MAURITIUS

SELECTED ISSUES

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MAURITIUS

SELECTED ISSUES

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Approved By
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ESTIMATING A FINANCIAL CONDITIONS INDEX FOR MAURITIUS[1]

Financial Conditions Indices (FCIs) have become a widely-used instrument to gauge the operational state of the financial sector and to act as a reliable predictor for real economy activity. Constructing a country-specific FCI for Mauritius—which reflects both external and domestic financial conditions—the results show that the FCI tracks economic activity well and is a leading indicator of real GDP growth. This highlights the usefulness of an FCI as a potential forecasting tool for the Mauritian economy and also as an instrument for macroprudential policy, notably in calibrating the Basel III countercyclical capital buffer.

A. Introduction

1.   This paper develops a Financial Conditions Index (FCI) for Mauritius—an instrument to gauge the operational state of the financial sector and predict real economy activity. Mauritius is a highly financially-integrated economy, with the financial sector playing an increasingly important role in generating economic activity and employment. With the transition from traditional agriculture and manufacturing activities toward provision of financial services to both residents and nonresidents, Mauritius has become a well-known global financial center.

2.   The evolution of Mauritius' financial services sector has been supported by a vibrant offshore corporate sector. The offshore global business sector is comprised of "global business companies" (GBCs), with assets under management of over 50 times GDP. As documented in IMF Country Report 16/89, there are important linkages between banks and GBCs—both in the form of deposits from GBCs and loans to GBCs. While banks typically do not intermediate the potentially volatile GBC deposits (about 40 percent of total deposits), preferring to retain them as a liquidity buffer instead, this type of relatively inexpensive funding buttresses banks' profitability and frees up traditional funding for lending. In this respect, the two-way linkage between the global business sector and the financial sector affects the entire economy.

3.   Given the strong macro-financial linkages, it is imperative to closely monitor domestic financial developments. Financial developments are broader than monetary developments depicting money supply and interest rates. Indeed, a financial conditions index is a logical extension of the monetary conditions index (MCI) that became popular in the 1990s. Subsequently, researchers increasingly included financial market variables such as asset prices and long-term interest rates as well as liquidity indicators, particularly following the Global Financial Crisis (GFC), giving rise to the construction of explicit financial condition indices. FCIs can be a better indicator of financial conditions than traditional MCIs, for example, in times of financial stress (such as after the GFC), when despite monetary loosening, overall financial conditions remained tight as lending rates did not decrease much reflecting banks' unwillingness

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[1] Prepared by Salifou Issoufou and Torsten Wezel.

to lend due to balance sheet constraints (Manning and Shamloo, 2015). The purpose of an FCI can be to assess whether financial conditions are lax or tight, or it can be used as a forecasting instrument summarizing the impact of financial factors on economic activity (Hatzius et al., 2010). While individual financial variables may also be good predictors, the pooling of financial information has been shown to improve predictive power (Hatzius et al., 2010).

4.   **A burgeoning literature exists on FCIs.** The literature on FCIs has flourished significantly after the global financial crisis, and covers both advanced economies—such as Canada (Gauthier et al., 2004), the US (Swiston, 2008), Greece (Manning and Shamloo, 2015) and France (Kongsamut et al. 2017)—as well as emerging market and transition economies—e.g. Brazil (Krznar and Matheson, 2017), China (Guihuan and Yu, 2014), Colombia (Gómez et al., 2011), India (Khundrakpam et al., 2017), Malaysia (Abu Bakar and Badrudin (2017), Poland (Ho and Lu, 2013), and Turkey (Kara et al., 2012). Some studies also construct regional FCIs, e.g., for Asia (Osorio et al., 2011), the Euro Area (Angelopoulou et al., 2013), and Central and Eastern Europe (Auer, 2017). In the context of sub-Saharan Africa, Gumata et al. (2012) have developed an FCI for South Africa.

5.   **In general, tests of the FCIs corroborate the hypothesis that financial conditions matter for future economic growth.** In- and out-of-sample tests generally show good predictive power of FCIs, which has made them a popular tool for forecasting, including by policymaking institutions. The IMF, e.g., has been using FCIs among other inputs to project the "growth-at-risk"—both at the global level (IMF, 2017; IMF, 2018a), and for individual countries (e.g. IMF, 2018b).

6.   **Two approaches stand out in constructing FCIs.** First, the weighted-sum approach based on vector autoregressive (VAR) models obtains the weights of the individual financial variables in the FCI from the cumulative impulse-response functions. Second, the common factor approach, typically estimated through Principal Components Analysis (PCA) models the variance structure of the financial variables using optimal linear combinations of them. Occasionally, other methods such as common factor analysis using a Kalman filter (Gumata et al., 2012) or semi-structural models (Krznar and Matheson, 2017) are employed. The VAR approach has the advantage of linking financial conditions and GDP as the variable of ultimate interest in a system of equations but may present econometric challenges, while the PCA allows for inclusion of ample financial variables but is, by construction, agnostic about the relationship to output (Ho and Lu, 2013)[2] despite having been found to predict future growth well and occasionally outperforming leading indicators (Gumata et al., 2012).

7.   **Financial variables to be included fall into several categories reflecting prices, quantities and risk factors (e.g., Kongsamut et al., 2017).** Variables that are almost always incorporated in FCIs comprise a market interest rate such as for private sector loans, the nominal or real effective exchange rate, asset prices having wealth effects such as stock prices and their

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[2] However, it may be sensible to exclude candidate variables that have a low predictive power of GDP growth in a VAR (Gómez et al., 2011).

volatility as well as house prices, and risk factors such as credit or bonds spreads, both within the economy and to the exterior. More rarely, monetary variables like money aggregates or bank reserves are accounted for. Where available, the information content of loan officer survey of credit standards has been exploited as well (Swiston, 2008, Hatzius et al., 2010, Angelopoulou et al., 2013, Ho and Lu, 2013). The variable set included in the FCI for South Africa (Gumata et al., 2012) is particularly relevant for variable selection in this study.[3]

8.   Typically, the FCI is purged from effects of real sector developments. To measure the pure impact of financial variables on economic activity and exclude feedback from past economic events on the former, almost all studies purge the FCI by regressing either the individual (raw) variables on GDP growth and inflation or the readily-constructed FCI on these variables and utilizing the residuals for the purged FCI. Some studies (e.g. Hatzius et al., 2010) purge even from monetary conditions by including the policy rate among the regressors. The financial variables are typically demeaned and occasionally also divided by their standard deviation to remove the influence of the unit of measurement (as in Khundrakpam et al., 2017). Sometimes a moving average of the indicator is used to reduce excessive short-term volatility and focus on more persistent deviations (Gómez et al., 2011; Manning and Shamloo, 2015).

9.   This study computes VAR- and PCA-based FCIs in their purged and unpurged variants and uses them for growth prediction and macroprudential policy purposes. Upon obtaining the different FCIs, the study then runs in-sample and "pseudo out-of-sample" forecasts to test the predictive quality of the FCIs for future economic activity. Introducing a new aspect in the literature, the study uses the computed FCIs for macroprudential policy purposes, notably as a complement to the prevailing credit-to-GDP gap in the setting of the countercyclical capital buffer (CCB) for banks, which Mauritius plans to introduce as part of its adoption of the Basel III reform package.

10.   The paper is organized as follows. Section two presents methodological aspects surrounding FCI construction and provides information on the data used and variable selection. Section three presents the estimation results, notably the evolution of the various indices since the mid-2000s in relation to GDP growth. Section four tests whether the new FCI is a good predictor of short-run economic activity using in-sample forecasts. It also assesses the usefulness of the FCIs for detecting boom-bust episodes in Mauritius and for informing macroprudential policy, examining whether an FCI could be used as a trigger in activating the Basel III countercyclical capital buffer. Section five concludes with some policy recommendations.

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[3] The FCI for South Africa uses: U.S. stock prices and their volatility (VIX) as well as South African stock prices; several spread measures—the EMBI spread, the spread between 3-mo. LIBOR and 3-mo. U.S. Treasury Bills, and South Africa's sovereign spread; private sector credit, and non-performing loans; the nominal effective exchange rate; a bank funding rate, and the domestic house price index (Gumata et al., 2012).

B.   Methodology

11.   The variables used in this paper to construct the FCIs consist of global and domestic factors. Global variables represent external financial conditions that would likely affect the Mauritian economy through the exposure of its international financial center to China, India, Europe and the US. Domestic variables capture the various channels through which monetary policy affects the real economy. The global factors are the JP Morgan Emerging Market Bond Index (EMBI), the US three-month Treasury Bill rate (US TBILL), and the China and Emerging Markets (EMS) Morgan Stanley Capital International indices (China and EMS MSCIs). The domestic factors are nominal effective exchange rate (NEER), the index of the Mauritius stock exchange (SEMDEX), the average lending rate and the growth rate of credit to the private sector.[4] We initially considered more global and domestic factors but decided to settle on those factors with the highest, and significant, correlation coefficient with Mauritius' real GDP growth. Also, many of the excluded global (domestic) factors are highly correlated with the selected global (domestic) factors. The sample spans 2002Q3-2018Q2.

12.   To construct the FCI for Mauritius, we use the following methodologies: Weighted-sum approach using Vector Auto-Regression (VAR) and factor analysis approach using Principal Component Analysis (PCA).

Vector Auto-Regression (VAR)

13.   VAR modelling allows obtaining the weights of the individual financial variables in the FCI. The weights are obtained from the cumulative impulse-response functions of GDP growth to a one standard deviation shock to each of the variables. The VAR approach has the advantage of relating financial conditions directly with GDP developments. However, the list of covariates may empirically be restricted by the degrees of freedom, whereby having too many variables or rather short-time series runs the risk of overfitting. As a result, only a few financial variables are typically included.

14.   To construct the weighted-sum FCI, a recursive VAR model consisting of the eight variables plus annualized quarterly real GDP and the consumer price index (CPI) is estimated. The inclusion of GDP and CPI takes into account the impact of current and past economic activity on financial conditions. The derived FCI is therefore stripped of the feedback from current and past economic activity. The identification of structural shocks is achieved through a Cholesky decomposition**,** which assumes that domestic financial conditions do not have contemporaneous effects on growth and inflation, and that domestic developments (real and financial) do not contemporaneously affect external variables. Specifically, we employ the

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[4] The credit series exhibits a structural break in 2003Q2 due to a re-definition by the BOM of elements included in bank credit to the private sector. A comparison of FCIs based on the original and a shortened credit series omitting the structural break shows that the differences are marginal.

following Cholesky ordering: US TBILL, JPM EMBI, MSCI EMS, MSCI China, GDP growth, consumer price index, SEMDEX, NEER, lending rate, and credit to the private sector.[5]

15.   Augmented Dickey-Fueler tests confirm that all variables except the lending rate non-stationary. The US TBILL is first-difference stationary. The rest of non-stationary variables (EMBI, China and EMS MSCIs, SEMDEX, NEER and credit to the private sector) enter the VAR as year-on-year percentage change while the lending rate enters in levels, and the US TBILL enters in first difference.

