authorities either by creating CPBs or requiring that entities meet minimum standards to be allowed to execute procurement as a second-best option.

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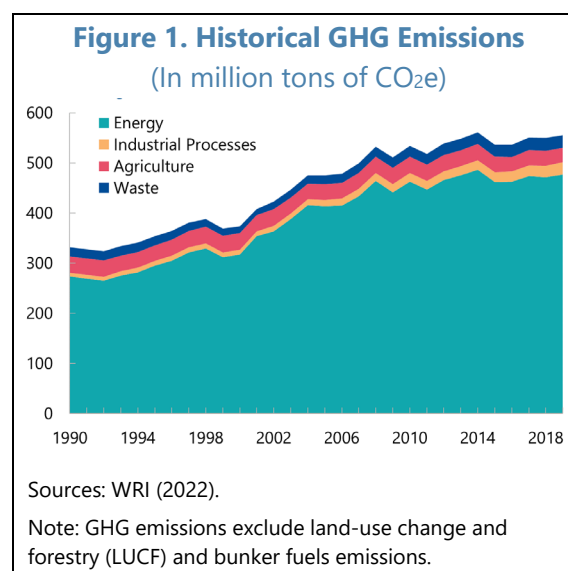
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SOUTH AFRICA CARBON PRICING AND CLIMATE MITIGATION POLICY¹

Meeting South Africa's ambitious climate objectives will require a comprehensive strategy that includes a more effective use of carbon pricing policy, reducing inefficient government subsidies that have delayed the green transition, well-targeted support to affected industries and households, and other green financial and sectoral measures. Implemented well, the mitigation policy package would promote low-carbon investments, raise government revenues, and support economic growth.

A. Existing Carbon Pricing in South Africa

1. South Africa has ambitious climate mitigation goals. South Africa is the largest greenhouse gas (GHG) emitter on the African continent. Its total GHG emissions (excluding forestry and other land use) increased by over 67 percent from 1990 to 2019 (Figure 1). The energy sector accounted for close to 86 percent of the emissions in 2019 and contributed to almost 91 percent of the GHG emission increase over the past three decades. The emission profile reflects the carbon-intensive electricity generation in the country which mostly relies on coal-fired power plants. Transition towards a green and climate resilient economy is already part of the country's National Development Plan 2030.² In its updated Nationally Determined Contribution (NDC), South Africa committed to reduce its GHG emission to 350–420 MtCO₂e by 2030 and reach carbon neutrality by the midcentury. Thus, meeting these objectives will require climate mitigation policies.



2. Consistent with the climate ambition, South Africa is the first African country to adopt a carbon tax policy. The carbon tax was implemented in June 2019 as an important policy lever for the country's mitigation strategy. The tax follows the polluter-pays-principle and is imposed on fuel inputs based on emission factors and procedures in line with the standards published by the Intergovernmental Panel on Climate Change. The tax covers about 90 percent of the country's total GHG emissions, with only agriculture, forestry, land use, and waste excluded.

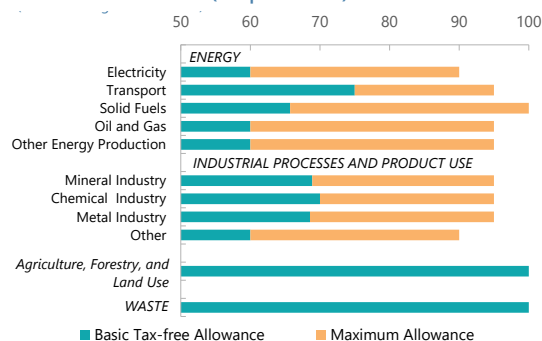
¹ Prepared by Haonan Qu, Suphachol Suphachalasai, Sneha Thube, and Sébastien Walker.

² South Africa Government (2012).

3. A phased approach of the carbon tax regime was introduced to ease the transition.

Reflecting concerns related to competitiveness and impact on low-income households of the carbon tax, transitional tax-free thresholds, allowances, and carbon offsets were introduced during the transition phase of the carbon tax. As a result, there is a basic tax-free allowance ranging between 60 percent and 75 percent of emissions across sectors, with additional allowances and offsets potentially adding up to 95 percent depending on the sector, except for those that have been completely excluded (Figure 2). Mimicking features of a sectoral feebate programs, the carbon tax regime allows performance adjustments through which the tax-free threshold is adjusted using a carbon emission intensity factor for output relative to a sector benchmark, although the adjustment is capped at 5 percentage points. There are also additional tax-free allowances possible for participants in the country's carbon budget system, companies with significant trade exposure, and those utilizing carbon offsets.

Figure 2. Emission Tax-Free Thresholds for Selected Industries
(In percent)

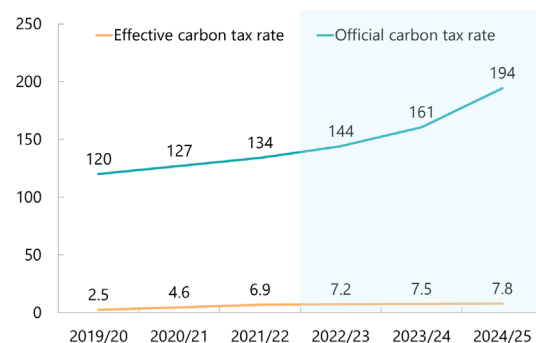


Sources: South Africa Carbon Tax Act 2019 and IMF staff calculations.

4. The generous tax-free thresholds and allowances contributed to a low effective carbon tax rate in South Africa.

The official carbon tax rate was set at R120 (or about \$7) per ton of CO₂e initially and increased to R134 (or about \$8) by end 2022. However, based on the carbon tax revenue collected, the estimated effective rate was less than R7 per ton of CO₂e during the FY2021–22 (Figure 3). With the transition phase of the carbon tax extended from end 2022 to end 2025, the effective carbon tax rate is expected to remain low, despite of the planned increase in the headline official rate in the coming years.

