MOROCCO

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INTERNATIONAL MONETARY FUND

MOROCCO

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CONTENTS

FISCAL MULTIPLIERS IN MOROCCO[1]

A. Introduction

1.   Interest in estimating the size of the fiscal multiplier in Morocco has surged in recent years, as the country has experienced several exogenous shocks, including from the fiscal sector. The overall fiscal deficit in Morocco declined from a peak of 7.3 percent in 2012 to 4.9 percent of GDP in 2014, due in part to exogenous factors. This has revived interest in understanding the impact of fiscal shocks, particularly from government expenditure, on aggregate demand as the adjustment has been tilted towards government consumption. Estimating the fiscal multiplier, defined as the change in the real GDP caused by one unit increase in government consumption arising from exogenous shocks, helps address some of these questions.

2.   The magnitude of the fiscal multiplier may depend on the transmission and the dynamics of the shocks to the economy. To better understand the size of the fiscal multiplier, it may be necessary to better comprehend the relationship between key macroeconomic variables in both the short and long run. Changes in government expenditure could induce long-run and/or short-run effects on the economy; long-run effects tend to impact the steady equilibrium of the economy, while short-term effects only affect the cyclical components of macroeconomic variables, which implies that these effects are short lived.

3.   This note follows a three-step process toward assessing the impact of government spending shocks on output. First, it provides stylized facts on the long-run correlations between key macroeconomic variables. Second, it assesses the short-run effects of government consumption using VAR techniques (specifically, the Blanchard and Perotti (2002) structural identification methodology). Finally, it assesses the size of the fiscal multiplier, using impulse response functions. The note is organized as follows: section B briefly reviews long-run stylized facts; section C presents the methodology used to analyze the short-run effects of government consumption; section D presents the short-term stylized facts; section E describes the impulse response analysis; section F discusses the size of fiscal multipliers in Morocco; and, section G concludes.

4.   The analysis suggests that the government consumption multiplier in Morocco is relatively small. However, its size falls within the range expected for emerging economies. The transmission channels of transitory shocks seem weak as the co-movement among macroeconomic variables is weak in the short run. In contrast, permanent adjustments of government consumption could have long-lasting effects on economic activity.

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[1] Prepared by Jean Frédéric Noah Ndela Ntsama.

B.   Long-Term Stylized Facts

5.   The long-run stylized facts focus on correlations between key macroeconomic variations, abstracting from cyclical movements. We filtered the data using a Hodrick-Prescott filter to eliminate short-run volatility, and then calculated the correlations among the trend components of the variables.[2] Table 1 (below) shows some basic, long-run correlations among key macroeconomic variables.

Table 1. Morocco: Long-Run Correlations							
	Real GDP	Agriculture GDP	Non-Agriculture GDP	Government consumption	Reel effective Exchange rate	Trade balance	Central government debt
Real GDP	1.0						
Agriculture GDP	0.86 (12.25)	1.00 -----					
Non-Agriculture GDP	0.98 (32.65)	0.72 (7.70)	1.00 -----				
Government consumption	0.99 (58.83)	0.79 (9.43)	0.99 (67.76)	1.00 -----			
Reel effective Exchange rate	-0.98 (-35.39)	-0.84 (-11.59)	-0.96 (-24.31)	-0.97 (-28.26)	1.00 -----		
Trade balance	-0.90 (-15.11)	-0.98 (-40.51)	-0.78 (-9.26)	-0.84 (-11.55)	0.86 (12.34)	1.00 -----	
Central government debt	0.93 (18.87)	0.61 (5.68)	0.99 (46.02)	0.97 (28.97)	-0.90 (-15.54)	-0.69 (-7.01)	1.00 -----

Source: IMF staff estimates and projections.

6.   The transmission channel of permanent shocks appears strong as macroeconomic variables co-move along the growth path. Correlations among real variables are high in the long run. The GDP is particularly correlated with most variables in the long run, with the coefficients of correlation generally close to 0.9, while the relationship is almost one-to-one between real GDP and non-agricultural GDP. This suggests a strong co-movement along the growth path, which could imply more persistent effects from permanent shocks, specifically supply shocks.