16.   The weighted-sum FCI is then calculated as follows:

$$FCI_t = \sum_{j=1}^{k} w_j(x_{jt} - u_j) \quad (1)$$

The FCI in each period t is a weighted average of the k different financial variables (in this case k=8) denoted x_{jt}, where w_j is the weight and u_j is the mean of the financial variable over the sample period.[6] The weight w_j is the cumulative two-quarter impulse response of real GDP growth to a one-unit shock to f_{jt}.

Principle Component Analysis (PCA)

17.   Principal Components Analysis models the variance structure of the financial variables. This is achieved by using optimal linear combinations of the observed financial variables, i.e. the principal component accounts for a maximum amount of the variables' total variance.[7] As mentioned, the PCA typically allows for inclusion of more financial variables compared to the VAR approach. However, constructing FCIs using PCA is done without explicit regard for the impact on economic activity—it may be that a variable has a large factor loading implying that the variable explains most of the common factor's variance but irrespective of whether the variable matters for growth in a given case. Also, including too many similar indicators runs the risk of giving too much weight to a certain set of drivers, which, in addition, may be less relevant for future economy activity. To mitigate this problem and thus safeguard a parsimonious specification, only one variable depicting developments in a given area (e.g. stock market developments, bond spreads) is chosen.

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[5] Note that the ordering would change based on the software used to estimate the VAR as some software use a lower triangular matrix while others use upper triangular matrix when implementing the Cholesky ordering. This ensures that the response of the variable to a shock would be zero contemporaneously if the response variable is ordered in such a way that it is not affected by the shock variable on impact.

[6] Although the sample spans 2002Q3-2018Q2, the fact that some of the variables enter as y-o-y percentage changes mean that the usable sample is limited to 2003Q3/Q4-2018Q2.

[7] Put differently, a principal component is a weighted average of the variables where the weights ("loadings") are derived so that the index explains the maximum amount of variation of all included financial variables (Krznar and Matheson, 2017). In practice, only the first few principal components are considered for the FCI, assuming they capture a large share of the variation cumulatively (e.g. a minimum of 70 percent, as suggested by Gómez et al., 2011, and Khundrakpam et al., 2017).

18.   The principal component methodology is used to extract common factors (F_t) that represent the greatest common variation in a group of k financial variables (X_t). The model can be presented as follows:

$$X_t - \mu = \beta F_t + U_t \quad (2)$$

Where X_t is a $k \times 1$ vector of variables' means, μ is the mean of the observables over the sample period, β is a $k \times m$ matrix of coefficients, and F_t is a vector of $m \times 1$ unobserved common factors, U_t is a $k \times 1$ vector of errors. The model assumes that the errors are orthogonal to the common factors, which in turn are assumed to have mean zero.

19.   The factor-based FCI includes both domestic and global financial variables, as in the VAR framework (except GDP and inflation). It is derived from PCA-based common factors calculated for the period of 2003Q3-2018Q2 using the eight global and domestic financial variables. Two sets of common factors are calculated. One using the static approach and the second using the dynamic approach. To introduce dynamics into the common factors, we add lags of each financial variable in the matrix X_t of observables.[8]

20.   Given that the number of common factors derived from the PCA is a multiple of variables used (including lags), we chose the optimal number of common factors based on the Bai and Ng (2002) selection criteria. The three Bai and Ng criteria suggest 8 common factors, which in this case account for close to 99 percent of variation in the data. We set a minimum of a cumulative 90 percent variation in the data that the combined common factors have to explain. In the case of the static PCA, the six first common factors account for more than 90 percent of variation in the financial variables while in the case of the dynamic PCA the five first factors account for more than 90 percent of variation in the data. For that reason, we selected the first six (five) common factors and combine them into single common factors using weighted averaging with weights equal to the factors' respective coefficients of variation.

The combined common factors are then each stripped of feedback from past economic activity to construct the two PCA-based FCIs using the following equation:

$$F_t = A(L)y_t + A(L)\pi_t + \varepsilon_t \quad (3)$$

where A(L) is the lag operator reflecting current and lagged GDP and inflation. y_t denotes y-o-y GDP growth rate and π_t denotes y-o-y inflation rate. The respective error terms ε_t are the PCA-based FCIs capturing only exogenous developments in financial conditions that would predict future economic activity.

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[8] Essentially, X_t is replaced by $Z_t = [X_t - X_{t-p}]$ in equation (2), where p in the number of lags. We include 1 lag based on results from performing the Akaike Information Criterion (AIC) lag selection test.

21.   Financial conditions in Mauritius are strongly correlated with external factors.
Figure 1 presents the correlation coefficients (or factor loadings) between the two factor-based

FCIs (purged) and the financial variables.[9]
These factor loadings represent the relative
importance of each financial variable in the
factor based FCIs. Positive factor loadings imply
that a higher value of the financial variable is
associated with better financial conditions in
Mauritius. Negative factor loadings on the
other hand imply that lower values of the
financial variables are associated with better
financial conditions. The loadings suggest that
financial conditions in Mauritius are positively
affected by: the EMBI; the China and Emerging
Markets MSCIs; the Mauritius stock market

Figure 1. Mauritius: PCA FCIs Factor Loadings

Sources: Bank of Mauritius, Bloomberg, Statistics Mauritius, and IMF staff calculations.

index, an appreciating nominal effective exchange rate and credit to the private sector.[10]
Financial conditions in Mauritius are negatively affected by a higher domestic lending rate and a
higher US T-Bill rate.

C.   Financial Condition Index for Mauritius

Overview of the Constructed FCIs

22.   Figures 2 and 3 depict the measures of FCI constructed from VAR and PCA. The two
PCA FCIs are constructed using static and dynamic PCA, respectively, and they are stripped of
feedback effect from real economic activity in Figure 2, but not in Figure 3.

**23.   An increasing FCI implies looser financial conditions while a decreasing index
indicates tighter financial conditions**. The constructed FCIs are highly and significantly
correlated with each other (Table 1).

Table 1. Mauritius: Correlations Between FCIs, 2003Q4–2018Q2				
	Static FCI	Static FCI (purged)	Dynamic FCI	Dynamic FCI (purged)
Static FCI				
Static FCI (purged)	0.95*			
Dynamic FCI	0.98*	0.89*		
Dynamic FCI (purged)	0.93*	0.99*	0.90*	
VAR FCI	0.95*	0.93*	0.92*	0.91*
*=significance at the 10 percent level				
Source: IMF staff estimates.				

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[9] All the factor loadings are statistically significant except for the nominal effective exchange rate.

[10] The positive coefficient on the NEER implies that an appreciation of the Mauritian rupee is associated with
more relaxed financial conditions.

24. **The constructed FCIs appear to track GDP growth well.** This is a testament to their potential forecasting power and the importance of the financial sector in Mauritius' economy. For example, the FCIs decreased significantly from 2007Q3 to 2008Q4, three quarters before Mauritian GDP began its largest contraction post-2000 (Figures 2 and 3).

Figure 2. Mauritius: GDP Growth, PCA (Purged) and VAR FCIs, 2003–18

Sources: Bank of Mauritius, Bloomberg, Statistics Mauritius and IMF staff estimates.

Figure 3. Mauritius: GDP Growth, PCA (Unpurged) and VAR FCIs, 2003–18

Sources: Bank of Mauritius, Bloomberg, Statistics Mauritius and IMF staff estimates.

Forecast Evaluation

25. **The forecasting power of most of the constructed FCIs is confirmed by their correlation with real GDP (Table 2).** The VAR-based FCI correlates the most with two- to four-quarter ahead growth rates, suggesting potential predicting power for near-term growth. Unsurprisingly, the unpurged dynamic PCA-based FCI has the highest contemporaneous correlation with GDP growth, while the purged dynamic PCA-based FCI is more related to future growth. This reflects the fact that the purged PCA-based FCI is stripped of feedback from current and previous one to two quarters' real economic activity.

Table 2. Mauritius: Correlations Between FCIs and Real Activity, 2003Q4–2018Q2

	Real GDP (annualized year-on-year percent change)				
Variable	t	t+1	t+2	t+3	t+4
Static FCI	0.29*	0.35*	0.39*	0.43*	0.37*
Static FCI (purged)	0	0.1	0.21	0.35	0.38
Dynamic FCI	0.38*	0.46*	0.46*	0.47*	0.39
Dynamic FCI (purged)	0	0.1	0.23	0.37*	0.41*
VAR FCI	0.18	0.29*	0.42*	**0.51***	**0.48***

* = statistically significance at the 10 percent level

26. **To evaluate the strength of the constructed FCIs in forecasting GDP, the following diffusion index model is used:**

$$y_t = \alpha(L)y_{t-1} + \theta(L)F_t + \xi_t \quad (4)$$

where y is real GDP growth and F is the FCI of interest. The optimal number of lags for each estimation is chosen based on the Bayesian Information Criterion (BIC).[11] The model in equation (4) is estimated with and without the FCI, and the relevant root mean squared errors (RMSEs) are compared.

27.   As can be seen in Table 3 below, root mean squared errors are smaller when FCIs are included in the estimation. The highest improvement in RMSE occurs when the VAR-based FCI is included in the regression, suggesting that the VAR-based FCI has a marginally better forecasting power than the PCA-based FCIs.

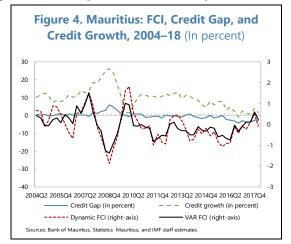| Table 3. Mauritius: Root Mean Squared Errors	
Equation (4)	RMSE
Static Common Factor FCI	0.63
Static Common Factor FCI (purged)	0.63
Dynamic Common Factor FCI	0.61
Dynamic Common Factor FCI (purged)	0.62
VAR-based FCI	0.60
Excluding FCI (AR(p) Process)	0.97
Source: IMF staff calculations.	