Figure 3. Carbon Tax Rate
(In Rand per Ton CO₂e)

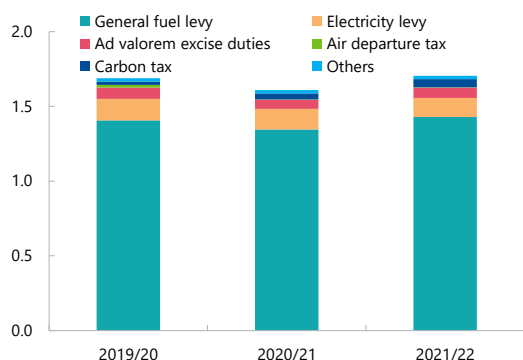


Sources: National Treasury (2022) and IMF staff calculations.

5. In addition to the carbon tax, there are other policy instruments that influence carbon pricing in South Africa.

There are a number of environment-related taxes at both the national and the local government level, which include transport fuels, vehicle taxation, aviation taxes, product taxes, electricity, water supply, and wastewater. Revenue from the national level tax instruments accounted for about 1.7 percent of GDP on average in recent years (Figure 4). The general fuel levy was the major instrument, accounting for close to 84 percent of the total. It significantly raised the price of carbon in South Africa compared with other G20 countries (Figure 5).

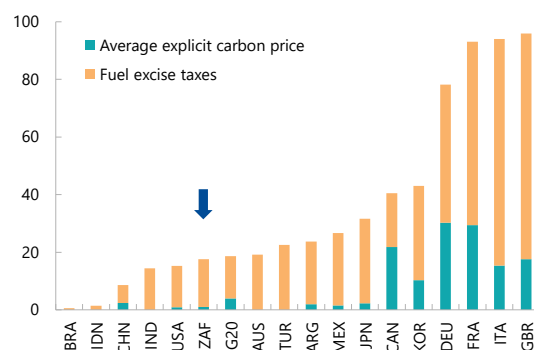
Figure 4. Environment-Related Taxes
(In percent of GDP)



Source: National Treasury (2022), and IMF Staff calculations.

Note: Others include plastic bag levy Universal Service Fund, levies on financial services, CO₂ motor vehicle emissions, incandescent light bulb levy, turnover tax for micro businesses, tire levy, International Oil Pollution Compensation Fund.

Figure 5. Carbon Price, 2021
(EUR per ton of CO₂e)



Source: OECD (2021).

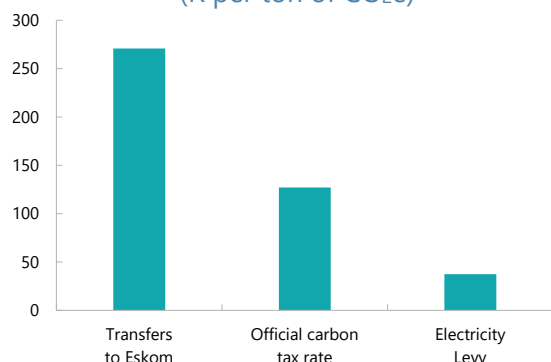
Note: G20 includes all G20 countries, except Saudi Arabia. Explicit carbon price refers to price that uses carbon taxes and emissions trading systems to raise the cost of carbon-intensive fuels.

6. Prior to the carbon tax, an electricity generation levy was introduced to help with the country's long-term climate objectives.³ It is worth noting that most of the existing environment-related tax instruments prior to the carbon tax were introduced with the intention of raising revenue, rather than focusing on the environmental considerations in their designs. One exception is the electricity levy introduced in 2009 on the power generation from fossil-fuel and nuclear sources. The purpose was to mitigate electricity shortages as a demand-side management tool and to expand the country's energy-efficiency tax incentive programs. During the transition phase of the carbon tax, the energy sector can use the electricity generation levy to offset its carbon tax liabilities.

7. Large government transfers to the carbon-intensive energy sector significantly reduce the effective price of carbon in South Africa. Eskom, the state utility monopoly, relies primarily on coal to fuel its power plants and depends on large transfers from the government to continue operating. Eskom currently enjoys the offset from the electricity levy paid under the Carbon Tax Act and, with the extension of the transition phase, does not expect to have a liability for the tax until 2026. Eskom currently pays the electricity levy on power produced from non-renewable sources, but subsidies to Eskom on a rand per ton of CO₂e basis are vastly greater than both the electricity levy on the same basis and the official carbon tax rate (Figure 6). This, together with the uncertainty over when Eskom will become liable for the carbon tax, provides little incentive for Eskom to move away from coal-fueled generation. Moreover, Eskom's challenges in reducing its costs and the need to ensure availability of power will likely result in continued subsidies to the sector (Figure 7).

³ National Treasury (2015).

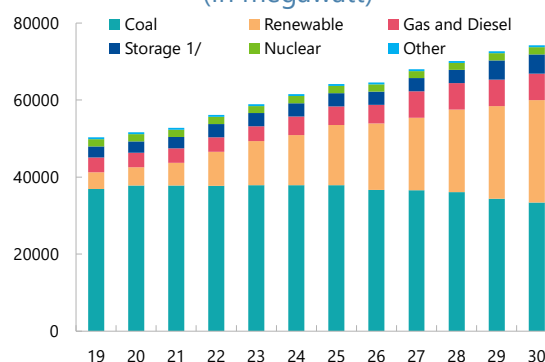
Figure 6. Transfers, Carbon Tax, and Electricity Levy, FY2020/21
(R per ton of CO₂e)



Sources: Eskom, IMF Staff calculations.

Note: "Transfers to Eskom" are government transfers to Eskom divided by the company's CO₂-equivalent emissions. Eskom is currently exempt from the carbon tax. Electricity levy is the environmental levy on electricity generated in South Africa from non-renewable sources and revenues from non-Eskom producers are assumed to be negligible.

Figure 7. Electricity Generation Capacity Projection
(In megawatt)



1/ Storage systems for electricity include battery, flywheel, compressed air, and hydrogen fuel cells, etc.

Source: IRP 2019.

