



KINGDOM OF SWAZILAND

SELECTED ISSUES

September 2017

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CONTENTS

THE ECONOMIC IMPACT OF FISCAL VULNERABILITIES: A BALANCE SHEET

APPROACH	2
A. Government as a Source of Vulnerability	2
B. Transmission of Fiscal Vulnerabilities into the Economy	4
C. Impact of Fiscal Vulnerabilities	5

TABLE

1. Balance Sheet Analysis: Shock Transmission Channels	6
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INVESTMENT, EMPLOYMENT, AND INCLUSIVE GROWTH IN SWAZILAND

A. What Explains Low Private Investment and Responsiveness of Employment to Growth?	8
B. Dividends from Structural Reforms	11

FIGURE

1. Investment, Unemployment and Skills Mismatch Index	9
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TABLES

1. Factors Affecting Private Investment Across Middle Income Countries, 2005–2014	11
2. Business and Labor Market Indicators and Predicted Increase in the Employment-to-Output Elasticity	13

APPENDICES

I. Okun's Law in Swaziland	14
II. Skill Mismatch Index	15

References	16
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THE ECONOMIC IMPACT OF FISCAL VULNERABILITIES: A BALANCE SHEET APPROACH¹

Government's balance sheet vulnerabilities have been rapidly rising, becoming a potential source of macro-financial risks for the economy. Banks and nonbank financial institutions, businesses and households have large exposures to the government and, in some cases, their own vulnerabilities. In this context, a fiscal shock can rapidly propagate into the economy through the financial sector. The financial sector is also likely to amplify the impact of shocks on the economy, possibly opening the way to deep recession. In the case of an extreme shock with difficulties in servicing debt, the banking system capitalization would be significantly hit. Staff analysis highlights the need for fiscal consolidation and for strengthening the CBS's role in monitoring and managing macro-financial risks.

1. Since 2015, the government's balance sheet, liquidity, and risk exposures have been rapidly deteriorating, raising concerns about the impact on other sectors of the economy. As in many countries, the government in Swaziland is a major economic player with strong linkages with both the financial (banks and non-bank financial institutions) and nonfinancial sectors (businesses and households). As the government's balance sheet deteriorates, all exposures to the government become a potential source of vulnerabilities for the sectors linked to the government and for the whole economy. Relying on the balance sheet analysis (BSA), this paper examines the nature of balance sheet vulnerabilities the government in Swaziland faces, and how fiscal shocks could transmit through the economy via balance sheet linkages and affect other economic sectors.²

A. Government as a Source of Vulnerability

2. Over the last few years, the government's balance sheet has been rapidly deteriorating.³ The deterioration has occurred on both the liability and the asset sides.

- **Rising public debt and short-term exposures.** With declining SACU revenue and an expansionary fiscal policy, in FY16/17 the fiscal deficit widened considerably and, while still relatively low, government debt jumped to 25½ percent of GDP, with gross financing needs exceeding 22 percent of GDP. To cover its needs, the government placed an increasing amount of securities with domestic banks and non-bank financial institutions, particularly the public pension fund (PSPF), used some of its deposits at the central bank, borrowed directly from the

¹ Prepared by G. Ugazio.

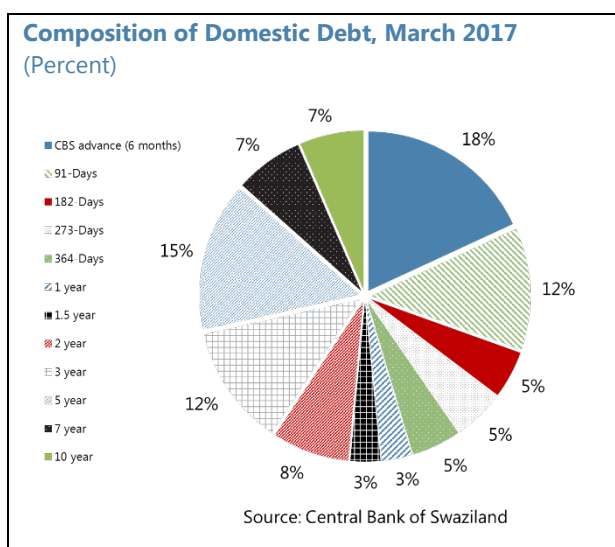
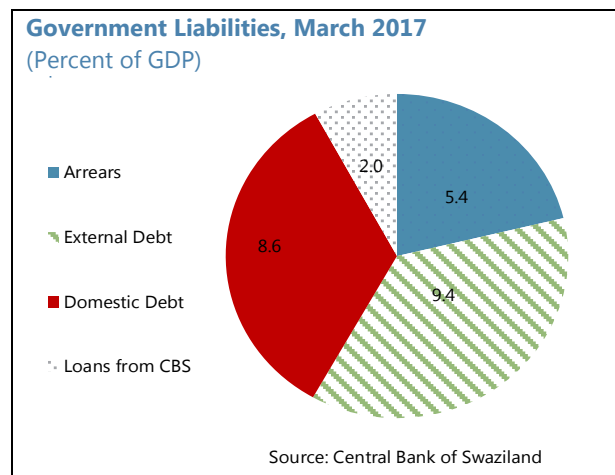
² For details on the balance sheet approach see "Balance sheet analysis in Fund surveillance", IMF 2015. The BSA matrix for Swaziland is based on official data provided by the authorities covering the fiscal, financial, and external sectors, as well as ad hoc data to fill gaps and estimate the missing links. By construction, the sum of all net positions allocated in the BSA matrix is zero.