D.   Using the FCI for Macroprudential Policy Purposes

28.   The Basel III Countercyclical Capital Buffer (CCB) could be a useful tool in the authorities' macroprudential policy toolkit. Although Mauritius does not have a comprehensive macroprudential policy framework, the authorities have deployed key macroprudential instruments such as the loan-to-value ratio or debt-service-to-income ratio. They have also introduced elements of the Basel III capital and liquidity regulation and are considering adopting the CCB, which is an additional capital buffer that should be built when credit to the private sector grows disproportionately. The CCB helps to cushion the mounting losses in an ensuing downturn. The Basel Committee on Banking Supervision (BCBS, 2010) recommends using a specification of the credit-to-GDP gap for activating the CCB.[12] We apply the BCBS gap calculation but with a lower smoothing factor that is arguably more appropriate for a country like Mauritius, where credit cycles generally correspond to about five years (see Figure

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[11] Optimal lags based on AIC are higher, and more unstable, than those based on BIC. We opted for higher parsimony (and better degree of freedom) by using optimal lags based on BIC. Using AIC-suggested lags does not alter the relative ranking of FCIs.

[12] According to the BCBS (2010), banks should start building the CCB when the credit-to-GDP gap surpasses 2 percentage points, up to a maximum of 10 percentage points, at which point the maximum size of the CCB of 2.5 percent of risk-weighted assets is normally reached. Banks can reduce the buffer when allowed so by the regulator. This is normally the case when the credit boom episode is over or when bank losses rise in a downturn.
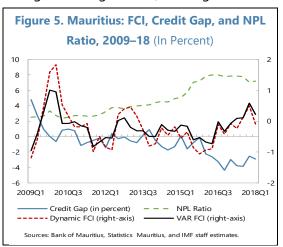
4).[13] Several country authorities deviate from the pure BCBS buffer guide and consider other indicators for setting the CCB such as asset prices or financial sector conditions more broadly.

29.   Given its predictive power for economic growth, FCI's performance as a predictor for boom-bust episodes is assessed. Specifically, we check whether the FCI can forecast more accurately unsustainable boom conditions that are followed by downturns than the credit-to-GDP gap. Such downturn episodes are manifested in depressed GDP growth, rising NPLs and falling bank profits. In Mauritius, such an episode occurred during 2010-16. Favorable conditions led to high credit growth and a subsequent moderate bust which more than doubled the NPL ratio to 8.0 percent in early 2016, while the return on assets fell slightly. A macroprudential policy framework and key instruments that could have supported the policy response were not in place at the time.

Figure 4. Mauritius: FCI, Credit Gap, and Credit Growth, 2004–18 (In percent)

Credit Gap (in percent) — — Credit growth (in percent)
- - - Dynamic FCI (right-axis) —— VAR FCI (right-axis)
Sources: Bank of Mauritius, Statistics Mauritius, and IMF staff estimates.

30.   Indeed, the FCI serves as a leading indicator for credit accelerations. As can be seen from Figure 4, both the dynamic (purged) PCA-based FCI and the VAR-based FCI lead the turning points in private sector credit growth by about four quarters, notably in 2007Q3 with respect to the peak in year-on-year credit growth in 2008Q4, in 2008Q4 with respect to the trough in 2010Q1, and again in 2009Q4/2010Q1 with respect to the rebound in credit in 2010Q4. By contrast, the credit gap variable moves with the credit boom variable, and its magnitude generally implies a less-than-fully activated CCB (according to BCBS guidance). The signals from the FCI for the later years are somewhat less clear, although the VAR-based FCI signals a return to single-digit credit growth rate in early 2014.

31.   The FCI also appears to be a better predictor for deteriorating loan quality than the credit gap. The FCI increased in early 2013, just when the NPL ratio was beginning to rise.[14] It then kept falling for three years, when banks' portfolio deterioration intensified. The credit gap turned positive at 1 ppt. at year-end 2013, although its magnitude would not have implies an

Figure 5. Mauritius: FCI, Credit Gap, and NPL Ratio, 2009–18 (In Percent)

Credit Gap (in percent) — — NPL Ratio
- - - Dynamic FCI (right-axis) —— VAR FCI (right-axis)
Sources: Bank of Mauritius, Statistics Mauritius, and IMF staff estimates.

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[13] Specifically, we use a smoothing factor (lambda) of 1,600 that is standard for quarterly data instead of a factor of 400,000 as recommended by the BCBS. The reason is that credit cycles in Mauritius have been as short as five years (e.g. a complete cycle during 2005-10, and again 2010-16), which contrasts with the BCBS' assumption of an average credit cycle of 20 years justifying its choice of a very high lambda. There is evidence that in such cases a lower smoothing factor helps obtain reasonably-sized credit gaps (see Wezel, 2019).

[14] Consistent information on NPLs is available only from 2009.

activation of the CCB (critical minimum threshold of 2 ppt). The two FCIs then stayed depressed in late 2015/early 2016, coinciding with the peak in the NPL ratio and the trough in the return on assets. Thus, while both concepts (FCIs and credit gap) emit coherent signals, the FCI appears to be a better predictor of credit booms and busts as well as the one instance of a run-up in NPLs.

32. **The FCI could be used to help inform the setting of the CCB.** While it is challenging to give concrete guidance on setting the CCB based on only one recent episode of mild banking distress, the Mauritian authorities will have to devise a buffer guide if they introduce the CCB. Given Mauritius' shorter financial cycles and the experience of a sudden NPL hike, the authorities could opt for an earlier or more accelerated buffer build-up than advised by the BCBS guidance (2010). An important consideration in this regard should be the weakness of the credit gap in timely predicting the past credit boom/bust episodes. An analysis of the credit gap could thus be usefully complemented with the FCI (and possibly other indicators such as development in credit standards and asset prices).

E. Conclusions

33. **This paper develops a financial conditions index for Mauritius using different approaches.** Two sets of FCIs derived from the standard VAR and PCA approaches display a reassuringly high degree of correlation. External financial conditions dominate domestic conditions in the FCIs. The three emerging market indices have the highest factor loadings and contribute the most to the PCA-based FCIs. Among the domestic variables, the stock market index is the most important, followed by the nominal effective exchange rate index. Bank-specific variables (deposit and lending rate as well as credit growth) feature less prominently. These results are in line with expectations, given that Mauritius' financial sector is highly dependent on external capital flows.

34. **The FCI is a robust predictor of real GDP growth in Mauritius.** Both VAR- and PCA-based FCIs predict changes in economic activity well. This was particularly true for the 2008–09 economic downturn that was signaled by a marked decline in the FCIs already in 2007 as well as the subsequent quick recovery when the FCI turned around even before GDP growth reached its trough. While the unpurged FCI is, by construction, more correlated with current economic growth, the purged dynamic FCI and the VAR-based FCI are significantly correlated with the four-quarter ahead real GDP growth rate, illustrating their capacity to predict near-term economic activity. This finding is corroborated by lower forecasting errors in models including FCIs relative to simple autoregressive models.

35. **The FCI can also help inform macroprudential policy decisions**. Decisions on setting the countercyclical capital buffer of Basel III could be informed by analyzing developments in the FCI. As historically Mauritius has not experienced drastic swings in financial credit, testing the constructed FCIs for predicting boom-bust episodes is difficult. Nevertheless, the FCI signaled lax financial conditions in 2009 and again in 2012 that likely contributed to accelerated credit growth in 2012–13 and a subsequent acceleration in NPLs during 2014–16. Hence, the FCI together with

the Basel credit gap and perhaps other relevant information could be used for activating the countercyclical capital buffer (and/or for other macroprudential policy purposes).

36.   In sum, the economic forecasting framework for Mauritius could be usefully augmented with the FCI. While there are other variables that can be thought of as leading indicators of economic activity in Mauritius, the FCI conveniently aggregates key external and domestic factors that tend to influence future domestic real and financial activity.

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UNLOCKING STRUCTURAL TRANSFORMATION IN MAURITIUS: CHALLENGES AND OPPORTUNITIES[1]

Structural transformation by moving up the value chain is an integral part of the Mauritian authorities' efforts to boost competitiveness and growth and achieve the high-income country status by 2030. This note analyzes trends in economic growth, productivity and economic diversification in the country to assess the key factors that could help Mauritius achieve its long-term vision. The findings show that the slowdown in growth relative to the 1990s can be attributed to a decline in the rate of physical and human capital accumulation, and uneven productivity growth across sectors. Efforts to improve diversification are hampered by limited infrastructure and innovation capacity, and by a shortage of an adequately skilled workforce. Addressing these challenges could help Mauritius to expand its export base and improve export sophistication.
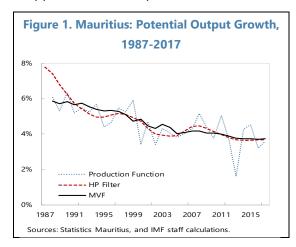
A. Introduction

1.   Mauritius has experienced a robust economic growth momentum since its independence in 1968. Real GDP grew at an average of 4.7 percent over 1968–2017, enabling the country to achieve the upper middle-income country status in less than fifty years. A key reason for such impressive economic performance has been the ability of Mauritius to transform itself from an agriculture-based economy to a more diversified manufacturing and services-oriented economy and reap large productivity gains.

2.   Ambitious plans are being pursued to further diversify Mauritius into high-value added sectors. To climb up the economic development ladder, the authorities are pursuing ambitious plans to boost productivity, improve diversification, and spur private investment. The "Vision 2030" put forward by the authorities includes positioning Mauritius as a major regional investment gateway and a financial services hub, revamping the manufacturing base, and developing the information, technology and communications (ICT) sector.

3.   This paper analyzes trends in economic growth, productivity and diversification to determine the key factors that could help Mauritius achieve its long-term vision. The analysis shows that the challenges faced by Mauritius arise from a slowdown in physical and human capital accumulation, and uneven productivity growth across sectors. Addressing these challenges, notably, through upgrading infrastructure, skill development, building innovation capacity, and increasing female labor force participation could help Mauritius to unleash the second wave of structural transformation.
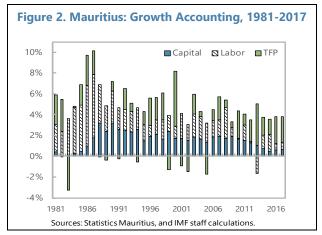
B. Long-Term Growth and Growth Decomposition

4.   Potential output growth has slowed down considerably in Mauritius over the last three decades. Applying several approaches including the Hodrick-Prescott (HP) filter, the

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[1] Prepared by Sandesh Dhungana.

production function approach and a multivariate filter (MVF) to separate potential output from cyclical components, the analysis shows that the potential output growth rate in Mauritius has dropped from over 6 percent in the late 1980s to below 4 percent in 2017 (Figure 1).[2]

Figure 1. Mauritius: Potential Output Growth, 1987-2017

Figure 2. Mauritius: Growth Accounting, 1981-2017

Sources: Statistics Mauritius, and IMF staff calculations.