7.   Moreover, permanent adjustments of government consumption could have long-lasting effects on economic activity. In the long run, government consumption is positively correlated with all the macroeconomic variables, with the exception of trade balance and the real exchange rate. This strongly positive relationship could be a result of the framework of government consumption (such as wages and social benefits) and the transfer system to local collectivities or

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[2] In the Hodrick-Prescott filter, the parameter λ equals to the ratio of the volatility of the cycle component over the volatility of the trend. For emerging economies, the trend could generally be more volatile than in developed economies (see Aguiar and Gopinath, 2007), which might require a value of λ lower than the 1600 (calibrated for US quarterly data). However, given the smooth path of Morocco variable, the trend seems stable with a low standard deviation, thus we use $\lambda = 1600$.

public entities. However, the strongly negative correlation between the government spending, the trade balance and the real exchange rate indicates possible dampening effects to permanent government consumption shocks. The dampening effects from the trade account are driven by leakages. The long-run correlation between government spending and real exchange rates suggest that permanent government consumption shocks could play an important role in long real exchange rate movements.

C.   Short-Term Stylized Facts

8.   The short-run stylized facts focus on co-movements of cyclical movements of key macroeconomic variables. Empirical methodologies in the literature on business cycles require the removal of trend from macroeconomic variables through the first difference technique.[3] To obtain a comprehensive picture on short-term fluctuations, we estimate a vector autoregression (VAR) model including GDP, non-agricultural GDP, government consumption, trade balance, and the real effective exchange rate. We then augment the VAR with nominal variables, specifically inflation and the money market interest rate, in order to capture the relationship between nominal and real variables. We compute the VAR-based autocorrelation functions (ACFs),[4] over a horizon period of 20 quarters, to assess the persistence and co-movements among macroeconomic variables in the short run (Figure 1).[5]

9.   In contrast to the findings on permanent shocks, the transmission channels of transitory shocks seem weak, despite the large fluctuations. Fluctuations in real variables are particularly large at the end of the sample period—with substantially large amplitudes between peaks and troughs—characterizing a period during which Morocco experienced severe exogenous shocks. Similarly, there are high frequency fluctuations in the government consumption, which exhibit large swings from strong policy action to contain wage bill and to reform subsidies particularly toward the end of the sample period. Although the "cyclical components" of macroeconomic variables display large fluctuations, their correlations seems to be low, suggesting that the transmission mechanism is weak.

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[3] There are three leading approaches for removing trend from macroeconomic time series: de-trending using a linear trend, differencing, and filtering (the most common used filters are the Hodrick-Prescott (H-P) filter and the Band Pass (B-P) filter) (see Canova, 2007, or Dejong and Dave, 2007). In this analysis, we obtain the cyclical component through differencing technique primarily because we are interested on the growth impact, which could easily be connected to the macro outlook analysis.

[4] Note that a vector autoregressive model VAR (p) specified for an *m x 1* vector has a companion form $z_t = Az_{t-1} + e_t$. The sth-order covariance matrix is given by $\Gamma(s) = A^s \Gamma(0)$, where $\Gamma(0) = E(z_t z_t')$ is the contemporaneous variance-covariance matrix of z_t, which satisfies $\Gamma(0) = A\Gamma(0)A' + \Sigma_e$, and to which the solution is given by $vec[\Gamma(0)] = [I - A \otimes A]^{-1} vec[\Sigma_e]$, where $\Sigma_e = E(z_t z_t')$ (see Hamilton, 1994). The correlations are obtained by normalizing the variances and cross-covariances by the variances.

[5] On Figure 1, $\Delta LnGDP_t$ stands for the Log difference of the real GDP, $\Delta LnNGDP_t$ for the Log difference of the non-agriculture real GDP, $\Delta LnGC_t$ the Log difference of the government consumption, TB_t/GDP_t the trade balance to GDP ratio, π_t the inflation rate, i_t the nominal interest rate, and $\Delta LnREER_t$ the Log difference of real effective exchange rate.

10.   Moreover, the growth rate of government consumption displays weak correlation, including in the leads and lags. The correlation between (the growth rates of) real GDP and government consumption is about 0.3 at its peak, but becomes close to zero in the very short-run horizon. The correlation between government consumption and the trade balance is negative and appears to be important in the first quarter. The government consumption is also negatively correlated with inflation. However, the correlation between the interest rate and the real exchange rate appears positive.