B. Challenges in Meeting South Africa's NDC

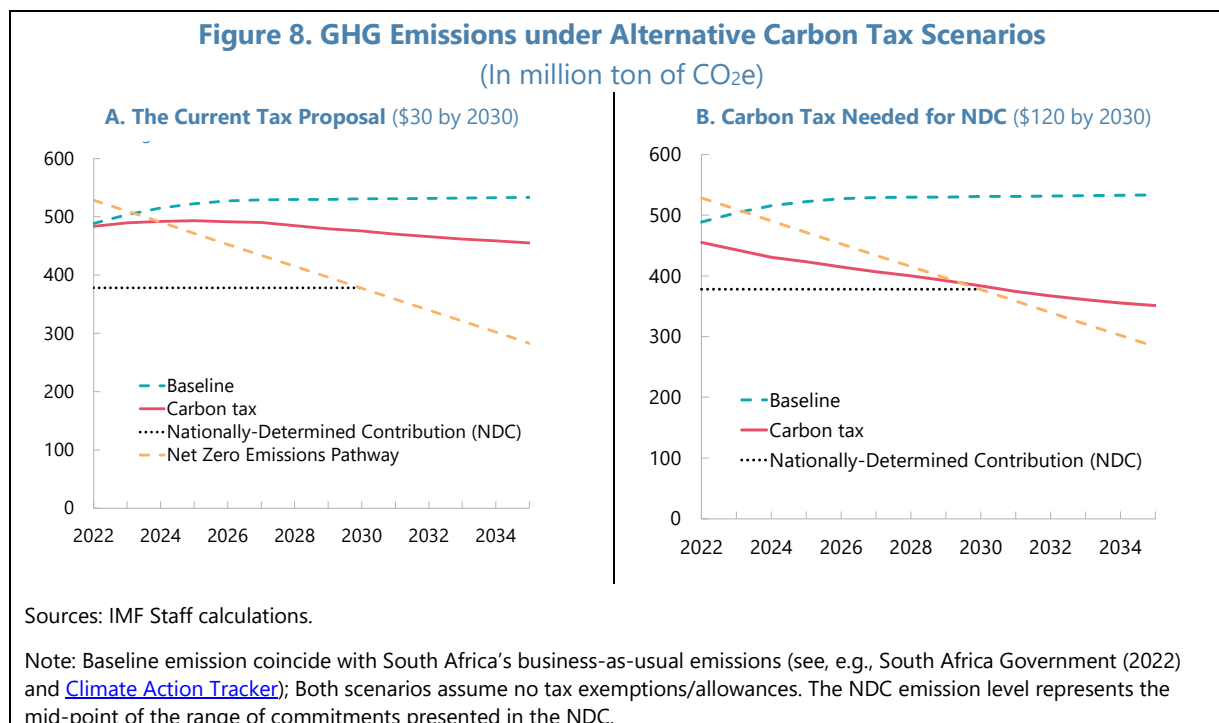
8. The government has laid out a long-term plan for the carbon tax rate path. In the 2022 Budget and the 2022 Draft Taxation Law Amendment Bill, the government proposes to strengthen the carbon tax policy by progressively raising the carbon tax rates between 2023 and 2030, as well as providing a long-term carbon tax trajectory up to 2050 and beyond. After the transition phase of the carbon tax ends in 2025, the government plans to raise the carbon tax rate to at least US\$20/tCO₂ by 2026, to US\$30/tCO₂ by 2030, and accelerating to higher levels up to US\$120/tCO₂ beyond 2050.

9. The Carbon Pricing Assessment Tool (CPAT) is used to simulate the impacts of the proposed carbon tax rates scenario. The CPAT is based on a reduced-form model of energy consumption that incorporates growth forecasts, price and income elasticities, exogenous and endogenous rates of technical progress, and price changes.⁴ By using input-output tables and household expenditure survey data, the model also offers insights into the distributional impact of carbon pricing across different industries and income groups of South African households.

10. The current projected path of South Africa carbon tax rate is, by itself, likely to fall short of South Africa's NDC. The results from the CPAT suggest that raising the carbon tax rate to envisaged levels alone will not be enough for South Africa to meet its emission targets. The NDC

⁴ The CPAT was developed by IMF and World Bank staff and evolved from an earlier IMF tool used, for example, in IMF (2019a and b). For descriptions of the model and its parameterization, see IMF (2019b) Appendix III, and Parry and others (2021), and for further underlying rationale see Heine and Black (2019).

makes commitments to curb GHG emissions within the range of 350–420 MtCO₂e during 2026–2030, or between 15 to 30 percent reduction from the current level. The CPAT model shows that the current carbon tax proposal, albeit making a significant contribution to emission reduction effort, would result in GHG emissions in the range of 475–492 MtCO₂e during 2026–2030 (Figure 8A). It is important to note that, for simplicity, the simulation assumes that there is no tax exemptions or allowances over the modeling period and the carbon tax is the only policy instrument deployed.



11. Reaching the emission reduction targets as planned would require higher effective carbon tax rates. An alternative carbon tax scenario is constructed under the CPAT that would result in emission reductions that meet the NDC target. Figure 8B depicts a scenario where the carbon tax rate is raised to \$120/tCO₂ by 2030. This is projected to result in the levels of GHG emissions within the range of 377–453 MtCO₂ during 2026–2030, consistent with the NDC commitment range. By 2030, the GHG emission is expected to reduce to the mid-point of the NDC target under this scenario. The results also suggest that, for South Africa to achieve the net zero target by the midcentury, the carbon tax rate needs to ramp up faster after 2030 and rise above \$120/tCO₂. Furthermore, this scenario implies that the current proposal in the 2022 budget to raise the carbon tax to \$120/tCO₂ after 2050 would not deliver the NDC and the net zero target in the absence of additional mitigation measures.

C. Complementary Climate Mitigation Measures to Carbon Tax

12. Many other countries face similar challenges in meeting their NDCs and often resort to multiple policy instruments. Countries rely on different combinations of a wide range of price-based and non-price-based policies that suit country-specific circumstances to reduce GHG

emissions. International experiences show that a comprehensive package of policies is needed to support ambitious climate mitigation goals. As for South Africa, the carbon tax is key but needs to be complemented by other policies and investment measures. As envisaged in the NDC, the carbon tax is among other instruments and measures including the Integrated Resources Plan (IRP), the Green Transportation Strategy, and the enhanced energy efficiency programs. The draft Climate Change Bill also articulates the carbon budgets and the sectoral emission targets. The Just Energy Transition Investment Partnership is an important flagship initiative that would help leveraging various public and private financing sources to support South Africa's long-term vision of a just transition.