5.   The decline in the growth grate can be largely explained by a slowdown in labor and capital accumulation. A standard growth accounting exercise shows that an increase in female labor force participation spurred growth in the 1980s (labor contribution to real GDP was 3.8 percent).[3] Physical and human capital accumulation, as well as total factor productivity (TFP) growth contributed to economic growth in the 1990s (Figure 2). Since 2000, however, labor growth has been about 1.2 percent (vis-à-vis about 3 percent over 1980–2000), while capital accumulation has contributed only 1.4 percent (compared to 2.3 percent in the 1990s).

6.   Growth contribution of capital and labor is projected to remain low in the medium term. With a rapidly aging population, labor force participation is expected to decline in the future, which will further reduce the contribution of labor to economic growth. Similarly, with medium-term investment projected to remain lower than in the 1990s, the contribution of capital to growth is also likely to be low.

7.   Productivity growth would be the key driver of economic growth in the future. The authorities aim to achieve an average annual growth rate of 5-6 percent over the next decade or so.[4] Assuming the same level of contribution from capital and labor as in 2000–17, TFP growth

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[2] The HP filter separates the trend and cyclical components of output through a purely statistical filtering technique, while the production function approach first uses a standard Cobb-Douglas production function to calculate productivity, and then uses trend values of unemployment and productivity to calculate potential output. The MVF approach allows for the inclusion of two structural relationships, namely Phillips curve and Okun's law, thereby adding pertinent information on output, inflation, and unemployment to the potential output estimation process (Blagrave et al., 2015).
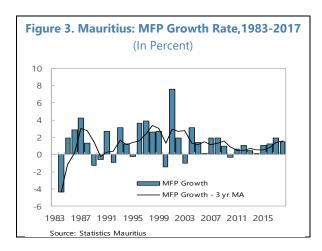
[3] The growth accounting exercise assumes output is generated by a Cobb-Douglas production function. Human capital augmented labor is used. Perpetual inventory method with geometric depreciation rate of 7 percent is used to calculate capital stock. Contributions from TFP are calculated as a residual.
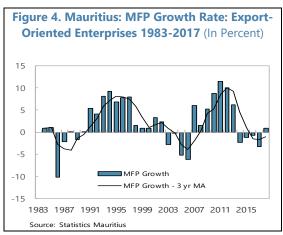
[4] http://www.govmu.org/English/News/Pages/Achieving-The-Second-Economic-Miracle-And-Vision-2030--Prime-Minister-presents-Economic-Mission-Statement-.aspx

will have to rise to about 3 percent—much higher than the average TFP growth of about 1 percent observed over the last forty years—to meet this goal.
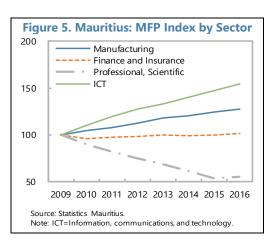
C. Recent Productivity Trends

8.   Analyzing recent trends in productivity growth shows a general slowdown relative to the 1990s. Average multifactor productivity (MFP) growth rate for the overall economy has been around 1.1 percent since 2000, which is half of the rate observed during the 1990s (Figure 3).[5] While MFP growth for the manufacturing sector has rebounded since 2010 (3.1 percent relative to 1.2 percent in the 2000s), it is still below the average growth rate of the 1990s (3.7 percent). In addition, at a little over 1 percent, productivity growth of the export-oriented enterprises (EOE) has dropped significantly compared to the 1990s (5 percent).[6] The slowdown in MFP growth is common to both textile and non-textile EOEs (Figure 4).

Figure 3. Mauritius: MFP Growth Rate,1983-2017 (In Percent)

Source: Statistics Mauritius

Figure 4. Mauritius: MFP Growth Rate: Export-Oriented Enterprises 1983-2017 (In Percent)
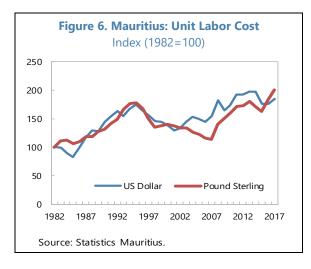
Source: Statistics Mauritius

9.   Productivity growth varies significantly across sectors. At 6.4 percent, the ICT sector has experienced the fastest MFP growth over 2009–16 (Figure 5). However, annual productivity growth in the finance and insurance sectors has been negligible, while that in the professional, scientific and technical activities category has seen a sharp decline.

10.   Notably, wage increases have outstripped labor productivity across the economy. Average wage has risen at a higher rate than labor productivity, resulting in an increase in unit labor
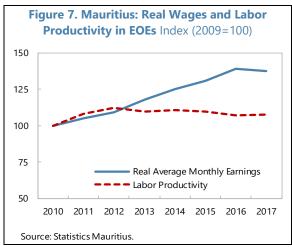

Figure 5. Mauritius: MFP Index by Sector

Manufacturing
Finance and Insurance
Professional, Scientific
ICT

Source: Statistics Mauritius.
Note: ICT=Information, communications, and technology.

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[5] Multifactor Productivity (MFP) is calculated by Statistics Mauritius (SM) as the ratio of real output to weighted combination of labor and capital inputs.

[6] EOEs comprise manufacturing enterprises, formerly operating with an export certificate (for Export Processing Zones) and export manufacturing enterprises holding a registration certificate issued by the Board of Investment. In 2016, this sector accounted for 40 percent of the manufacturing output and 5.2 percent of total output.

costs over the last few years (Figure 6). The divergence between real wages and productivity has been particularly pronounced among the EOEs (Figure 7).[7] The loss of competitiveness of the EOEs is evident from the sharp decline in the real export of goods in recent years, which have fallen by about 20 percent over 2014–18.
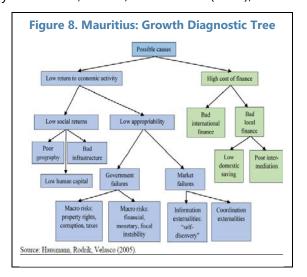

Figure 6. Mauritius: Unit Labor Cost Index (1982=100)

Source: Statistics Mauritius.

Figure 7. Mauritius: Real Wages and Labor Productivity in EOEs Index (2009=100)

Source: Statistics Mauritius.

D.   Growth Diagnostic Analysis

11.   A growth diagnostic framework is applied to analyze the key impediments to boosting productivity in Mauritius. Pioneered by Hausmann, Rodrik, and Velasco (2005), the approach uses a diagnostic decision tree to assess the most binding constraints to economic growth (Figure 8).[8] At the most general level, growth is constrained by a lack of finance for entrepreneurs and/or by low economic returns. These factors could in turn be driven by several other variables (including geography, availability of human capital, infrastructure, appropriability of returns, etc.). The growth diagnostic methodology is based on moving down the tree, eliminating factors that are unimportant in explaining the growth performance. Elimination is done by comparing prices/shadow prices for the constraints across time and with peers.[9] In

Figure 8. Mauritius: Growth Diagnostic Tree

Source: Hausmann, Rodrik, Velasco (2005).

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[7] As discussed in Country Report No. 17/363, the wage-setting mechanism is a major driver of these trends.

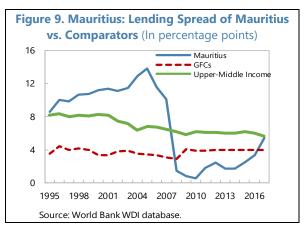[8] The most binding constraint is the one that, if relaxed, would lead to the largest increase in long run growth. See Hausmann, Rodrik and Velasco (HRV, 2005) for the theoretical exposition of the approach. Also see Hausmann, Klinger and Wagner (2008) for a handbook on doing growth diagnostics in practice.

[9] If a constraint is binding, the price/shadow price for the constraint should be high. Also, episodes of the constraint loosening (if available), should lead to growth spurts.

addition, the analysis examines if many agents in the economy are trying to overcome certain obstacles.[10]

12.   High cost of finance does not appear to be a binding growth constraint in Mauritius. Countries where weak financial access primarily constrains private investment often display high interest rates and large spreads between lending and deposit rates. Mauritius' interest rate spreads are slightly lower than in other middle-income countries and close to the average for advanced global financial centers (GFCs; Figure 9).[11] Mauritius also has a strong credit rating (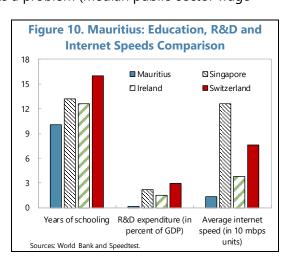Baa1 by Moody's), while the World Economic Forum's (WEF) global competitiveness index lists access to finance as the sixth (out of sixteen) most important business problem.[12]

Figure 9. Mauritius: Lending Spread of Mauritius vs. Comparators (In percentage points)

Source: World Bank WDI database.

13.   Mauritius has a stable macroeconomic and political environment, and strong institutions, implying a low risk of appropriability and expropriation. Mauritius has had a vibrant democracy and has enjoyed years of political and macroeconomic stability. It scores highly on the security and property rights indicators (including the WEF). The overall cost of starting businesses is about 1 percent of income per capita, comparable to the best performers worldwide.[13] The high public-sector wage premium is a problem (median public-sector wage increased from 218 percent of median private wage in 2011 to 240 percent in 2016), however, which disincentivizes workers to respond to private sector needs.

14.   Mauritius lags behind peers in innovation capacity, notably, in skilled labor, research and development (R&D), and information technology (IT) infrastructure. R&D expenditure in Mauritius is only 0.2 percent of GDP compared to over 2 percent in advanced GFCs. Among the middle-income countries also, Mauritius lags in the quality of research

Figure 10. Mauritius: Education, R&D and Internet Speeds Comparison

Sources: World Bank and Speedtest.

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[10] For example, if political risk is high, large firms invest in security infrastructure. If financing is an issue, firms invest using retained earnings.

[11] Singapore, the United Arab Emirates, Ireland and Switzerland are used as comparator GFCs.

[12] Among some of the other GFCs, access to finance is rated the most important problem in the United Arab Emirates, the third most important for Ireland and the sixth most important for Singapore and Switzerland.