## D.   Structural VAR: Methodology

11.   The empirical methodology used to estimate the impact of government spending shock on key macroeconomic variables is the following:

- A structural VAR is needed as it enables us to identify fiscal shocks. This is important because fiscal policy requires some time to respond to news about the economy. Structural identification rests on the assumption that fiscal policy shocks affect output through wealth effects, intertemporal substitution, and distortions.

- Using the empirical approach based on quarterly data utilized by Ilzetzki and others (2013) and the Blanchard and Perotti (2002) structural identification methodology, we estimate the SVAR on the Log difference of the government consumption $(\Delta LnGC_t)$, the Log difference of the real effective exchange rate $(\Delta LnREER_t)$, the trade balance to GDP ratio (TB_t / GDP_t), and the Log difference of the real GDP $(\Delta LnGDP_t)$.[6]

- We then use the SVAR impulse functions to estimate the size of fiscal multipliers for Morocco and to explore the relevant factors that could explain their magnitude.

- We complement the analysis of SVAR with Bayesian impulse responses of the observable macroeconomic variables following a one-off temporary change in government consumption.

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[6] We conduct a series of test on the VAR representation. The VAR satisfies the stability condition since all its roots lie inside the unit circle. The maximum number of lags, three, introduced in the VAR model was determined using the sequential modified likelihood ratio test, and the Akaike and Schwarz based lower maximum likelihood criteria. The Portmanteau autocorrelation test, the normality test, and the White heteroskedasticity test performed on the residuals also confirm this VAR representation.