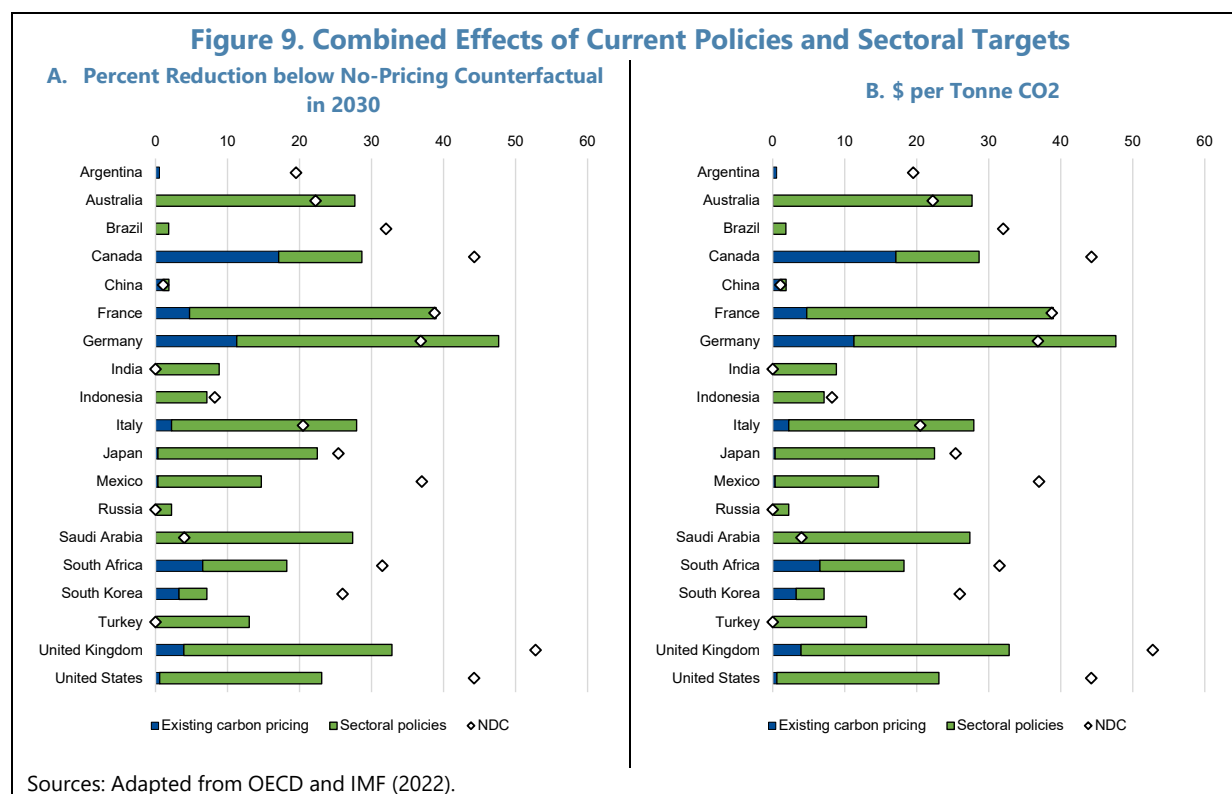
13. South Africa's policy package should help meet the climate objectives if policy instruments are aligned. The combined effect of policies varies greatly across countries (Figure 9A). The carbon tax and planned investment in renewable energy as articulated in the IRP are expected to be the main drivers of South Africa's emission reduction effort. This, together with the carbon tax trajectory proposed in the 2022 Budget suggest a strong commitment to meeting climate objectives. But putting in place these policies and implementing them effectively will be critical. In carbon price equivalent terms, South Africa's policy package translates to approximately \$30t/CO₂ based on the current carbon tax and sectoral policies (Figure 9B). With a range of existing and new policies on the table, it is crucial to ensure that the various policy instruments are well aligned to support the NDC objectives and are not in conflict with each other.

14. The carbon tax and the carbon budgets in South Africa's policy package need to be integrated. In addition to the carbon tax, South Africa plans to use company-level carbon budgets as part of the policy package to achieve NDC goals. The carbon budgets will provide GHG emissions allowance, against which emissions from the operations of a company will be tracked. If a company or an entity has been allocated a carbon budget, it must prepare a GHG mitigation plan which outlines the measures that will ensure that the company stays within its allocated carbon budget.⁵ There are strengths and weaknesses associated with carbon tax and carbon budget approaches.⁶ It is therefore important to coordinate the two policies to ensure their consistency and desirable emission reduction outcomes.⁷ To address concerns about potential double penalties from the two instruments, the government proposes to set a higher carbon tax rate of R640/tCO₂ for GHG emissions exceeding the carbon budget in the transition phase of the carbon tax (and no penalty for non-compliance for the carbon budget). However, it is not clear how the penalties will be adjusted or aligned with the new proposal of carbon tax rates from 2026 onward.

⁵ The mandatory carbon budgeting system will come into effect once the Climate Change Bill is enacted, and the carbon budget allowance of 5 percent under the carbon tax will be phased out.

⁶ For instance, there is greater uncertainty on emission outcomes from a carbon tax, compared to a carbon budget. However, a carbon tax is considered more cost-effective to administer and more equitable (the same tax rates apply to all sectors, whereas a carbon budget is determined at the firm-level and vary across entities). For more detailed discussion, see Partnership for Market Readiness (2017).

⁷ In particular, the incentives for emission reductions and disincentives for non-compliance across the carbon tax and the carbon budget should be well aligned.



15. Sectoral feebates could help promote mitigation across sectors and reinforce a carbon tax. Feebates apply a revenue-neutral, sliding scale of fees on activities with above-average emission rates and a sliding scale of rebates on activities with below-average emission rates. Feebate schemes do not impose a fiscal cost to the government and can help with acceptability because (unlike carbon pricing) they avoid the burden of higher energy prices on the average household and firm. In South Africa, the existing performance benchmark allowances under the carbon tax, and the carbon budgets that penalize emissions above the allocated budgets (through higher tax rate) have similar features to feebates.