[13] The cost of starting a business is 0.1 percent of per capita income in Singapore, and 1.1 percent for the U.S.

 institutions.[14] The IT infrastructure is also weaker than in other major GFCs (Figure 10). In terms of human capital, while primary and secondary enrollment rates are over 95 percent in Mauritius, the tertiary enrollment rate (at 38.7 percent) and average years of schooling (10.1 years) are significantly lower than other upper-middle income economies and advanced GFCs.[15]

15.   Co-ordination externalities can also be considered as a binding growth constraint in Mauritius. Recent research argues that value upgrading is a primary driver of economic development (Hausmann et. al., 2007; Verhoogen, 2008; Khandelwal, 2010). However, economic development through value upgrading is difficult—on the one hand, many products and services cannot be produced without specific inputs and know-how; and on the other hand, investments into producing such inputs and know-how are not initially profitable. This implies some path dependence, as economies move from products they already produce into products that use similar know-how and inputs. It also creates co-ordination externalities, where social benefits to coordination are large but cannot be reaped easily by private actors. When these co-ordination externalities remain unresolved, it is difficult to build the inputs and know-how needed to move into higher value-added sectors—resulting in a less sophisticated and diversified production and export base.[16] The low levels of export complexity, in turn, tend to result in low growth rates and level of economic development.[17]

E.   Export Structure

16.   Mauritius has much room to improve the sophistication of its export basket. Mauritius' goods export complexity has been consistently below that of other major GFCs (Figure 11). This gap is driven by the high ubiquity (or low uniqueness) of Mauritius' exports (see Box 1). Mauritius' export basket also lacks diversification relative to its global competitors, as indicated by the inverse Herfindahl-Hirschman Index (HHI) in Figure 12.[18] The complexity of its services exports has also lagged that of other global competitors. Calculating the average complexity of service export categories (a la Hausmann et al., 2007; Anand et. al. 2012), Mauritius fares much lower than other GFCs.[19] Mauritius' dependence on tourism (with a low complexity score) and a relatively narrow base in high complexity sectors such as finance are the key reasons for this gap.

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[14] According to the WEF index, Mauritius also lags most middle-income countries in terms of R&D industry-university collaboration.

[15] Tertiary enrollment rates are higher in Singapore (83 percent), Switzerland (77 percent) and Ireland (58 percent). The average for upper-middle income economies is 52 percent.
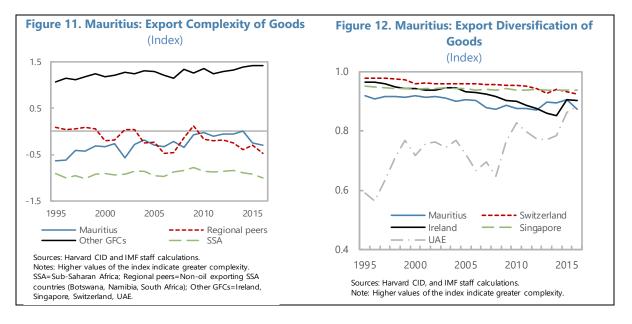
[16] Production sophistication data is mostly unavailable at a sectoral level; hence export sophistication is generally used in the literature. Overall, the two tend to be highly correlated.
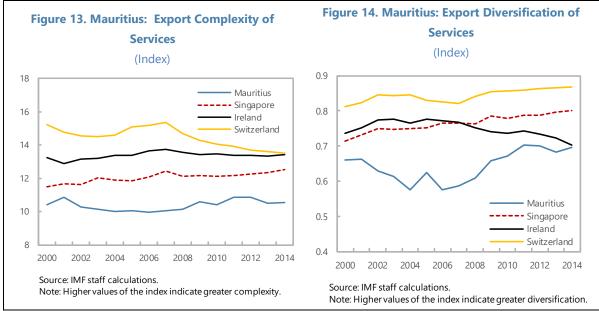
[17] See, e.g., the Atlas of Economic Complexity developed by the Harvard Center for International Development (http://atlas.cid.harvard.edu/). The export complexity measure combines diversification and ubiquity. Ubiquity measures the number of countries exporting the same product (with low values indicating a more complex product, as it is only produced by a few countries). An export basket with high diversification and low ubiquity is more complex.

[18] The index is calculated as $Index = 1 - \sum^{N} s_i^2$ where s_i is the share of category i in the overall export basket. Categorization is done at the HS 4-digit level.

[19] Due to lack of granular data, this analysis only uses service categories at the 1-digit level. The United Arab Emirates (UAE) is not included as the database does not have any data on the UAE.

In 2014, for example, finance comprised only 3 percent of Mauritius' services exports, while the average for other GFCs was 14 percent. By contrast, travel constituted 45 percent of Mauritius' services exports in 2014, which is over four times the average for its comparators (11 percent).

Figure 11. Mauritius: Export Complexity of Goods
(Index)

Sources: Harvard CID and IMF staff calculations.
Notes: Higher values of the index indicate greater complexity.
SSA=Sub-Saharan Africa; Regional peers=Non-oil exporting SSA countries (Botswana, Namibia, South Africa); Other GFCs=Ireland, Singapore, Switzerland, UAE.

Figure 12. Mauritius: Export Diversification of Goods
(Index)

Sources: Harvard CID, and IMF staff calculations.
Note: Higher values of the index indicate greater complexity.

Figure 13. Mauritius: Export Complexity of Services
(Index)

Source: IMF staff calculations.
Note: Higher values of the index indicate greater complexity.

Figure 14. Mauritius: Export Diversification of Services
(Index)

Source: IMF staff calculations.
Note: Higher values of the index indicate greater diversification.

17.   Why does Mauritius lag in export complexity? To address this question, an export complexity function—linking the export complexity index with various structural and macroeconomic factors—is estimated using panel data for 121 advanced and emerging market countries over 1995–2016:
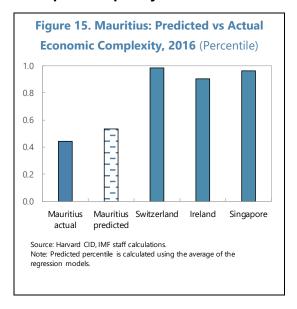
$$ECI_{it} = \beta_0 + \beta_1 X_{it} + \beta_2 D_i + \beta_3 ECI_{it-j} + \psi_t + \mu_{it} \tag{1}$$

where ECI_{it} is the export complexity index of country i in time t; X_{it} includes economic and structural variables that are likely to affect the comparative advantage of countries, and thereby their export sophistication (such as human capital proxied by the average years of schooling; financial development proxied by the private credit to GDP ratio; institutional quality proxied by the World Governance Indicator's governance effectiveness rating; political stability; and economic size proxied by the total population); and ψ_t are time effects to capture common shocks across countries. Given that several of these variables are slow-moving, country-fixed effects are not included in the benchmark regression, but several dummy variables, D_i, are included to capture the time-invariant country characteristics (such as the resource exporter status; income status, regional grouping, distance to major markets etc.). In addition, to capture the persistence in the export structure, the lagged term of the dependent variable (ECI_{it-j}; j=1) is also included.

18.   Findings suggest that innovation capacity, political stability, and governance are key drivers of export complexity. Table 1 shows the regression results for equation (1)—both with and without the lag of the ECI variable. The results show that the average years of schooling, R&D expenditure, governance and political stability, communications infrastructure and trade openness are significant determinants of economic complexity. The lag of the ECI is also highly significant, suggesting strong path dependence in export complexity and the difficulties associated with moving up the value chain. Distance to major markets is strongly negatively associated with higher levels of export complexity, suggesting that geographically remote countries are at a locational disadvantage for export sophistication. This could be because of the high information and transportation costs associated with remoteness, which lowers the economic returns for enterprises, deterring private investment.[20]

19.   Mauritius has significant room to improve its export complexity. Based on the estimation results, Mauritius appears to have a lower ECI than that predicted by its macro-structural characteristics. Thus, while it scored as the 44th percentile in 2016, its predicted level turns out to be 53 (Figure 15). This suggests a misallocation of resources (e.g., from skill mismatches), and/or deficiencies in the physical infrastructure and investment climate not well captured by the indices used. Notwithstanding the difference between actual and potential ECI, Mauritius also has considerable room to boost its potential by improving the factors positively associated with ECI—notably, human capital, the ICT infrastructure and R&D.

Figure 15. Mauritius: Predicted vs Actual Economic Complexity, 2016 (Percentile)

Source: Harvard CID, IMF staff calculations.
Note: Predicted percentile is calculated using the average of the regression models.

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[20] Mauritius is ranked 18th in the world in remoteness by the Global Connectivity Index (2018). Mauritius is ten times more distant to major world ports compared to Ireland and Switzerland, and 1.5 times farther than Singapore (Gallup et al., 1999).

Box 1. Export Clusters for Mauritius: A Comparative Analysis
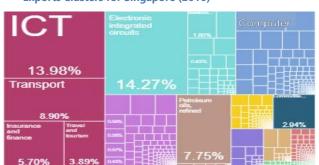
In recent work, Jankowska et al. (2012) explore the differences between Asian economies which escaped the middle-income trap (South Korea, Hong Kong, Singapore) and Latin American economies which did not (Brazil, Colombia and Mexico). They calculate a proximity metric across products (product A is proximate to product B if it is easier to produce A once a country already produces B). Their analysis finds that the successful Asian economies expanded into proximate products and accrued more sophisticated capabilities in this process. In this framework, some products are unique, as they are: a) proximate to many other products, creating a cluster, and b) and are high value. Some examples of such high connectivity, high value clusters are electronics, vehicles and chemicals. Jankowska et al. (2012) show that highly successful economies built up comparative advantage in at least some of these clusters.

Breaking down the shares (indicated by the rectangle sizes) of the largest exports for Mauritius and its comparators (at HS 4-digit level) in the figures below, the analysis shows that Mauritius' export basket in 2016 was dominated by travel and tourism, fish, sugar and ICT, with little or no comparative advantage in high connectivity clusters. By contrast, Singapore, a small open economy which is also a competitive financial center, exports goods and services in a variety of high margin clusters including the electronics and chemicals clusters. The other countries considered here, Switzerland and Ireland, both show a comparative advantage in high connectivity clusters and niche high-margin goods. Switzerland specializes in precious metals, stones, pharmaceutical products, clocks, industrial and electrical machinery. In comparison, Ireland's export basket focuses more on services, but still includes chemicals, machinery and electronics.
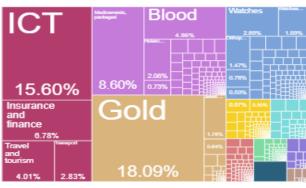
Exports Clusters for Mauritius (2016)

Exports Clusters for Singapore (2016)

Exports Clusters for Switzerland (2016)

Exports Clusters for Ireland (2016)

Source: Atlas of Economic Complexity, Harvard CID.