Figure 1. Morocco: VAR-Based Cross-Correlations Between Morocco Key Macroeconomic Variables
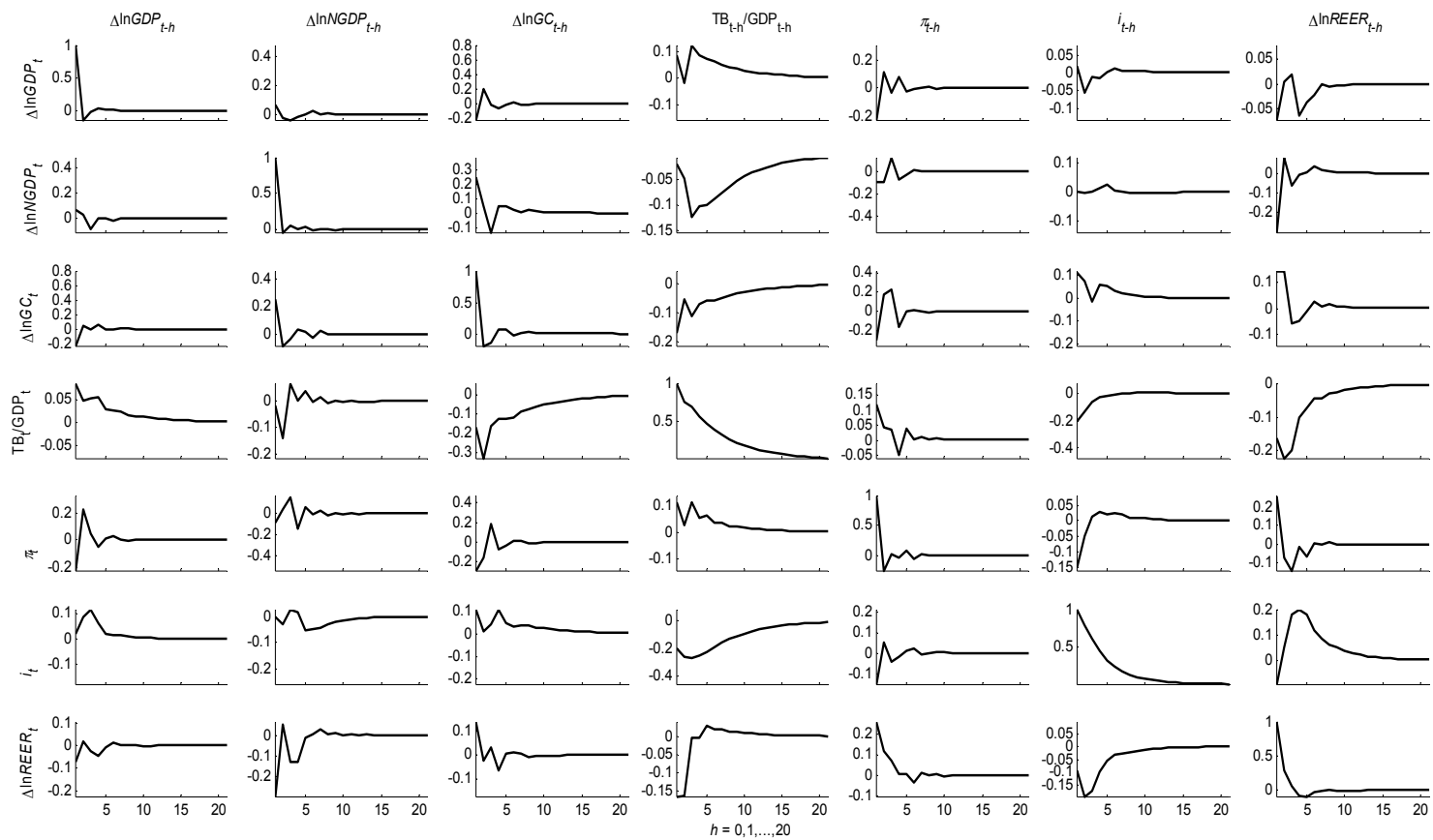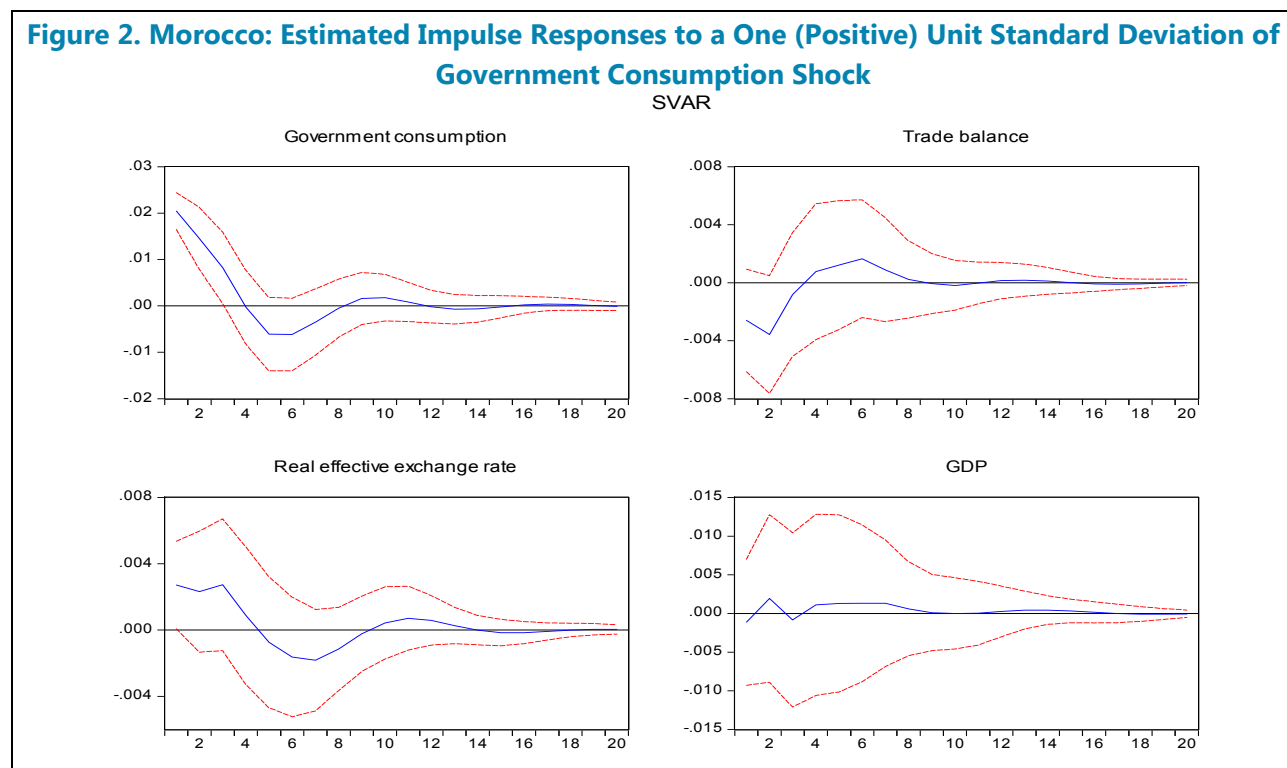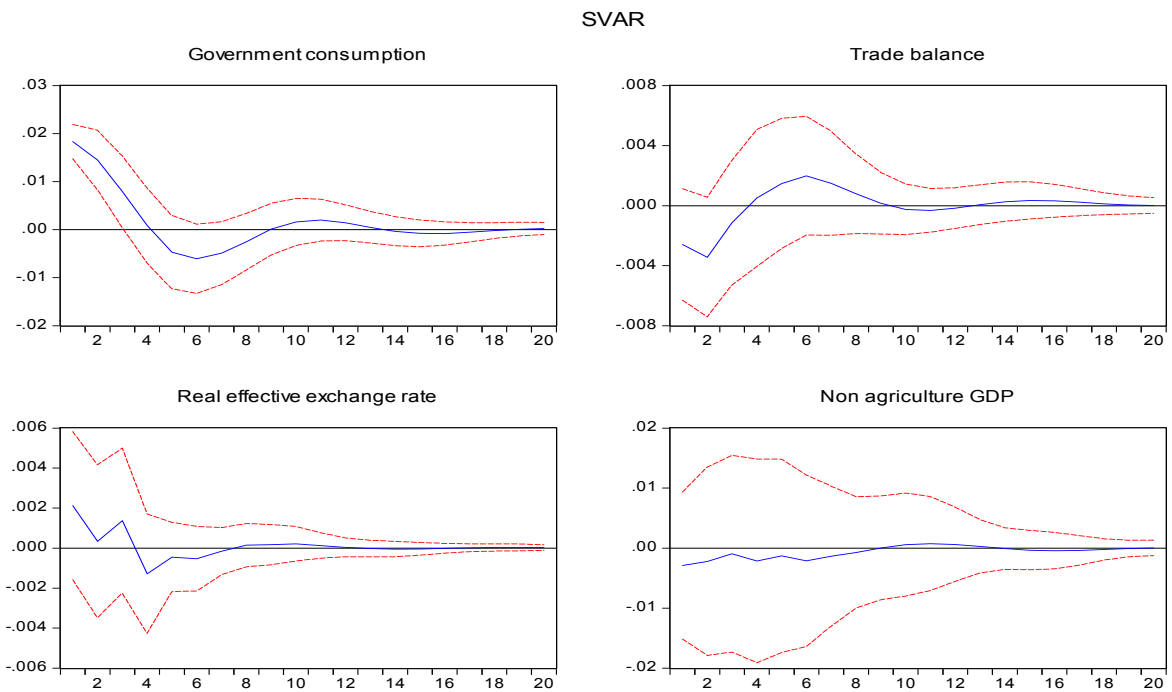
E. Impulse Response Analysis