16. Green financial policy could play an important role in mobilizing the much-needed private sector climate finance. Financing needs for the decarbonization transition could amount to 4 ½ percent of GDP per year between 2022 and 2050, requiring private finance.⁸ Green financial sector reforms can help crowd-in private sector climate finance and enhance financial sector resilience. To this end, the government can play a major role in creating an enabling environment, de-risking green investments, and removing critical regulatory and business barriers. This, in turn, helps lowering the necessary levels of carbon tax to meet climate mitigation targets. National Treasury (2021) provided concrete actions including, for instance, providing guidelines for reporting

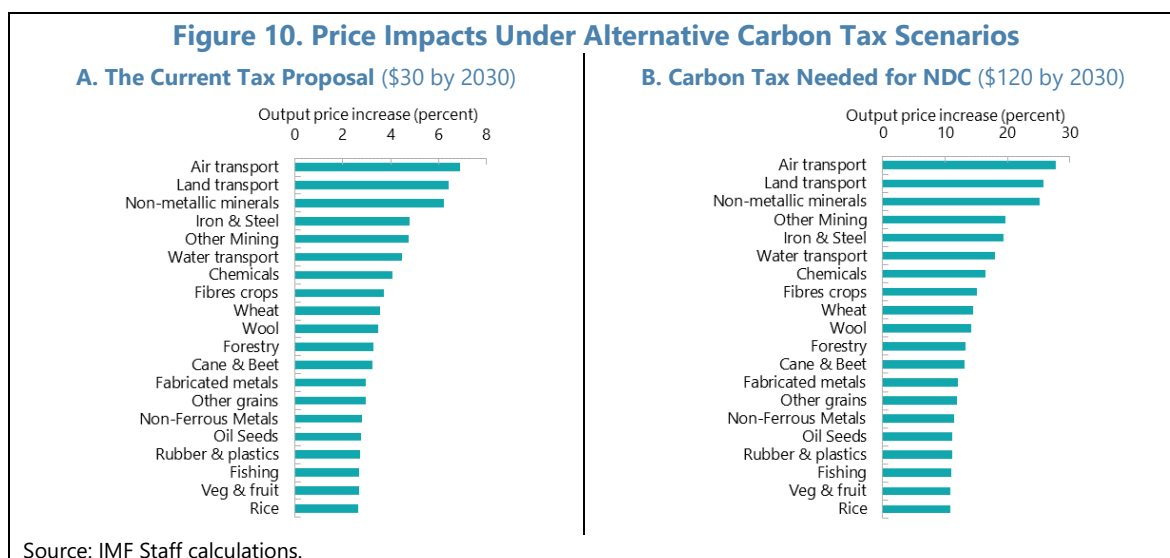
⁸ World Bank Group (2022).

and disclosure of climate-related risks, providing guidelines for climate stress testing, and scaling-up green bond issuance building on the green finance taxonomy.⁹

17. Addressing the carbon intensity of energy generation in South Africa should be a priority. This will require phasing out exemptions from the carbon tax, raising the carbon tax rates as planned, removing regulatory barriers for alternative green energy generation, promoting contestability in the energy sector, as well as providing enabling conditions to crowd in green private sector investments.

D. Distributional Consequences from Carbon Pricing

18. The impact of higher carbon pricing varies significantly across sectors. The carbon tax policy will have differentiated impacts across economic sectors. The NDC-aligned carbon tax scenario would add tremendous pressure on output prices compared to the current carbon tax proposal (Figure 10A and 10B). Carbon price in the CPAT model simulation is assumed to pass through to energy prices, with the largest effect on coal prices followed by natural gas, oil, as well as electricity prices. Increases of fuel and electricity prices in turn push up output prices. The transport and industry sectors are the most vulnerable in both carbon tax scenarios.¹⁰



19. Differentiated effects across sectors indicate profound shifts in the economy. Sectoral changes in value-added and employment are estimated using the global dynamic CGE model IMF-

⁹ In 2022, South Africa's first national Green Finance Taxonomy was launched by the Taxonomy Working Group chaired by National Treasury. Their latest work on the issue can be found via <https://sustainablefinanceinitiative.org.za/working-groups/taxonomy-working-group/>.

¹⁰ As part of the extension of the transition phase of the carbon tax policy, the government continued to allow taxpayers to deduct payments of the electricity generation levy and additional purchases of renewable electricity from their carbon tax liability until end 2025. This measure is estimated to help alleviate electricity price increase by 17 percent since the carbon tax policy came into effect. However, similar to the rest of the paper, the CPAT simulation results do not include any tax-free allowance and exemptions.