F. Conclusions

20.   Mauritius faces several challenges in its structural transformation into high value-added sectors. The authorities' Vision 2030 foresees Mauritius join the ranks of higher-income countries over the next decade by a fundamental transformation of the economy to a more economically diversified and sophisticated economy. However, dwindling productivity, rising unit labor costs, limited innovation capacity, and unfavorable demographic trends in the form of an aging population and a potentially declining labor force, pose significant challenges in achieving this goal.

21.   These challenges could be tackled with proactive and pragmatic policies to build innovation capacity, human capital and infrastructure. A comparative analysis with other GFCs suggests there is considerable room for Mauritius to diversify into high-value added sectors, notably services, by improving human and physical capital, and innovation capability. Structural reforms to address labor market inefficiencies, reduce skill mismatches, increase female labor force participation, and promote research and development will help to unlock Mauritius' economic potential and modernize the economy.

22.   Initially focusing on value upgrading in the traditional sectors could help to unlock structural transformation. Mauritius' traditional exports have comprised sugar, textiles, tourism, and financial services, where there is considerable scope for value upgrading. Given capacity constraints, efforts could focus on increasing the value added in these sectors to build on the initial infrastructure and technical expertise. The strategies to diversify must also be realistic about the existing limitations in terms of human, financial and institutional capacity constraints, and address the fundamental bottlenecks first to prevent a wastage of resources. For example, artificial intelligence/machine learning-based strategies require a strong ICT infrastructure. Similarly, initiatives such as the new life sciences park require a solid R&D set up and collaboration between the research institutions and the industry.

23.   Systematic monitoring and evaluation of the initiatives to address the structural challenges is essential. In recent years, Mauritius has introduced a range of initiatives and reforms to boost skill development, support private enterprises, and increase women's participation in the workforce. These programs should be aligned with the long-term vision of improving export sophistication and productivity growth, and target sectors with the highest potential. Regular monitoring and evaluation of these programs through data collection is essential to track progress, prevent wastage of public resources, and enhance effectiveness.

Table 1. Mauritius: Drivers of Economic Complexity, 1995–2016

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Without Lag of ECI				With Lag of ECI		
	OLS	OLS	FE	FE	OLS	OLS	FE	FE
Lag of ECI					0.91***	0.93***	0.70***	0.57***
					(0.01)	(0.02)	(0.03)	(0.03)
Average Years of Schooling	0.05**	0.04*	0.06**	0.02	0.00	0.00	0.02*	0.01
	(0.02)	(0.02)	(0.03)	(0.02)	(0.00)	(0.00)	(0.01)	(0.01)
Population	0.01	0.08**	-0.06	0.22	-0.00	0.00	-0.02	0.10
	(0.03)	(0.04)	(0.09)	(0.19)	(0.00)	(0.01)	(0.03)	(0.09)
Log of Credit to GDP Ratio	0.19***	-0.06		-0.05	0.02**	-0.02**		-0.03
	(0.05)	(0.06)		(0.04)	(0.01)	(0.01)		(0.02)
Inflation Rate	0.00	-0.49**		-0.25***	-0.00***	-0.10**		-0.13***
	(0.00)	(0.23)		(0.07)	(0.00)	(0.04)		(0.05)
Electricity Usage	-0.01	-0.02*	0.01	0.07**	-0.00	-0.00	0.00	0.03**
	(0.01)	(0.01)	(0.01)	(0.03)	(0.00)	(0.00)	(0.00)	(0.01)
Mobile Subscribers	3.07***	3.82***	1.38**	0.57	0.35**	0.58**	0.31	0.21
	(1.09)	(1.06)	(0.68)	(0.63)	(0.15)	(0.26)	(0.21)	(0.33)
Polity Score	0.01	-0.00		0.00	-0.00	-0.00		0.00
	(0.01)	(0.01)		(0.01)	(0.00)	(0.00)		(0.00)
WGI - Corruption		-0.14		-0.00		-0.03*		0.01
		(0.11)		(0.04)		(0.02)		(0.02)
WGI - Governance Effectiveness		0.33**		0.14**		0.06**		0.06**
		(0.15)		(0.06)		(0.02)		(0.03)
WGI - Political Stability		0.20***		-0.01		0.01		-0.00
		(0.07)		(0.04)		(0.01)		(0.02)
Size of Government[1]	-0.01	0.03		0.03**	0.00	0.00		0.01*
	(0.03)	(0.03)		(0.01)	(0.00)	(0.00)		(0.01)
Property Rights[1]	0.01	-0.08		0.01	0.00	-0.01		0.01
	(0.03)	(0.05)		(0.03)	(0.00)	(0.01)		(0.01)
Freedom to international trade[1]	0.04*	0.13***		0.06***	0.00	0.01*		0.03***
	(0.02)	(0.05)		(0.02)	(0.00)	(0.01)		(0.01)
Regulation[1]	0.01	-0.02		-0.01	0.00	-0.01		-0.01
	(0.03)	(0.05)		(0.04)	(0.00)	(0.01)		(0.02)
R&D to GDP Ratio		0.33***				0.02*		
		(0.07)				(0.01)		
Distance to Major Markets	-0.30***	-0.21**			-0.03***	-0.03***		
	(0.08)	(0.09)			(0.01)	(0.01)		
Observations	2,591	1,047	4,504	1,929	2,589	1,047	4,488	1,927
R-squared	0.82	0.86	0.95	0.97	0.97	0.98	0.53	0.41
Country Groups (for FE)			121	113			121	113

Note: Robust standard errors clustered at country level in parentheses. Time fixed effects included in all regressions. Columns [3-4] and [7-8] use fixed effects at country level as well. ***, ** and * indicate statistical significance at 1,5, and 10 percent levels respectively.

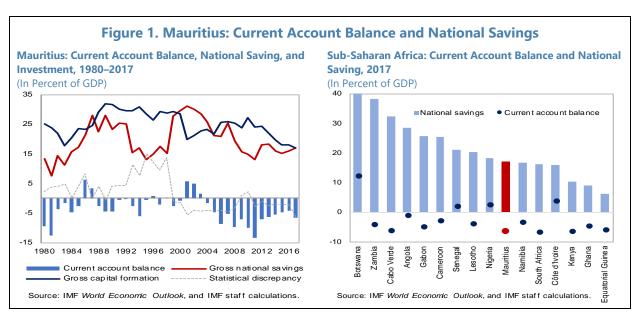1. Taken from the Fraser Institute Economic Freedom Database.

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PRIVATE SAVINGS IN MAURITIUS[1]

The private saving rate in Mauritius has declined over the years and is lower than in other countries with similar characteristics. This decline has contributed to a lower national saving rate and a sizable current account deficit. Using data over the last four decades, this paper empirically examines the factors associated with the private saving rate in Mauritius and compares them with those for other emerging market and developing countries. The analysis indicates that while private savings respond to both economic and demographic factors in other countries, the deposit rate and economic growth are the key drivers of private savings in Mauritius. Given its macroeconomic and demographic characteristics. Mauritius' private saving rate is about 3 percent of GDP lower than potential.

A.   Background

1.   **The current account balance of Mauritius has been in a persistent deficit since the mid-2000s, peaking at about 10 percent of GDP in 2010** (Figure 1). While the current account deficit averaged about 5 percent of GDP in the runup to the global financial crisis, it has averaged 7.5 percent of GDP since 2008, primarily because of the deterioration in the goods trade balance.

2.   **From a savings and investment perspective, Mauritius' current account deficit can be largely attributed to a decline in national savings, as investment has remained tepid.** National savings fell sharply during the global financial crisis in 2008-09, but recovered somewhat in 2011, and have averaged about 17 percent of GDP since then. This ratio is one of the lowest among middle-income sub-Saharan African (SSA) countries—most of which have also been running current account deficits in recent years, though generally of a smaller magnitude than Mauritius (Figure 1).

Figure 1. Mauritius: Current Account Balance and National Savings

Mauritius: Current Account Balance, National Saving, and Investment, 1980–2017
(In Percent of GDP)

Sub-Saharan Africa: Current Account Balance and National Saving, 2017
(In Percent of GDP)

Source: IMF *World Economic Outlook*, and IMF staff calculations.

Source: IMF *World Economic Outlook*, and IMF staff calculations.

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[1] Prepared by Raveesha Gupta and Mahvash S. Qureshi.

3.   **The main contributor to national saving is private saving, which has averaged about 18 percent of GDP in recent years.** As in other countries in SSA, national savings in Mauritius are mainly driven by private savings, which have fallen from a peak of 32 percent of GDP in the early 2000s to about 18 percent of GDP over the last decade (Figure 2). This rate is lower than the average private saving rate for other emerging market and developing countries (EMDEs), as well as the average for Mauritius' middle-income peers in the region (Figure 3).

Figure 2. Mauritius: Public and Private Saving

Mauritius: Public and Private Saving (In Percent of GDP)

Source: IMF World Economic Outlook, and IMF staff

Sub-Saharan Africa: Public and Private Saving, 2017 (In Percent of GDP)

Source: IMF *World Economic Outlook*, and IMF staff calculations.

4.   **What factors explain the decline in the private saving rate in Mauritius?** The existing academic literature identifies several economic and structural factors—such as demographics, income growth, deposit rates, inflation, financial development, etc.— as the determinants of private savings across countries, but a systematic analysis for Mauritius has been lacking. This paper fills the gap by conducting a time-series analysis using data over 1980–2017. In addition, it conducts a panel data analysis of the private saving rate for a broad sample of 110 EMDEs to benchmark the private saving rate for Mauritius given its economic and structural characteristics.

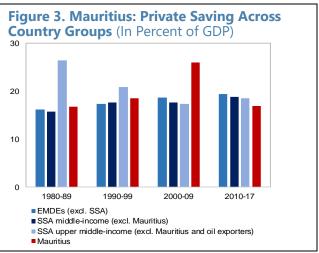**Figure 3. Mauritius: Private Saving Across Country Groups** (In Percent of GDP)

- EMDEs (excl. SSA)
- SSA middle-income (excl. Mauritius)
- SSA upper middle-income (excl. Mauritius and oil exporters)
- Mauritius

5.   **The findings show that the deposit rate and income growth are important determinants of private savings in Mauritius**. The analysis suggests that the private sector responds strongly to economic growth and the deposit rate. Notably, there is no evidence of substitutability between private and public savings for Mauritius, nor is there any evidence that the saving rate in Mauritius is responsive to the changing demographic trends. Results based on the panel data

analysis suggest that Mauritius' private saving rate is about 3 percent of GDP lower than that based on its economic and demographic characteristics. While economic growth would boost private savings, a rapidly rising old-age dependency ratio requires a higher level of savings to alleviate fiscal pressures and avoid abrupt policy adjustments in the future. In this regard, efforts should focus on generating greater public awareness and encouraging private savings—e.g., through old-age related saving schemes. Better targeting of social benefits and broader pension reforms (including increasing the contribution rates of employees and introducing mandatory contributions for the self-employed) could also help to boost savings.