12.   The impulse response analysis focuses on the response of the economy to an exogenous shock to government consumption, as most of the fiscal adjustment has fallen on consumption. It also helps to examine the dynamic properties of our model, check its stability, and identify the variables that might display complex and interesting dynamics; for example, by undershooting or overshooting their steady state values. The magnitude of the government consumption shock is set to a one (positive) unit standard deviation of the exogenous shock. The figure below shows the response of the trade balance, real effective exchange rate, and the real GDP from a SVAR estimated on the full sample.

13.   The findings suggest that a government consumption shock has a weak impact on most macroeconomic variables, particularly real GDP. A positive government consumption shock increases real GDP by less than 0.005 percent. Moreover, the effect is short lived since it dies out completely after eight quarters. However, the government spending shock would worsen the trade balance and lead to real appreciation. The trade balance worsens initially by about 0.004 percent, while the real effective exchange rate appreciates significantly by the same magnitude. To some extent, the weak cross-correlation between real GDP and government consumption (growth rates) in the short run could echo the similarity that emerges from their impulse responses to exogenous shocks.

Figure 2. Morocco: Estimated Impulse Responses to a One (Positive) Unit Standard Deviation of Government Consumption Shock

Figure 2. Morocco: Estimated Impulse Responses to a One (Positive) Unit Standard Deviation of Government Consumption Shock (concluded)

SVAR

Government consumption

Trade balance

Real effective exchange rate

Non agriculture GDP

Note: The figure plots the median (blue line) impulse response together with the 5th and 95th percentiles (red lines). The horizontal axis represents the horizon in quarters, while the vertical axis gives the percentage deviation from the balanced growth path or steady state.