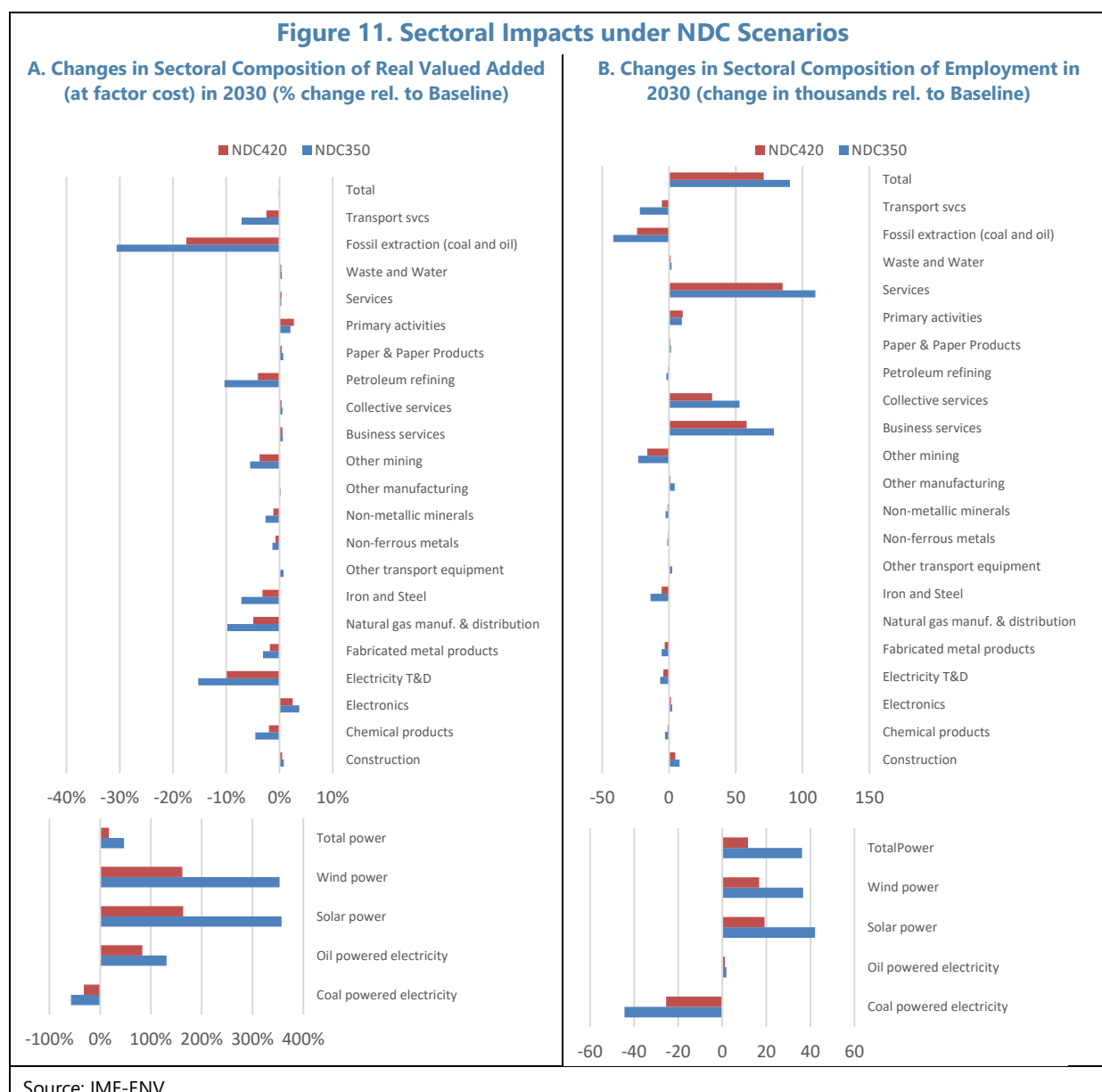
ENV, which captures economic interlinkages across sectors and countries.¹¹ Two scenarios are modelled based on the upper and lower bound of South Africa's 2030 GHG emission target range of 350–420 MtCO₂e. While the model simulations suggest a relatively mild overall growth impact,¹² the differentiated effects across sectors could be substantial. In the NDC target range, the energy-intensive and high-carbon sectors contract while there is expansion of green and low-carbon sectors (Figure 11A). The value-added in the fossil extraction sector can fall between 17 to 31 percent relative to the baseline scenario. A smaller decrease in value-added is also seen in iron and steel, chemicals and non-metallic mineral sectors which are typically energy intensive. Substantial shift in value added to less carbon-intensive sectors is observed in the power sector, highlighting the importance of the sector for the success of South Africa's climate mitigation strategy. Overall, the value added in the power sector can increase by 17–47 percent relative to the baseline, with the overall share of renewables in 2030 increasing from 10 percent in baseline to 30–53 percent. Though coal remains the biggest source for electricity generation in 2030, its share is falling over the years with growing demand being increasingly supported by renewables.

20. The significant reallocation of employment across sectors warrants careful policy planning. Overall, total employment in South Africa can increase by about ½ percent relative to the baseline (or roughly 70–90 thousand more jobs) driven by increased employment in the collective, business, and other services (Figure 11B). Relative to baseline, employment falls in fossil extraction and transport services, both of which heavily rely on the contracting fossil sectors. Total employment in the power sector increases with solar and wind sectors driving the growth. The total reduction in fossil electricity is almost entirely driven by coal powered electricity. The model simulation results suggest significant employment turnover consistent with the profound sectoral shift from the transition. In total, job reallocation estimates (i.e., the sum of job destruction and creation) are about 10–17 percent higher on average under the NDC scenarios compared to the baseline over the model simulation period (2022–30). Mitigating the impact on the affected workers and communities is therefore necessary for the decarbonization to succeed. This would require efforts to promote labor market flexibility and build human capital to support displaced workers and prepare the young.¹³

¹¹ IMF-ENV represents 36 sectoral and 26 regional aggregates and, this granularity in capturing economic interlinkages between sectors and across countries makes it a strong tool to assess the impacts of structural changes (see Appendix A for a non-technical description of the model).

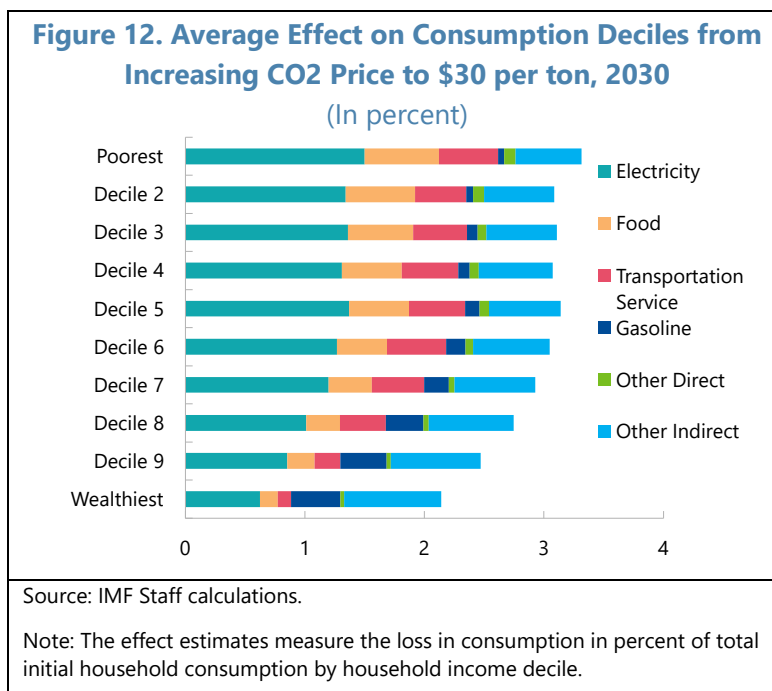
¹² Under NDC350 and NDC420 pathways the annual GDP growth rate between 2022–2030 reduces by 0.04 to 0.12 percentage points relative to the baseline growth rate.

¹³ IMF (2022).



21. The impact of higher carbon pricing on South African households could be regressive.

Under the current tax proposal scenario (i.e., \$30 per ton by 2030), the CPAT simulation results show that the burden on South African poorest households is over 3.3 percent of consumption, while the estimate is about 2.1 percent for the wealthiest group (Figure 12). The main items behind the impact of higher carbon pricing are increased prices of electricity, food, and transportation (1.2 percent, 0.4 percent, and 0.4 percent of consumption respectively), of which the impact tends to be higher for lower income households. In contrast, the impact from gasoline prices and other indirect effects driven by increases in the price of general consumption goods due to higher energy costs industries appear to be progressive.