6.   **The rest of the paper is organized as follows**. Section B outlines the analytical framework and estimation model for examining the determinants of private savings in Mauritius. Section C presents the country-specific time series estimation results for Mauritius, as well as the results of the panel data analysis used to benchmark the private saving rate of Mauritius. Section D discusses the policy implications of our findings and concludes.
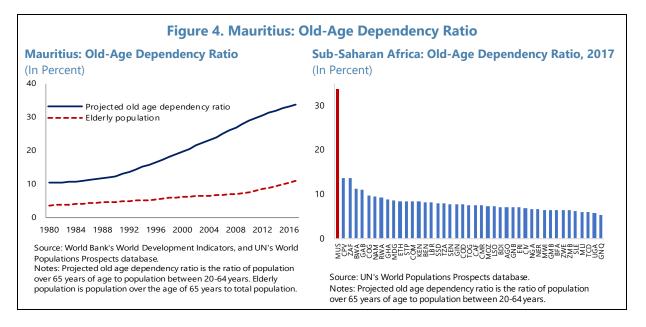
B.   Analytical Framework

7.   **Given the significant role that savings can play in promoting economic growth, an extensive body of academic literature investigates the determinants of savings**. Earlier literature, outlined below, was dominated by the life-cycle model, which emphasizes the role played by the age structure of the population in determining savings, while later studies have explored the importance of other possible factors (such as public savings, pension systems, income level, financial development, inflation, terms of trade, etc.) in stimulating the saving rate.

Life-Cycle Hypothesis

8.   **The life-cycle model has been the standard theory for explaining the behavior of savings (and consumption) over time and across countries**. Assuming perfect capital markets and perfect foresight, the model predicts that consumption depends on expected lifetime income (and not on current income) as individuals smooth consumption over their lifetimes. Given the fluctuations in income, saving thus depends on the stage in the life cycle—with individuals being net savers during their working years and dis-savers during retirement (Modigliani, 1986).

9.   **At the macro level, an obvious implication of the life-cycle model is that a high share of working-age population would translate into higher savings as workers provide for their retirement.** Conversely, the private (and aggregate) saving rate would decline as the share of elderly population that has reached retirement age increases. Given the rising longevity, however, not only the current but also future age dependency ratio may matter for the saving behavior as individuals save more to meet their post-retirement consumption. Thus, while a higher current share of elderly population may imply lower savings, a higher share of elderly population in the future would imply higher savings as the population prepares for retirement.

10.   **The impact of demographics on savings has been well established empirically**. Several studies find a strong negative effect of the share of elderly population (in total

population or relative to working-age population), and a positive effect of the future share of elderly population, on private savings (e.g., Masson and others, 1998; IMF, 2017). Given Mauritius' demographics profile, all else held constant, this implies a lower saving rate as the share of elderly population in total population is increasing, while the sharp increase in the projected old-age dependency ratio (by far the highest in sub-Saharan Africa) suggests a higher saving rate (Figure 4).

Figure 4. Mauritius: Old-Age Dependency Ratio

Mauritius: Old-Age Dependency Ratio
(In Percent)

Source: World Bank's World Development Indicators, and UN's World Populations Prospects database.
Notes: Projected old age dependency ratio is the ratio of population over 65 years of age to population between 20-64 years. Elderly population is population over the age of 65 years to total population.

Sub-Saharan Africa: Old-Age Dependency Ratio, 2017
(In Percent)

Source: UN's World Populations Prospects database.
Notes: Projected old age dependency ratio is the ratio of population over 65 years of age to population between 20-64 years.

11.   Based on the life-cycle model, income growth also has implications for savings. With an unchanged saving rate by age group, higher income growth would increase the aggregate income of the working-age population (relative to the older age population not earning labor income), thereby raising aggregate savings (Modigliani, 1966). Tobin (1967), however, notes that if workers expect income growth to be permanent, then based on the life-cycle model, such wealth effects may induce more consumption today. Empirical literature has generally documented a significant positive effect of income growth on the saving rate.

12.   Interest rate on bank deposits may also influence private savings under the life-cycle model. The net effect of interest rates on savings is theoretically ambiguous because of potentially offsetting substitution and income effects. A higher real interest rate increases the present price of consumption relative to the future price, providing an incentive to increase saving. But if the individual is a net creditor in financial assets, a higher real interest rate increases lifetime income, and may increase consumption (reduce saving) through the income effect.[2] Paralleling the theoretical ambiguity, empirical research documents mixed results on the impact of real interest rates on savings (Schmidt-Hebbel and others, 1992).

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[2] The saving behavior of pensions plans enhances the empirical importance of the income effect on private saving. For defined benefit plans, for example, higher interest rates increase the income available to pay pensions, allowing lower contributions (Bernheim and Shoven, 1988).

Public-Private Saving Offset

13. **Under the Ricardian equivalence hypothesis, public and private savings are perfect substitutes.** Any change in public savings is offset by private savings as it will be accompanied by a change in future taxation; public saving will thus not affect national saving (Barro, 1974). Empirical evidence on the private saving offset to government saving is decidedly mixed with studies generally finding limited evidence of a full offset. This may be because of liquidity constraints faced by the private sector, or because of the differential effects of different types of government expenditure and revenue on private savings. In particular, if government investment is viewed as productive, and not expected to require tax increases in the future, it may not generate a response by the private sector.

Other Factors

14. **Several other macroeconomic and structural factors could also potentially affect the private saving behavior:**

- *Financial development* could lower the saving rate by increasing private sector's access to credit. At the same time, it could also raise private savings by providing more opportunities for saving. Empirical evidence generally supports a negative relationship between financial liberalization (access to foreign savings) or financial development (proxied by domestic credit to GDP ratio) and private (or national) savings.

- *Inflation* is another factor that may affect saving through several channels. In the life-cycle model, the impact of inflation on saving stems through its effect on the real interest rate (i.e., real returns to saving), but inflation could also impact real wealth (if consumers want to maintain a certain level of wealth relative to income, saving will rise with inflation). Moreover, by increasing uncertainty about future income stream, inflation could lead to higher savings on precautionary grounds as well.

- *Terms of trade improvement* could increase savings (through the Harberger-Laursen-Metzler effect); though recent literature argues that the impact may depend on whether the terms of trade change is transitory or permanent. A transitory change in income should increase savings, while permanent shocks to the terms of trade would have ambiguous effects that should be small in magnitude. Cross-country evidence generally supports the positive association between terms of trade changes and the saving rate.

- *Level of per capita income* could be another important factor influencing savings. At subsistence levels, the potential for savings is limited, a rise in per capita income therefore may lead to higher savings. Existing studies generally find strong evidence that rising income levels that expand the savings base are associated with private savings.

- *Total wealth* may also be a driver of private savings. While the theoretical prediction under the life cycle model is straightforward—that is, by reducing dependence on current income, higher wealth allows higher consumption (and lower saving)—the empirical evidence is less clear. While several studies find a statistically significant effect of changes

in wealth (proxied by changes in house prices given that housing wealth tends to be the dominant form of household wealth) on private saving in advanced countries (e.g., Muellbauer and Murphy, 1997; Benjamin and others, 2004; Case and others, 2005), the association between private residential property prices and the private saving rate is not documented to be statistically strong for some Asian countries (Phang, 2002; IMF, 2006). Given the unavailability of data on house prices for Mauritius, we are unable to test the importance of this channel in our analysis.

Empirical Model

15.   Drawing on the literature outlined above, we empirically examine the drivers of private savings in Mauritius by estimating the following equation:

$$S_t = \alpha_0 + \alpha_1 S_{t-1} + \sum_{j=1}^{J} \beta_j D_{jt} + \sum_{k=1}^{K} \gamma_k X_{kt} + \varepsilon_t \qquad (1)$$

where S_t is private saving in percent of GDP in year t; S_{t-1} is lagged private saving in percent of GDP to capture any persistence in saving behavior; D includes demographic variables such as the share of elderly population in total population and (20-year ahead) projected elderly age dependency ratio; X reflects different macroeconomic variables that may influence private saving such as public saving (in percent of GDP), real income growth, returns to saving (proxied by the deposit rate), the inflation rate, change in the terms of trade, and financial sector development (proxied by domestic private sector credit in percent of GDP); and ε is the random error term.[3] We estimate eq. (1) using ordinary least squares (OLS) with robust standard errors, as well as with the Prais-Winsten generalized least squares method to allow for possible first-order serial correlation in the error term.

16.   To benchmark Mauritius' private saving performance given its characteristics, we also estimate the private saving function for a large panel of emerging market and developing countries. To compare the drivers of private savings in Mauritius with those of other countries, and to benchmark its saving performance given its economic fundamentals and demographic profile, we estimate the following equation for a panel of 110 EMDEs using data for 1980–2017:

$$S_{it} = \gamma_0 + \gamma_1 S_{it-1} + D_{it}\theta + X_{it} + \omega_i + \mu_{it} \qquad (2)$$

where S_{it} is private saving in percent of GDP in country i in year t; S_{it-1} is lagged private saving to GDP; D and X are matrices including the demographic and macroeconomic variables indicated above, respectively; ω reflect the time-invariant country-specific factors, and μ is the random

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[3] In addition, equation (1) also includes a binary variable equal to one for the global financial crisis years (and zero otherwise) to capture the extraordinary size of the shock and its potential impact on the saving rate.

error term. We estimate eq. (2) using OLS (with standard errors clustered by country) and the Prais-Winsten method.[4]

C.   Estimation Results

Country-Specific Function

17.   The estimation results of equation (1) suggest that the deposit rate and income growth are key drivers of private savings in Mauritius. Controlling for other relevant factors, an increase in the deposit rate by 100 basis points is strongly associated with an increase in private savings by about one percent of GDP (Table 1, cols. [1]-[8]). In addition, higher real GDP growth is also statistically significantly associated with higher savings, suggesting that much of the income gains are perceived to be temporary by the private sector (cols. [5]-[8]).