Bayasian VAR

Government consumption

Trade balance

Real effective exchange rate

GDP
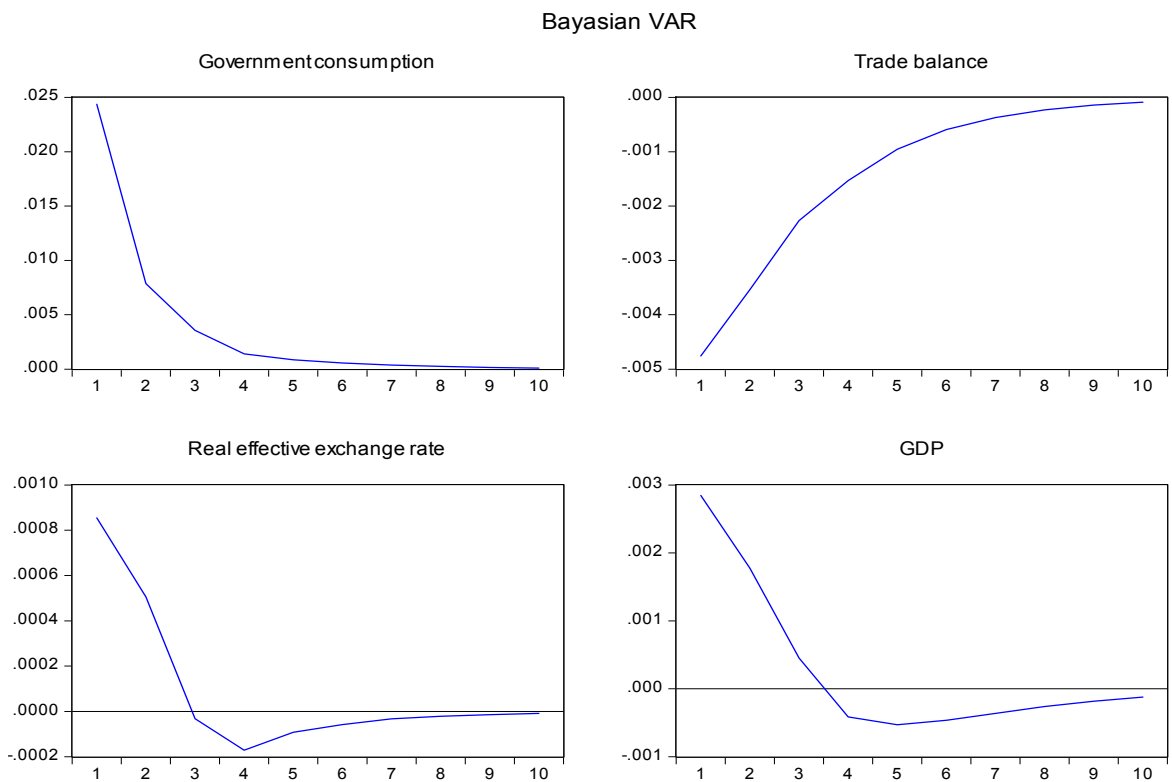
14.   The propagation of the government spending shock using a Bayesian VAR unveils identical patterns. However, with Bayesian behaviour, unanticipated government consumption shocks seem to have relatively larger effects.

F.   Size of Fiscal Multipliers

15.   In this section, we focus on the impact multiplier—that is, the change in the GDP at the moment the impulse to the government consumption occurs—**and the cumulative multiplier**—the change in the GDP over the period the impulse to government consumption vanishes.

16.   On average, fiscal multipliers for Morocco are relatively small: the average impact multiplier varies between 0.095 and 0.3, while the cumulative multiplier is estimated around 0.6.[7] By their size, fiscal multipliers in Morocco are not significantly different from estimates for emerging economies (see table below). The magnitude of the fiscal multipliers could be affected by several factors, including the degree of exchange rate flexibility, the openness of the economy, the monetary policy stance, and the public debt level. Household behaviors are critical in determining the size of fiscal multipliers. Specifically, the high propensity to consume and import foreign goods dampens the impact of a government spending shock on the real GDP, as significant leakages exist. Overall, the analysis tends to suggest that a well-designed fiscal consolidation (for instance, one tilted toward public consumption) would reduce public debt with a limited contractionary effect on growth.