³ The BSA analysis is based on the central government's balance sheet and exposures to the rest of the economy. It does not include additional exposures related to non-central government entities.

central bank, and ran significant arrears with domestic suppliers. By March 2017, domestic arrears represented over 20 percent of government liabilities as mapped in the BSA (about 5½ percent of GDP). The composition of government liabilities creates high rollover needs due to the predominantly short-term maturity of both the arrears and outstanding securities (above 66 percent of domestic securities has a maturity below one year).

- **Limited liquid financial assets.**

Government's assets mainly include deposits at the central bank. These are large, but have been on a declining trend since 2014, and reached 7 percent of GDP in March 2017.⁴ While these deposits are liquid and may in principle be used in the short run to cover expenses in domestic currency (e.g. wages), a significant drawdown would have a direct impact on international reserve coverage, risking to put the credibility of the peg with the South African rand at risk. Namely, deposit withdrawals would cause an expansion of the monetary base, and a drop of reserve coverage of the same. In addition to central bank deposits, the government holds various illiquid assets, mainly in the form of ownership of public corporations, and tax claims (3 percent of GDP), which are unlikely to be realized in full.



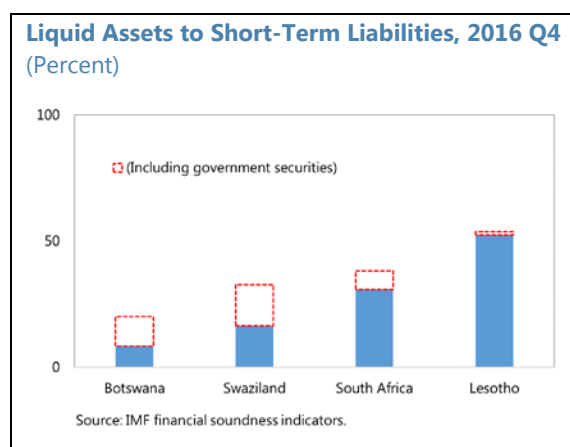
3. Large maturity mismatches in its balance sheet and high financing needs make the government a source of vulnerabilities and potential shocks to the economy. In the near term, the government is exposed to the risk of liquidity shortfalls, as its limited liquid financial assets are insufficient to cover its large short-term liabilities. As deposits at the central bank cannot be readily used without affecting external sustainability and putting at risk the credibility of the currency peg, the government is exposed to the risk of not being able to honor fully its short-term commitments (e.g. with suppliers). Apart from domestic arrears, in the extreme case, the government could have difficulty in servicing and rolling over debt, forcing balance sheet losses on government debt holders in the financial sector.

⁴ The additional 3 percent of GDP claim on the central bank displayed in Table 1 refers to central bank's capital.

B. Transmission of Fiscal Vulnerabilities into the Economy

4. The balance sheet analysis of the different sectors of the economy reveals two main channels through which fiscal shocks could propagate into the economy. First, the government has links with the private nonfinancial sector (i.e., corporate suppliers and households) via domestic arrears and services demand and, indirectly, with banks, through their large loan exposures to nonfinancial sectors. Second, both banks and non-bank financial institutions have direct exposures to the government via securities holdings.

- Linkages with the private sector and indirect links with banks.** The accumulation of arrears by the government weakens the balance sheet of nonfinancial corporations, leading to liquidity pressures and potentially increasing corporate default rates, including on bank loans. In turn, corporates have strong links with the banking system in the form of loans received. Specifically, loans to corporates and households represent over 60 percent of bank assets, or approximately 20 percent of GDP in March 2017. While the banking system appears on average well capitalized and liquidity buffers satisfy regulatory requirements, the liquid assets to short-term liabilities ratio for banks in Swaziland is low when compared to neighboring countries. In addition, liquid assets include relatively large amounts of government securities with no secondary market. The large amounts of illiquid assets make the banking system a potentially powerful transmission channel for fiscal balance sheet shocks into the economy. On the liability side, banks finance most of their assets through short-term corporate and household deposits.⁵ Against this background, the balance sheet analysis suggests that the banking sector is particularly vulnerable to liquidity withdrawals. Indeed, stress tests show that the banking sector on average could find difficult to withstand even moderate liquidity shocks. In this context, an increase in government arrears that prompts corporate defaults on outstanding loans or large deposit withdrawals could force banks to shrink their balance sheet, with negative effects on credit growth and on the economy.



- Direct linkages with the financial sector.** Banks and NBFIs also have direct exposures to the government via security holdings (about 8 percent of GDP). Banks own about 11 percent of their assets in government securities. The PSPF is the largest non-bank financial institution in Swaziland, with a balance sheet of about 37 percent of GDP in March 2017.⁶ The PSPF had a

⁵ Banks' exposure to non-financial sectors on the assets and liability side is equally split between corporates and households.