18.   The private saving behavior in Mauritius is highly persistent, but there is no evidence of a private-public savings trade-off. The coefficient on the public saving rate is negative but mostly statistically insignificant, suggesting that the private sector does not strongly offset lower public savings (and vice versa). There is, however, strong evidence of persistence in private saving behavior—the coefficient on the lagged private saving rate is highly statistically significant in all specifications, implying a half-life of deviation of about 2-3 years.

19.   Private savings do not appear to respond strongly to demographic trends. The association between private savings and the demographic variables (the share of elderly population and the projected elderly population ratio) is statistically insignificant, suggesting that the private sector remains oblivious to the changing demographic profile of the country, and the sharply rising old-age dependency ratio.[5] Including other variables to capture the demographics trends such as population growth, the working-age population ratio, and the 10-year ahead projected old-age dependency ratio, we do not find their coefficients to be statistically significant either. The association of the other macroeconomic variables such as terms of trade change, credit to GDP ratio, and inflation with the private saving rate is also statistically insignificant.

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[4] The fixed effects estimation of models with lagged dependent variable can produce biased estimates (the so-called "Nickell bias"). The bias (equal to $1/T$) is serious for short panels, but disappears as $T \to \infty$ (for our sample, T=40; so the fixed effects estimator is likely to perform at least as well as many alternatives; Judson and Owen, 1999). To check the robustness of our results, however, we also apply the System GMM estimator for dynamic panels and find the results to be generally robust.

[5] While it could be argued that the private sector may not be responding to the increasing longevity and rising future elderly dependency ratio as it expects public saving to increase (to provide old-age benefits), the lack of private-public savings trade-off does not support this argument. Moreover, estimating the national savings function, the results show no statistically strong association between the demographic variables and the old-age dependency ratio, implying that overall savings are not responding much to the changing demographic profile.

Table 1. Mauritius: Private Saving Function, 1980–2017

	Ordinary Least Squares				Prais-Winsten			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Private saving/GDP (lagged)	0.707***	0.701***	0.696***	0.693***	0.836***	0.828***	0.830***	0.829***
	(0.091)	(0.088)	(0.094)	(0.103)	(0.062)	(0.067)	(0.066)	(0.073)
Public saving/GDP	-0.596	-0.630	-0.494	-0.531	-0.690**	-0.679**	-0.406	-0.430
	(0.436)	(0.419)	(0.498)	(0.566)	(0.298)	(0.303)	(0.317)	(0.396)
Real GDP growth	0.508	0.434	0.375	0.384	0.858***	0.780***	0.766***	0.772***
	(0.409)	(0.457)	(0.485)	(0.488)	(0.282)	(0.256)	(0.229)	(0.228)
Deposit rate	1.149*	1.285*	1.289*	1.303*	0.923**	1.074**	1.028**	1.034**
	(0.661)	(0.636)	(0.660)	(0.710)	(0.384)	(0.465)	(0.451)	(0.479)
Inflation		-0.324	-0.350	-0.346		-0.195	-0.221	-0.217
		(0.285)	(0.281)	(0.288)		(0.189)	(0.168)	(0.168)
Terms of trade change			-0.051	-0.047			-0.114*	-0.110
			(0.068)	(0.068)			(0.066)	(0.068)
Private credit/GDP				0.038				0.021
				(0.185)				(0.168)
Old-age population ratio	1.699	1.553	1.619	1.659	1.388	1.337	1.552*	1.572*
	(1.468)	(1.457)	(1.495)	(1.594)	(0.851)	(0.880)	(0.801)	(0.872)
Proj. old-age dependency ratio	-0.182	-0.204	-0.223	-0.361	-0.149	-0.155	-0.211	-0.287
	(0.316)	(0.341)	(0.356)	(0.848)	(0.204)	(0.216)	(0.209)	(0.696)
Observations	37	37	37	37	37	37	37	37
Adjusted R2	0.546	0.559	0.549	0.532	0.832	0.830	0.861	0.855

Notes: Dependent variable is private saving in percent of GDP. Cols. [1]-[4] are estimated with the ordinary least squares method and cols. [5]-[6] are estimated with the Prais-Winsten method. All specifications include a constant term and a dummy variable equal to one for the global financial crisis years (2008-09). Robust standard errors are reported in parentheses. ***, **, and * indicate statistical signficance at the 1, 5, and 10 percent levels, respectively.

Panel Data Analysis

20.   In other emerging market and developing countries, economic and demographic factors play an important role in determining private savings. The estimation results for equation (2) suggest that, consistent with the life-cycle hypothesis, a higher share of elderly population is associated with a lower private saving rate (although the coefficient is not statistically significant when country-fixed effects are included in the model), while a higher projected old-age dependency ratio implies significantly more savings (Table 2). On average, a one percentage point increase in the projected future age dependency ratio raises the saving rate by about 0.2-0.3 percentage points. Higher real GDP growth and better terms of trade are also strongly positively associated with the private saving rate, with a one percentage point increase in the economic growth rate, on average, implying an increase in savings of about 0.1-0.2 percent of GDP, while a 10 percent improvement in the terms of trade increases the saving rate by about 0.5 percent of GDP.

21.   The results suggest a partial but imperfect private sector offset to public savings. The coefficient on the public saving rate is negative and statistically significant (at the one percent level), but formal tests reject the Ricardian Equivalence hypothesis. Across specifications, a one percentage point rise in the public saving rate implies a reduction in private savings by

about 0.3-0.4 percent of GDP. Among other factors, there is no strong evidence of a statistically significant relationship between private savings and the deposit rate, inflation, and financial development in the panel estimations, though the coefficient on the autoregressive term is significantly positive, implying persistence in the private saving behavior.[6]

22.   Given the economic and demographic characteristics of Mauritius, its private saving rate is about 3 percent of GDP below potential. Benchmarking Mauritius' private saving rate using the estimates obtained from the panel regressions, the actual saving rate in recent years turns out to be about 3 percent of GDP lower than that predicted by the model. This is in contrast to the 1980s and 1990s, as well as the first half of the 2000s, when the actual private saving rate was, on average, higher relative to domestic fundamentals.

Figure 5. Mauritius: Actual and Predicted Private Saving (In Percent of GDP)

Source: IMF, *World Economic Outlook,* and IMF staff calculations.

Table 2. Mauritius: Private Saving Function in Emerging Market and Developing Countries, 1980–2017

	Ordinary Least Squares					Prais-Winsten				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Private saving (lagged)	0.817***	0.618***	0.612***	0.600***	0.615***	0.861***	0.625***	0.594***	0.589***	0.596***
	(0.020)	(0.034)	(0.038)	(0.032)	(0.030)	(0.016)	(0.034)	(0.039)	(0.032)	(0.030)
Public saving/GDP	-0.139***	-0.343***	-0.348***	-0.343***	-0.335***	-0.102***	-0.336***	-0.362***	-0.352***	-0.350***
	(0.026)	(0.044)	(0.041)	(0.040)	(0.039)	(0.021)	(0.043)	(0.042)	(0.041)	(0.040)
Real GDP growth	0.092***	0.172***	0.195***	0.169***	0.166***	0.080***	0.171***	0.197***	0.171***	0.169***
	(0.029)	(0.030)	(0.030)	(0.032)	(0.031)	(0.027)	(0.030)	(0.030)	(0.032)	(0.032)
Deposit rate	-0.008	-0.012**	-0.008	-0.011	-0.007	-0.007	-0.012**	-0.008	-0.011	-0.007
	(0.006)	(0.006)	(0.010)	(0.010)	(0.010)	(0.005)	(0.006)	(0.010)	(0.010)	(0.011)
Inflation			0.002	0.007	0.005			0.003	0.007	0.006
			(0.007)	(0.007)	(0.008)			(0.008)	(0.007)	(0.008)
Terms of trade change				0.050***	0.052***				0.050***	0.052***
				(0.012)	(0.013)				(0.012)	(0.013)
Private credit/GDP					-0.008					-0.009
					(0.014)					(0.014)
Old-age population ratio	-0.307***	-0.238	-0.212	-0.303	-0.343	-0.231***	-0.234	-0.220	-0.310	-0.358
	(0.100)	(0.346)	(0.379)	(0.380)	(0.378)	(0.078)	(0.341)	(0.395)	(0.389)	(0.394)
Proj. old-age dependency ratio	0.139***	0.172*	0.191*	0.216**	0.272**	0.107***	0.168*	0.200*	0.222**	0.287**
	(0.041)	(0.094)	(0.103)	(0.104)	(0.117)	(0.033)	(0.093)	(0.107)	(0.107)	(0.123)
Country-fixed effects	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Observations	2,557	2,557	2,357	2,240	2,159	2,557	2,557	2,357	2,240	2,159
Countries	110	110	110	107	107	110	110	110	107	107
Adjusted R2	0.731	0.763	0.774	0.783	0.795	0.795	0.768	0.762	0.776	0.783

Notes: Dependent variable is private saving in percent of GDP. Cols. [1]-[4] are estimated with the ordinary least squares method and cols. [5]-[6] are estimated with the Prais-Winsten method. All specifications include a constant term and a dummy variable equal to one for the global financial crisis years (2008-09). Mauritius is not included in the sample. Clustered standard errors are reported in parentheses. ***, **, and * indicate statistical signficance at the 1, 5, and 10 percent levels, respectively.

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[6] Restricting the sample to sub-Saharan African countries only, the results show that, on average, private savings respond strongly to several economic factors (the public saving rate, real GDP growth, change in terms of trade, and inflation), but not to demographic variables.

D. Conclusion

23.   The private saving rate in Mauritius has declined over the last decade, falling below its peer countries. The decline has contributed to a lower national saving rate and an increase in the current account deficit. Empirical analysis shows that private savings in Mauritius respond to the deposit rate as well as to economic growth, while the effect of demographic factors is statistically mute. Though, on average, there is no strong evidence of private savings offsetting public (dis)savings, the private saving behavior in Mauritius exhibits high persistence.

24.   Estimates show that the private saving rate in Mauritius is about 3 percent of GDP lower given its economic and demographic characteristics. While the private saving rate has been higher than potential for the most part of the sample, it has been consistently below potential by about 3 percent of GDP over the last decade. While economic growth would boost private savings, a rapidly rising old-age dependency ratio requires a higher level of savings to alleviate fiscal pressures and avoid abrupt policy adjustments in the future. In this regard, efforts should focus on generating greater public awareness and encouraging private savings—e.g., through old-age related saving schemes. Better targeting of social benefits and broader pension reforms (including increasing the contribution rates of employees and introducing mandatory contributions for the self-employed) could also help to boost savings.

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