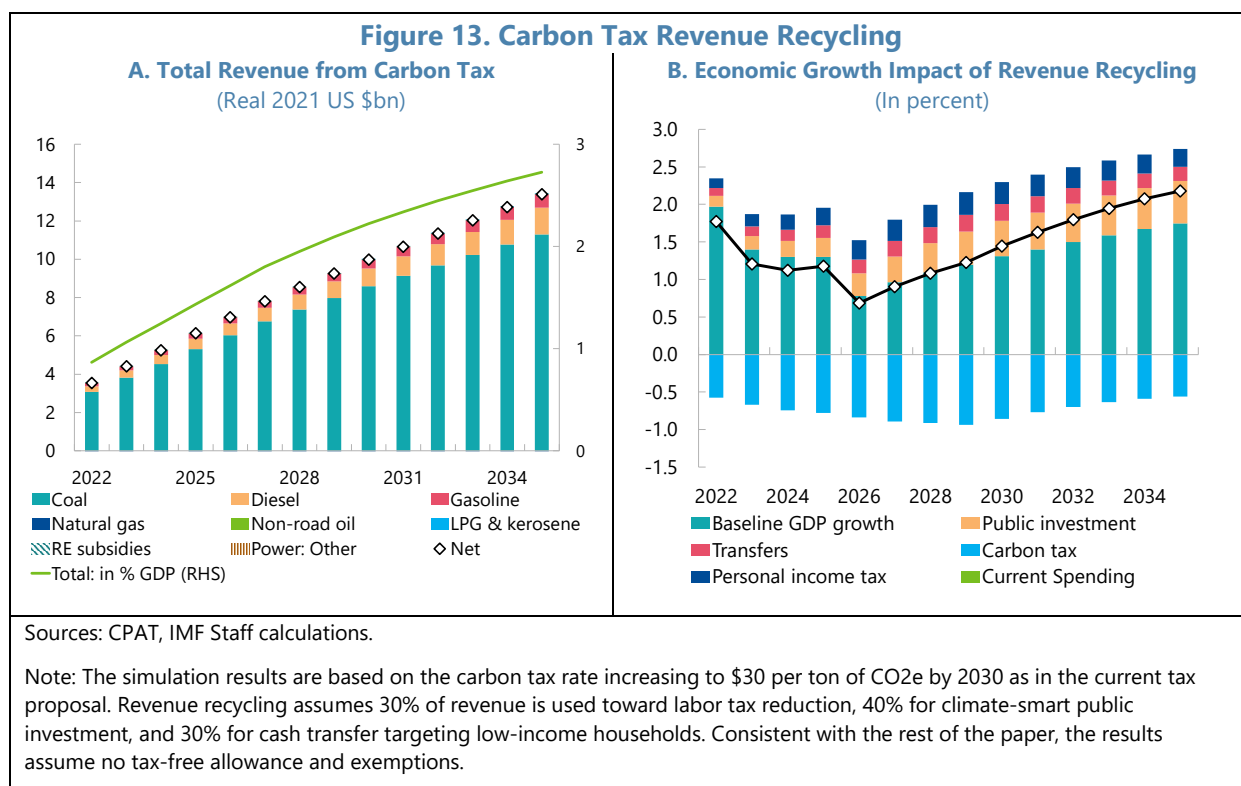


E. Use of Carbon Tax Revenues

22. Carbon tax revenues could provide fiscal space to promote economic growth and support the green transition. Similar to other environment-related taxes, carbon tax revenue is not earmarked, which helps preserve flexibility in the budget process. That said, carbon tax revenue will provide room for fiscal support to facilitate the decarbonization transition by expanding the available resource envelope. In the past, some of the revenue from the electricity generation levy was used to fund energy saving measures such as solar water heating, and road rehabilitation from the damage caused by the coal transportation for electricity generation. Under the current carbon tax design, the revenues can be used for an energy efficiency savings tax incentive, support for the installation of solar water heaters, enhanced free basic electricity/energy for low-income households, improved public transport, and support for a shift from road to rail freight transport.

23. Fiscal support could greatly mitigate the near-term adverse economic and distributional effects of higher carbon prices. For illustration, the CPAT model is used to simulate the implications of carbon tax revenue recycling. The analysis assumes that the revenues from the current tax proposal (i.e., \$30/tCO₂ by 2030) is utilized toward an increase in climate-smart public investment, a reduction of the personal income tax, and providing cash transfers to vulnerable households. The results suggest that the carbon tax revenues could reach about 2 percent of GDP by 2030, with the bulk of the revenues coming from tax collected on coal consumption (Figure 13A). Recycling the revenues would result in net annual GDP growth of 1.4 percent in 2030 (compared to 1.3 percent in the baseline) and 2.2 percent growth in 2035 (compared to 1.7 percent in the baseline). Figure 13B shows the decomposition of the revenue recycling effects on GDP growth under the current carbon tax proposal scenario. Nevertheless, it is important to maintain the current

practice of avoiding earmarking carbon tax revenues to ensure spending efficiency and fiscal transparency in the budget process.



24. The use of carbon tax revenue should also consider South Africa's already-substantial social assistance spending and lack of fiscal space. It is necessary, as part of a just decarbonization transition, to mitigate the impact on vulnerable households of phasing out the use of net carbon-emitting technologies and processes. However, South Africa's social assistance spending is already high relative to emerging market and other comparator countries.¹⁴ This notably reflects the country's very high inequality and poverty rate, but also suggests that the social assistance system could be reformed to reflect priorities under the green transition. As is the case with any other budget priority, the use of fiscal resources to support the climate transition should compete with all other budget priorities and be mindful of the available resource envelope. South Africa's lack of fiscal space, heavy debt burden, and large investment needs make a case for a balanced act regarding the use of the revenue from environmental taxes, which takes into account other budget priorities, including the need to reduce the budget deficit and ensure public finance sustainability.

F. Concluding Remarks

25. To meet South Africa's ambitious climate objectives, a comprehensive and well-designed carbon pricing scheme needs to play a more prominent role in supporting the

¹⁴ 2021 South Africa Article IV Staff Report, Annex I.

country's green transition. This paper provides a framework to assess the impact of planned carbon tax policy relative to the country's NDC targets. The distributional analysis also illustrates the costs of climate mitigation across industries and income groups of South African households.