⁶ PSPF's liabilities are assumed to mainly cover individuals (members of the fund)'s claims on the PSPF.

combined exposure to the public sector of about 4 percent of GDP (11 percent of PSPF's assets), including loans to parastatal institutions, while most its assets are invested abroad. The size and interconnectedness of other nonbank financial institutions is less clear, as assets under management may be double counted in the BSA table.⁷ Nevertheless, they are relatively smaller. However, direct linkages between the financial sector and the government may increase significantly if, following authorities' plans, the domestic asset requirement policy is increased obliging financial institutions to repatriate some of their foreign assets and hold local assets, most likely government debt instruments.

5. In sum, the BSA suggests that a fiscal shock could rapidly propagate throughout the sectors of the Swaziland economy with potentially significant macroeconomic effects. (Table 1). The initial shock generated by, for example, the government's inability to service arrears or debt outstanding could cause corporate bankruptcies, rising NPLs (as a percent of total loans, from 8 percent in 2016Q1 to 10½ percent in 2017Q1) and possibly a decrease in the value of government debt held by banks. The banking system would suffer losses through markdowns and provisioning, and possibly run the risk of liquidity withdrawals from depositors. In such a scenario, banks would be forced to deleverage and decrease credit supply, with negative effects on growth. In addition, in the case of difficulties to rollover short-term debt, the PSPF would also suffer losses on its government debt holdings. As the PSPF's liabilities are part of households' financial wealth, should the shock create a solvency issue for the fund, this would put additional pressure on the government's budget to bail out the fund's beneficiaries.

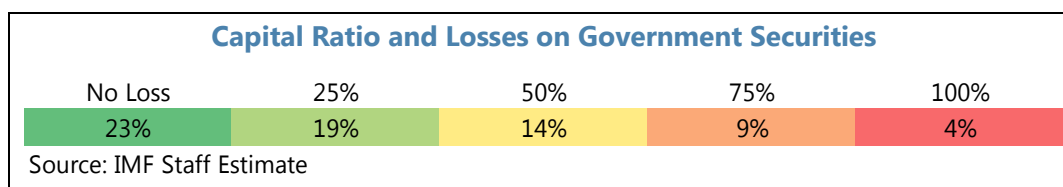
C. Impact of Fiscal Vulnerabilities

6. Further payment delays and accumulation of domestic arrears may have far reaching implications on the financial sector and the economy. In March 2017, the NPL ratio of banks (as a percent of total loans) stood on average at 10½ percent, and government arrears with non-financial corporations (NFCs) are estimated to be approximately three times larger than NPLs. Therefore, if a large amount of government arrears is not repaid, the NPL ratio could rise substantially. While stress tests indicate that the banking sector is on average resilient to a further increase in NPLs, the impact would vary across banks, forcing increases in provisions and imposing losses, with some deleveraging and reduction in bank credit. Second-round effects would see the impact of shocks on the economy amplified. Credit rationing could lead to a general slowdown of the economy impacting both corporates and household consumption, and possibly lead to further bankruptcies and NPLs.

7. In the extreme case of difficulties in servicing government debt, a reduction in the value of government securities would directly affect banks' capital buffers. As of March 2017, banks' holdings of government securities amounted to 2.1 billions Emalangeni (3.8 percent of GDP; about 85 percent of qualifying capital). While the banking system is well capitalized, a reduction in the value of government securities will severely hit banks' capital buffers. On average, capital would

⁷ Asset managers report on their financial statements those assets they manage on behalf of other institutions, but do not own them outright.

remain above regulatory requirements, but the effect would vary largely across banks and, in the case of large losses, the capital ratio for some banks would fall below regulatory requirements. Moreover, before a default on government debt occurs, corporate defaults rates and NPLs would have certainly increased, already weakening existing capital buffers, so that a default on government securities may likely bring capital below regulatory requirements.



8. In sum, a weak public sector balance sheet and tight linkages between government and domestic financial institutions raise significant macro-financial risks and call for adequate policies. Fiscal adjustment is critical to avoid a further deterioration of the fiscal position both in terms of flows and balance sheet. At the same time, tightening linkages between fiscal and financial sectors call for accelerating plans to create a financial regulatory architecture for the financial sector and provide the CBS with the powers and instruments to address macro-financial risks and exercise macro-prudential controls.

Table 1. Balance Sheet Analysis: Shock Transmission Channels, 2017Q1
(Percent of GDP)

	Government		Central Bank		Banks		PSPF		Other Non-Bank Financial		Nonfinancial Corporations		Households		External	
	A	L	A	L	A	L	A	L	A	L	A	L	A	L	A	L
Government			2.0	9.6	4.4	1.0	2.0	0.0	2.1	0.8	5.4	2.7			9.4	0.0
Central Bank					2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.1	4.6	15.5
Banks					1.6	1.7	3.1	0.0	0.0	1.1	12.1	10.8	15.4	10.3	0.5	2.3
PSPF									0.0	4.3	0.0	0.3	36.7	0.0	0.0	24.3
Other Non-Bank Financial 1/									13.4	13.7	3.3	1.4	3.9	0.0	20.5	29.0
Nonfinancial Corporations															0.0	0.0
Households																
External																

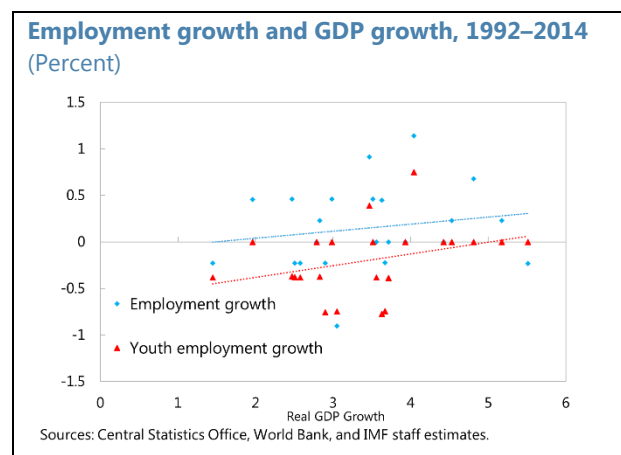
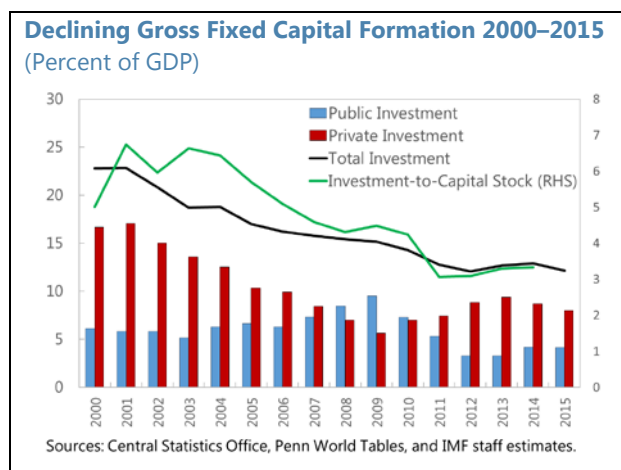
Sources: Swaziland authorities and IMF staff estimates.

1/ Includes assets managed by asset management companies.

INVESTMENT, EMPLOYMENT, AND INCLUSIVE GROWTH IN SWAZILAND¹

1. Since 2010, growth in Swaziland has been sluggish and private investment declining, while unemployment remained high and employment has been little responsive to growth.

- *Sluggish growth and declining investment rates.* Growth performance over the last decade has been held back by a negative contribution to growth by capital formation, which has been associated with a decline in the private investment to GDP ratio. Despite a recent increase in public investment, overall investment has declined from 16.7 percent of GDP in 2000 to 8 percent of GDP in 2015.
- *High unemployment and employment little responsive to growth.* Over the last few years, the unemployment rate has remained persistently high at around 28 percent of the labor force, and higher than in other lower-middle income countries (the regional estimated unemployment rate is 5.3 percent).² In addition, despite growth recovered in the post-2010 crisis, employment has changed little, making it unresponsive to growth and signaling a possible structural phenomenon. Staff analysis confirms the limited inclusiveness of growth in Swaziland. Following Ball and others (2016), we regress changes in unemployment rates and employment growth on real GDP growth (Appendix I). Results confirm that the responsiveness of the unemployment rate to GDP growth—the so-called Okun's coefficient—is not significantly different from zero, suggesting that the Okun's law does not hold in Swaziland. Moreover, coefficients measuring the



¹ Prepared by P. Ganum.

² According to the latest labor force survey (2013), the unemployment rate was 28.1 percent (28.5 percent in 2010). For analysis, this paper relies on estimates from the World Bank Development Indicators based on International Labor Organization (ILO)'s data, which provide time series estimates for unemployment at around 23 percent over the period 1992–2014. In July 2017, a new revised series was issued, covering two additional years, that could not be used for this paper.

employment growth responsiveness to GDP growth display the right (positive) sign, but are statistically insignificant, confirming the limited inclusiveness of growth.

2. Promoting growth and employment are critical developmental priorities for Swaziland. They are essential to address the high poverty rate (63 percent of the population lives in poverty) and income inequality (one of the highest in the world). Acknowledging these priorities, authorities have developed and have been implementing an Investor Roadmap (2005), and a post-2010 crisis Economy Recovery Strategy (2011), and have established a Swaziland Investment Promotion Authority (SIPA) to attract and promote domestic and foreign investment.

A. What Explains Low Private Investment and Responsiveness of Employment to Growth?

3. International comparisons suggest that specific structural impediments are limiting both private investment and the responsiveness of employment to growth. Three factors seem to play a role. First, skill mismatches in the labor market in Swaziland are particularly high. Second, for a long period, wage dynamics have been exceeding productivity trends in the economy. Finally, Swaziland's business regulations and institutional environment are little conducive to business development.³