26. There is a need to improve the effectiveness of carbon tax policy in South Africa. The generous tax-free allowances and exemptions under the carbon tax should be phased out in due course. The carbon tax rate in combination with other complementary policy instruments should be aligned with the GHG emission reduction targets. Furthermore, steady implementation of the energy sector reforms to streamline regulatory burden and foster competition will strengthen the effectiveness of the carbon tax by increasing the price-responsiveness of fossil-fuel use.¹⁵

27. Channeling fiscal resources to support the transition and advancing structural reforms could greatly mitigate the near-term economic and distributional impacts of higher carbon prices. Increasing climate-smart public investment, reducing labor taxes, and/or providing transfer to vulnerable households could facilitate the transition by promoting economic growth. Considering the distributional effects of the carbon pricing impact on South African households, well-targeted support to most affected groups will be important to ensure the success of the transition. While revenue from the carbon tax could facilitate the energy transition, limited fiscal resources and significant investment needs mean that difficult choices will have to be made. Meanwhile, advancing reforms to foster product market competition, promote labor market flexibility, and build human capital, will facilitate the sectoral reallocation of labor and capital, which is key for the success of South Africa's climate mitigation policy.

¹⁵ E.g., IMF (2022).

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Appendix I. Brief Description of the IMF-ENV CGE Model

1. **The IMF-ENV model¹ is a recursive dynamic neoclassical, global, general equilibrium model, built primarily on a database of national economies and a set of bilateral trade flows.**

The model describes how economic activities and agents are interlinked across several economic sectors and other countries or regions. The central input of the model is the data of the Global Trade Analysis Project version 10 database (Aguiar and others 2019). The database includes country-specific input-output tables for 141 countries and 65 commodities and real macro flows. It also represents world trade flows comprehensively for a given starting year. The currently used version (v10) is based on data from 2014. The model describes activities of the key actors: representative firms by sector of economic activity, a regional representative household, a government, and markets. Firms purchase inputs and primary factors to produce goods and services, optimizing their profits. Households receive the factor income and in turn buy the goods and services produced by firms; household demands result from standard welfare optimization under households' budget constraints. Markets determine equilibrium prices for factors, goods, and services. Frictions on factor or product markets are limited, except as described below.

2. The model is recursive and dynamic: it is solved as a sequence of comparative static equilibria. The fixed factors of production are exogenous for each time step and linked between time periods with accumulation equations, like the dynamics of the Solow growth model. Output production is implemented as a series of nested constant-elasticity-of-substitution functions to capture the different substitutability across all inputs. International trade is modeled using the so-called Armington specification, which posits that demands for goods are differentiated by region of origin. This specification uses a full set of bilateral flows and prices by traded commodity. In contrast to intermediate inputs, primary factors of production are not mobile across countries. Model closures assume real government expenditure and nominal current account to be constant to baseline values. Assumptions made on trade closure rules can impact results for export shares of countries in global trade and trade balances for both surplus and deficit countries (Bekkers and others 2020). In the baseline, the values of regional current-account-to-GDP ratios and total foreign-savings-of government-to-GDP ratios are calibrated to projections from ENV-Linkages and thus, for consistency, the same closure rules are retained in IMF-ENV.

3. While the capital market is characterized by real rigidities, the labor market is not. One major characteristic of the model is that it features vintage capital stocks in such a way that a firm's production structure and a firm's behavior are different in the short and long term. In each year, new investment is flexible and can be allocated across activities until the return to the "new" capital is equalized across sectors; the "old" (existing) capital stock, on the contrary, is mostly fixed and cannot be reallocated across sectors without costs. As a consequence, short-term elasticities of substitution across inputs in production processes (or substitution possibilities) are much lower than in the long term and make adjustments of capital more realistic. In contrast, labor (and land) market frictions are limited: in each year, labor (land) can shift across sectors with no adjustment cost until wages

¹ See Chateau et al (2022) and Black et al (2022) for recent applications of the model.

(land prices) equalize, and the labor (land) supply responds with some elasticity to changes in the net-of-taxes wage rate (land price).

4. The model also links economic activity to environmental outcomes. Emissions of greenhouses gases and other air pollutants are linked to economic activities either with fixed coefficients, such as those for emissions from fuel combustion, or with emission intensities that decrease (nonlinearly) with carbon prices—marginal abatement cost curves. This latter case applies to emissions associated with non-energy-input uses (for example, nitrous oxide emissions resulting from fertilizer uses) or with output processes (like methane emissions from waste management or carbon dioxide emissions from cement manufacturing). In the very long term, the model may overestimate the cost of decarbonization, since it does not take into account radical technology innovations that could materialize at this longer horizon (hydrogen, second generation of nuclear and biofuel technologies, carbon capture and storage technology). While some of these new technologies are at an experimental stage, it is difficult to include them in the model at the moment because of a lack of information about the future costs of these technologies if they were deployed at industrial scale.

5. The model can be used for scenario analysis and quantitative policy assessments. For scenario analysis, the model projects up to 2050 an internally consistent set of trends for all economic, sectoral, trade-related, and environmental variables. In this context, the model can be used to analyze economic impacts of various drivers of structural changes like technological progress, increases in living standards, and changes in preferences and in production modes. A second use for the model is quantitative economic and environmental policy assessment for the coming decades, including scenarios of a transition to a low-carbon economy. In this case, the model assesses the costs and benefits of different sets of policy instruments for reaching given targets like greenhouse gas emission reductions. With the recursive dynamic framework of IMF-ENV, in a carbon pricing policy simulation, for example, the model considers not only the direct effects of changes in relative prices of the carbon-intensive fuels but also the second-round effects of the policy on investment and labor over time. Moreover, the model projects the structural changes resulting from the policy over time by differentiating the elasticity of substitution between labor and capital-energy over the short term and the long term (less elastic in short term but more elastic in long term). There are various upside and downside risks around estimated GDP effects. For example, on the upside, new rapid technological innovations or more learning by doing could reduce the costs. On the downside, stranded assets, and a difficult reallocation of labor across sectors could increase the costs. Additional risks might affect abatement costs to stay within the temperature goals of the Paris Agreement positively or negatively, including economic and population growth and strategies used by fossil fuel producers.