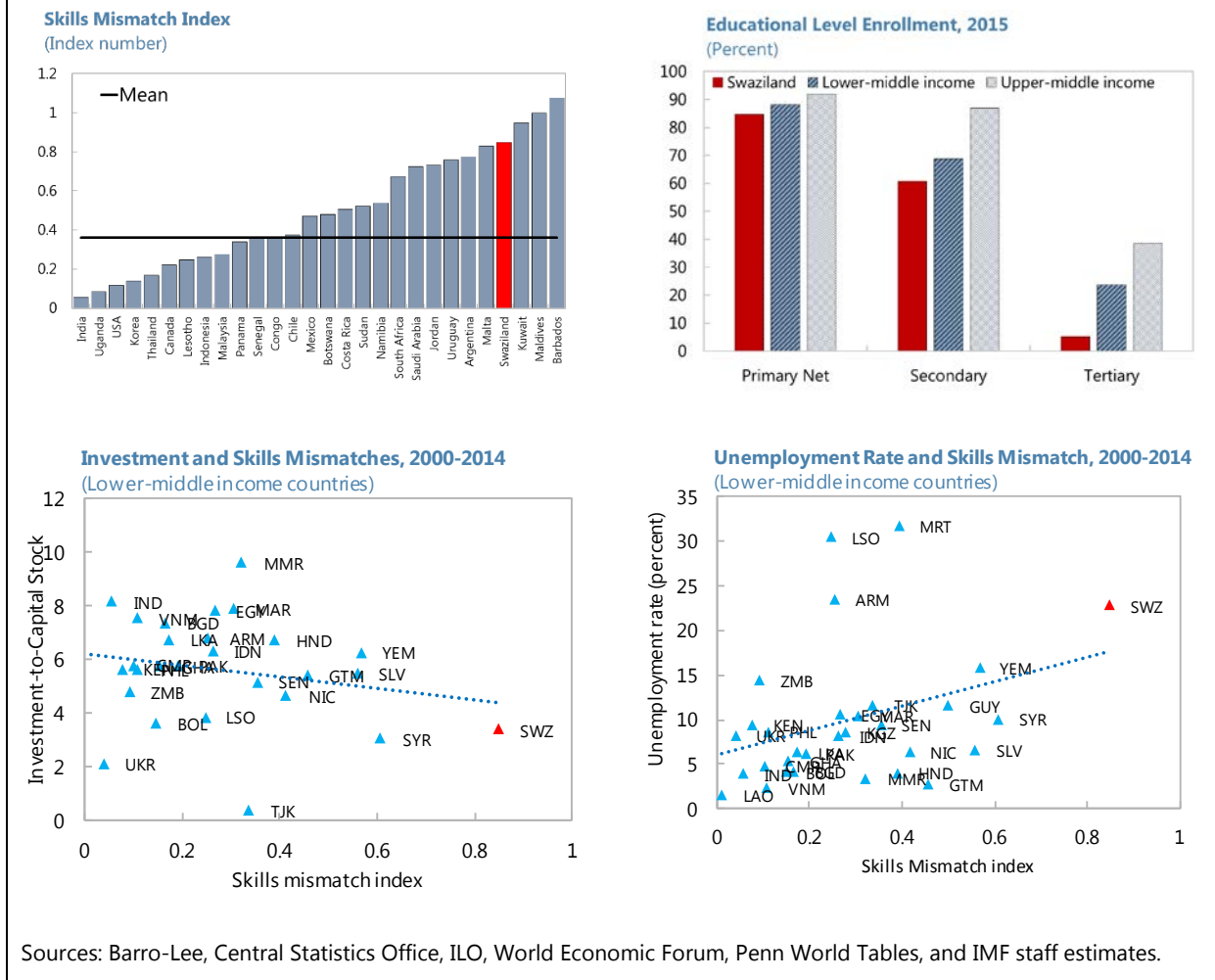
Skill Mismatches

4. Swaziland has very high skills mismatches in the labor market, which are usually associated with poor employment and investment performance. Following Estevao and Tsounta (2011), we construct, with some adjustments due to data availability, a skill mismatch index for 139 countries (Appendix II). According to the index, Swaziland has one of the highest skills mismatch index in the world, ranking 136th out of 139 countries (Figure 1). One possible source of such mismatch can be found in lower educational attainments particularly at the secondary and tertiary level compared to other lower middle income countries, i.e., there is a relatively low supply of skilled labor force in Swaziland. Past studies have shown that high skill mismatches are typically associated with higher unemployment rates.⁴ Moreover, a gap between occupational skills needed in given industries and those available in the labor force is likely to affect firms' decision to invest as industries might find difficult to grow without an adequately skilled labor force.

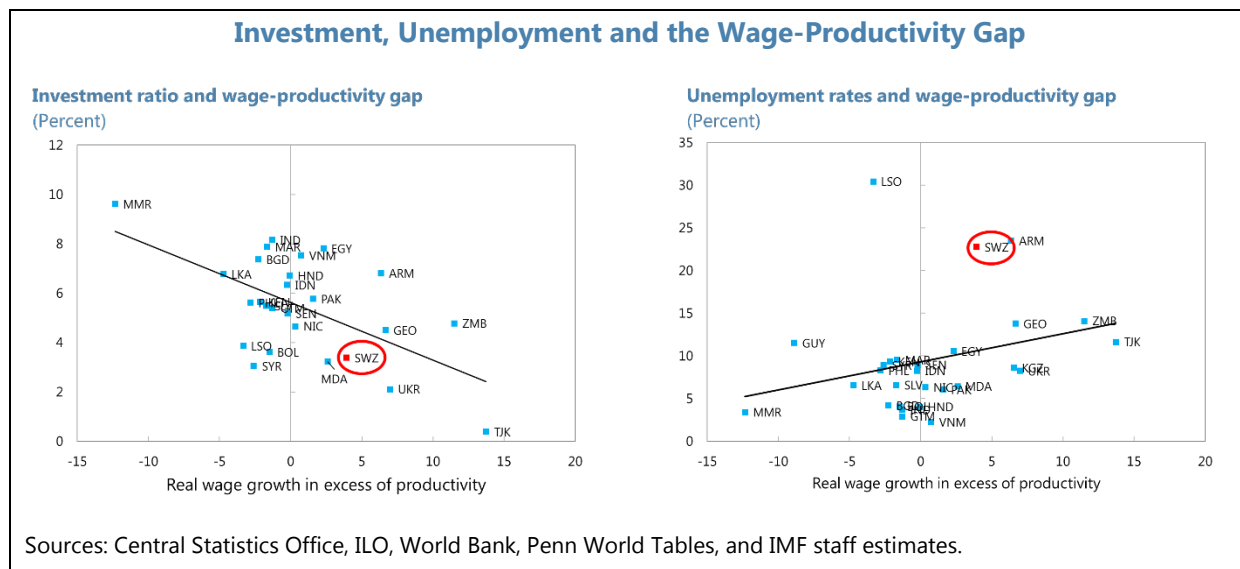
³ The following analysis relies on third party indicators that should be interpreted with caution due to limited number of respondents, cross-country differences in survey sample size, standardized assumptions and, in some cases, their perception-based nature.

⁴ See for instance, Estevao and Tsounta (2011) for the U.S., and Stepanyan and others (2013) for selected small middle-income countries

Figure 1. Investment, Unemployment and Skills Mismatch Index

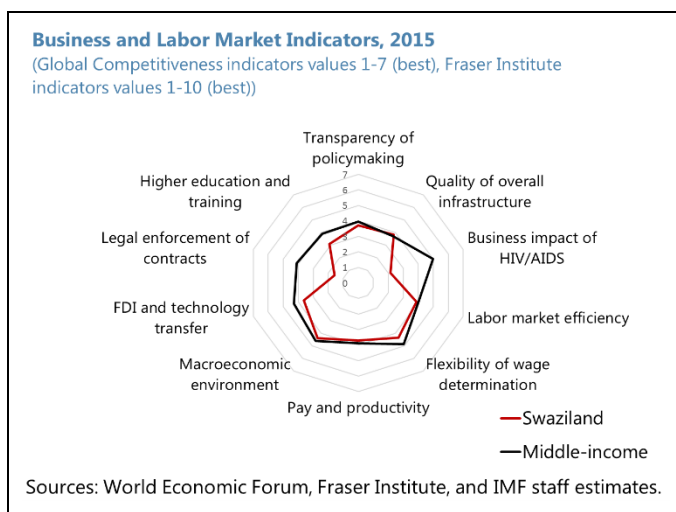


trends can contribute to keep unemployment rates high.⁶ At the same time, rising labor costs hurt firms' profitability, which negatively affects investment decisions and new investments as well as competitiveness, thus discouraging foreign investment. Cross-country correlations for lower-middle income countries show that in general the gap between wages and productivity is associated to lower investment and higher unemployment.



Rigidities in the Business Environment

6. Swaziland presents several weaknesses in the business environment that can potentially limit job creation and investment. Swaziland's ranking in the Global Competitiveness indicators has recently worsened, and in the 2015–2016 period the country ranked 128th out of 140 economies. Swaziland ranks clearly below the average of middle-income countries in legal contract enforcement (it attains 1.59 compared to an average of 4.1 points, on a 1–10 scale), higher education and training (3.1 against an average of 3.9 points, on a 1–7 scale), and the business impact of HIV (with an index of 2.1 compared to an average of 5, on a scale 1–7 with high indicating less negative impact) given the very high HIV prevalence in the country. This highlights areas that affect competitiveness where there is significant room for improvement. We show below



⁶ See for example "The Challenges of Small Middle-Income Countries in sub-Saharan Africa", IMF 2013.

that improved quality of the business and institutional environments is associated to better growth and employment performance.

B. Dividends from Structural Reforms

7. Staff analysis suggests that lower skills mismatches and better connection between wages and productivity have the potential to increase private investment. Following IMF (2015), estimating an investment accelerator model for middle income countries during 2005–2014 suggests that skill mismatches are negatively correlated to investment and better connection between wages and productivity is positively associated to investment.⁷ In addition, more flexible frameworks in determining wages (a measure of labor market rigidities) support higher investment. There are indications that business environment indicators, such as protection of property rights are positively related to investment (Table 1).

Table 1. Factors Affecting Private Investment Across Middle Income Countries, 2005–2014

DV: Private Investment-to-Capital Stock	(1)	(2)	(3)	(4)	(5)
L. Real GDP growth-to-Capital Stock	0.073008*** (0.012177)	0.102276*** (0.017234)	0.117042*** (0.021586)	0.111270*** (0.021285)	0.103427*** (0.021540)
Real lending rate	-0.000373** (0.000165)	-0.008990 (0.007725)	-0.052116*** (0.014726)	-0.050070*** (0.014499)	-0.050213*** (0.014771)
Capital inflows	0.058260*** (0.006641)	0.028827*** (0.007300)	0.046500*** (0.008175)	0.043946*** (0.008050)	0.048195*** (0.008124)
Terms of trade % change	0.001976 (0.003367)	0.003618 (0.005267)	0.001740 (0.006061)	0.004159 (0.005897)	0.004402 (0.006013)
Skills Mismatch Index		-1.953968** (0.880506)			
Flexibility of wage determination (index)			0.538911*** (0.193869)		
Connection between pay and productivity (index)				0.833444*** (0.185157)	
Property rights (index)					0.891455*** (0.188414)
Constant	6.147760*** (0.069006)	6.562566*** (0.323535)	3.171854*** (0.977458)	2.572003*** (0.743541)	2.344833*** (0.780607)
Observations	1,503	673	432	432	424
Country FE	YES	YES	YES	YES	YES
Adjusted R2	0.0271	0.0122	0.0824	0.112	0.124
No. countries	63	48	57	57	56

Notes: * denotes significance at the 10% level, ** at the 5% level, and *** at the 1% level.

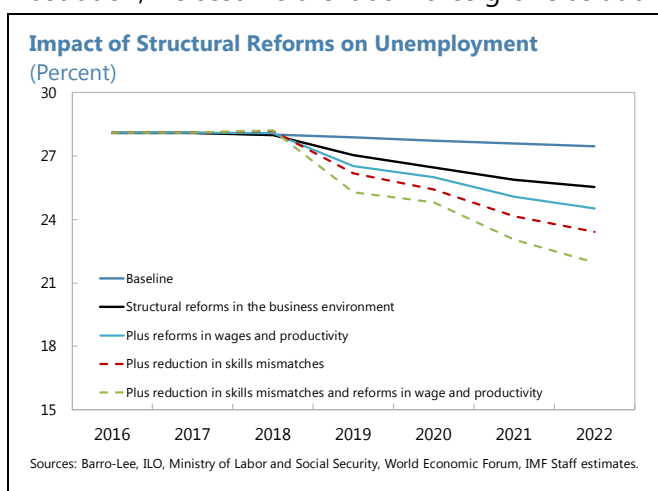
⁷ Regressions in Table 1 include a set of controls (real GDP growth as percent of the capital stock, real lending rate, capital inflows, and changes in the terms-of-trade). All controls show the expected sign. The set of independent variables following the controls are indices obtained from the World Economic Forum Global Competitiveness Indicators.

8. Cross-country analysis suggests that a better business environment and health attainments, lower skill mismatches, and close wage-productivity dynamics have the potential to increase the responsiveness of employment to growth. Recent panel regressions by An and others (2016) and Ball and others (2016) find evidence that a better business environment—proxied by a number of indicators—is positively correlated with the employment-to-output elasticity. Swaziland has significant gaps in several businesses, institutional, as well as health and education indicators (Table 2), suggesting the country has large margins for improvement in various areas that can potentially affect the responsiveness of employment to growth. Drawing on An and others (2017) and Ball and others (2016), staff expanded the original analysis to include a skill mismatch indicator, and institutional, health and education attainment indicators. Analysis suggests that improvements in the following areas have the potential to increase the responsiveness of employment to growth, achieving more inclusive growth:

- Improving the business and institutional environments, e.g. easing the conditions for doing business, strengthening the enforcement of contracts, protecting property rights, fostering judicial independence;
- Improving the wage and productivity dynamics, e.g. limiting public wage dynamics, increasing wage flexibility, increasing labor productivity
- Strengthening educational and health outcomes, e.g. lifting secondary and tertiary education level enrollment rates and reducing the HIV prevalence rate;

The positive coefficients in Table 2 on columns (1) – (4) imply that an improvement in the areas mentioned above should improve the responsiveness of employment to growth. While the negative sign of coefficients in columns (5) – (7) show that an improvement (that is a reduction) in the skill mismatches, in the excess of wage growth above productivity, and in the number of procedures to start a business should work in the same direction.

9. Structural reforms could potentially have the double dividends of lifting long-term growth and reducing unemployment. As an illustration, we assume the labor force grows as at the average rate of growth of the population during the past 15 years, and employment follows the path predicted by ILO estimates and grows in response to economic growth given the employment-to-GDP elasticity estimated in Appendix I. The estimation of potential gains from improving key indicators is conducted in two steps. As a first step, we project investment, and subsequently the impact on GDP growth under the assumption that investment will grow at the rate implied by its predicted path using coefficients from Table 1. Furthermore, to



predict investment's path and the impact on growth, we assume Swaziland gradually closes the gap in skill mismatches, flexibility of wage determination, and pay and productivity with the mean country over the course of five years starting in 2018 as structural reforms are implemented. As a second step, using the coefficients estimated in Table 2, and assuming that Swaziland closes the existing gap with the mean country in the key areas highlighted above, we simulate the behavior of the unemployment rate under different scenarios in which structural reforms would boost both growth and the responsiveness of employment to growth. The most promising areas⁸ of structural reforms are: (i) improving education outcomes to reduce skill mismatches, (ii) aligning wage growth with productivity growth, and (iii) reducing rigidities in the business environment, which together would reduce the unemployment rate from about 28.1 percent to 22 percent. In this exercise, we found that there seem to be double dividends of performing structural reforms that can boost private investment and thus growth, as well as its inclusiveness.

Table 2. Business and Labor Market Indicators and Predicted Increase in the Employment-to-Output Elasticity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Judicial independence	Property Rights	Business Impact of HIV	Tertiary enrollment rate	Skills Mismatch Index	Wage - productivity dynamics	Number of procedures to start a business
1st Quartile	3.7	3.8	5.0	30.8	0.2	-1.6	6.0
Mean	5.4	4.5	5.6	50.4	0.4	0.6	20.6
3rd Quartile	6.9	5.3	6.3	70.0	0.5	2.1	25.0
<i>Swaziland</i>	3.1	4.3	2.1	6.0	0.8	6.7	38
Distance from mean	2.3	0.2	3.5	44.5	-0.4	-6.1	-17.4
<u>Change in employment to output elasticity associated to a unit increase in each index</u>							
	0.110***	0.142***	0.184***	0.00767***	-1.614***	-0.0337†	-0.0409***

Notes: An increase in indices (1)– (4) indicates an improvement in business and labor market conditions; an increase in indices (5)– (7) denotes greater skill mismatches, rising labor costs, and impediments to start a business. * denotes significance at the 10% level, ** at the 5% level, and *** at the 1% level. † denotes significance at the 16 % level.

Sources: An, Ghazi and Gonzalez Prieto (2016); Ball, Furceri, Leigh, and Loungani (2016); Barro-Lee, Fraser Institute, World Economic Forum, IMF staff estimates.

10. In sum, Swaziland may benefit from implementing structural reforms that boost private investment, and strengthen the nexus between employment and growth. Structural measures aiming to reduce skills mismatches by improving educational outcomes in the population, aligning wage growth with productivity, strengthening institutions, and reducing rigidities in the business environment seem to be at the forefront of private sector development, boosting investment and sustainable job creation.

⁸ The coefficients used from Table 1 are the following: (i) skill mismatches in the labor market, (ii) flexibility of wage determination, and (iii) connection between salaries and productivity. These are combined with the following coefficients from Table 2: (i) tertiary enrollment rate, (ii) number of procedures to start a business, and (iii) wage-productivity dynamics.

Appendix I. Okun's Law in Swaziland

Following Ball and others (2016) and using 1992–2014 data, we regress changes in unemployment and employment growth on real GDP growth, including a constant and lagged dependent variable. Results confirm intuitions from descriptive analysis. The coefficient measuring the responsiveness of the unemployment rate to GDP growth—the so-called Okun's coefficient—is not significantly different from zero, confirming that the Okun's law does not hold in Swaziland data (the coefficient has also the wrong sign). Moreover, coefficients measuring the employment growth responsiveness to GDP growth display the right (positive) sign (when an autoregressive term is introduced) and statistically significant (for the lagged variable). In Swaziland, where the labor force participation rate has been stable, a low responsiveness of unemployment to growth is almost entirely due to the low responsiveness of employment to growth.

Responsiveness of Unemployment and Employment Growth to Real GDP				
	(1)	(2)	(3)	(4)
	Change in Unemployment	Change in Unemployment	Employment growth	Employment growth
Real GDP growth	-0.040246 (0.049556)	-0.040908 (0.051892)	-0.113047 (0.148025)	0.067624 (0.101278)
Lagged dependent variable		0.097504 (0.223893)		0.720817*** (0.146562)
Constant	0.113048 (0.178125)	0.126775 (0.186793)	1.942679*** (0.532064)	0.145688 (0.484264)
Observations	23	22	23	22
R-squared	0.030451	0.047448	0.027023	0.568253
Notes: Standard errors in parentheses, * denotes significance at the 10% level				
Sources: ILO, World Bank, and IMF staff estimates.				

Appendix II. Skill Mismatch Index

In our analysis, we computed a skills mismatch index (SMI) which measures the gap between skill demand and skill supply in the labor market. Following Estevao and Tsounta (2011), we computed the SMI for each country i at time t in a sample of 139 countries in the world from 2000 to 2014, using the following formula:

$$SMI_{it} = \sum_{j=1}^3 (S_{ijt} - M_{ijt})^2$$

Where j is the skill level; S_{ijt} is the percent of the population with skill level j at time t in country i ; and M_{ijt} is the percent of employees with skills level j at time t in country i . The skill level supply is proxied by Barro and Lee (2010) data on percent of the population with certain educational attainment, using primary education (as low skilled), secondary education (as semi-skilled), and tertiary and college (as high-skilled). Skill level demand is proxied by percent of employment in each sector:¹ agricultural (as low-skilled), industry (as semi-skilled), and services (as high-skilled) using data from the International Labor Organization.

¹ The assignment of skill level to each sector is based on data availability by broad sectors rather than specific industries as in other studies. We acknowledge that the SMI index might overestimate the mismatch in the labor market if the skill level demanded in the services sector for instance is for an educational attainment less than tertiary and college level.

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