G.   Conclusion

17.   There are strong correlations among real variables in the long run, but Morocco's macroeconomic variables display low persistence and co-movements in a very short-run period. The transmission channels of transitory shocks seem weak as the co-movement among macroeconomic variables is weak in the short run. In contrast, permanent adjustments of government consumption could have long-lasting effects on economic activity.

18.   Government consumption shock has a weak impact on most macroeconomic variables, particularly real GDP. Government consumption shocks would worsen the trade balance, lead to real appreciation, and raise output. While the impacts on the trade balance and real effective exchange rate are statistically significant, the impact on real GDP appears limited. However, with Bayesian behaviour, unanticipated government consumption shocks seem to have relatively larger effects

19.   The government consumption multipliers in Morocco are relatively small. However, their size falls within the range expected for emerging economies.

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[7] We use a rolling window SVAR (40 observations) and obtain to multiplier for each sub-period, then calculate the average. The idea is that Moroccan economy undergoes significant structural changes, which affect the transmission of shocks including the fiscal multipliers.

Table 2. Morocco: Comparison of the Size of Multipliers with the Literature

Countries	Model	Variables	S-T Multipliers	L-T multipliers 1/
Gulf Council Countries	Panel models	total expenditure	0.2 - 0.3	0.4 -0.7
Espinoza and Senhadji, 2011		capital expenditure	0.2 - 0.3	0.6 - 1.1
		current expenditure	0.2 - 0.3	0.3 - 0.7
22 developing countries	Panel SVAR	Developing countries dummy	-0.2	0.2
Ilzetzki, Mendoza, and Vegh, 2010		Exchange rate	0.1	1.5
		openness (exports + imports)	-0.3	-0.7
Emerging economies	VARs	total expenditures	0.1 - 0.2	0
IMF, WEO, 2008				
G-20 Countries		capital expenditure	0.5 - 1.8	
IMF, G-20 note, 2008		current expenditure	0.3 - 1.0	
Emerging Asia	Structural	capital expenditure	0.7	0.8
Freedman et al, 2008	model	transfers	0.4	0.2

1/ cumulative over three years.

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Canova, F., 2007. Methods for Applied Macroeconomic Research. Princeton, NJ: Princeton University Press.

Dejong, D. and Dave, C., 2007, Structural Macroeconometrics, Princeton, NJ: Princeton University Press.

Hamilton, J. D., 1994. Time Series Analysis. Princeton. N.J.: Princeton University Press.

Ilzetzki, E., Mendoza, E., Vegh, C.A., 2013. "How Big (Small?) are Fiscal Multipliers?" Journal of Monetary Economics 60, pp. 239–254.

EFFICIENCY OF PUBLIC SPENDING ON EDUCATION IN MOROCCO[1]

A. Introduction

1.   Youth unemployment in Morocco is among the highest in the MENA region, despite active policies to address this issue. As a senior Moroccan official observed: "Besides the risk of political unrest, the worst effect is the loss of human capital associated with the under-utilization of human resources. As the lack of access to income is the main driver of poverty, we may see an increase in inequality."[2]

2.   Education quality and skill mismatches are widely recognized as impediments to the youth population gaining a foothold in the labor market. The unemployment rate has remained high, particularly among the youth and graduates. The country's education standards, as measured by the score of Moroccan students at international tests, are among the lowest in the MENA region. Dropout rates are still high, and 72 percent of all students leave the education system without any qualification. The majority of Moroccan students choose to follow studies in social sciences at the expense of technical sciences, engineering, and business. This reflects a need to strengthen the general level of early education in order to prepare Moroccan students for the higher education qualifications that are conducive to jobs.

3.   Public spending on education in Morocco is high compared to other countries and accounts for a substantial share of the budget. Government spending in education in 2014 was about 5.9 percent of GDP and 21.3 percent of total government spending. It has been increasing by more than 5 percent per year, almost every year from 2002. Given the stark contrast in Morocco between high education spending and poor educational outcomes and unemployment, it appears crucial to improve the efficiency of the public spending is this area.

4.   This paper aims to help tackle youth unemployment by focusing on the efficiency of public spending on education, and provide policy recommendations. Section B provides stylized facts on the Moroccan labor market, education, and public spending in this sector. Section C analyzes the efficiency of public spending in education across countries, and identifies a gap in the case of Morocco. Finally, Section D identifies variables that explain this gap and derives measures for closing the efficiency gap to reach higher education standards and, subsequently, a stronger, broader Moroccan workforce.
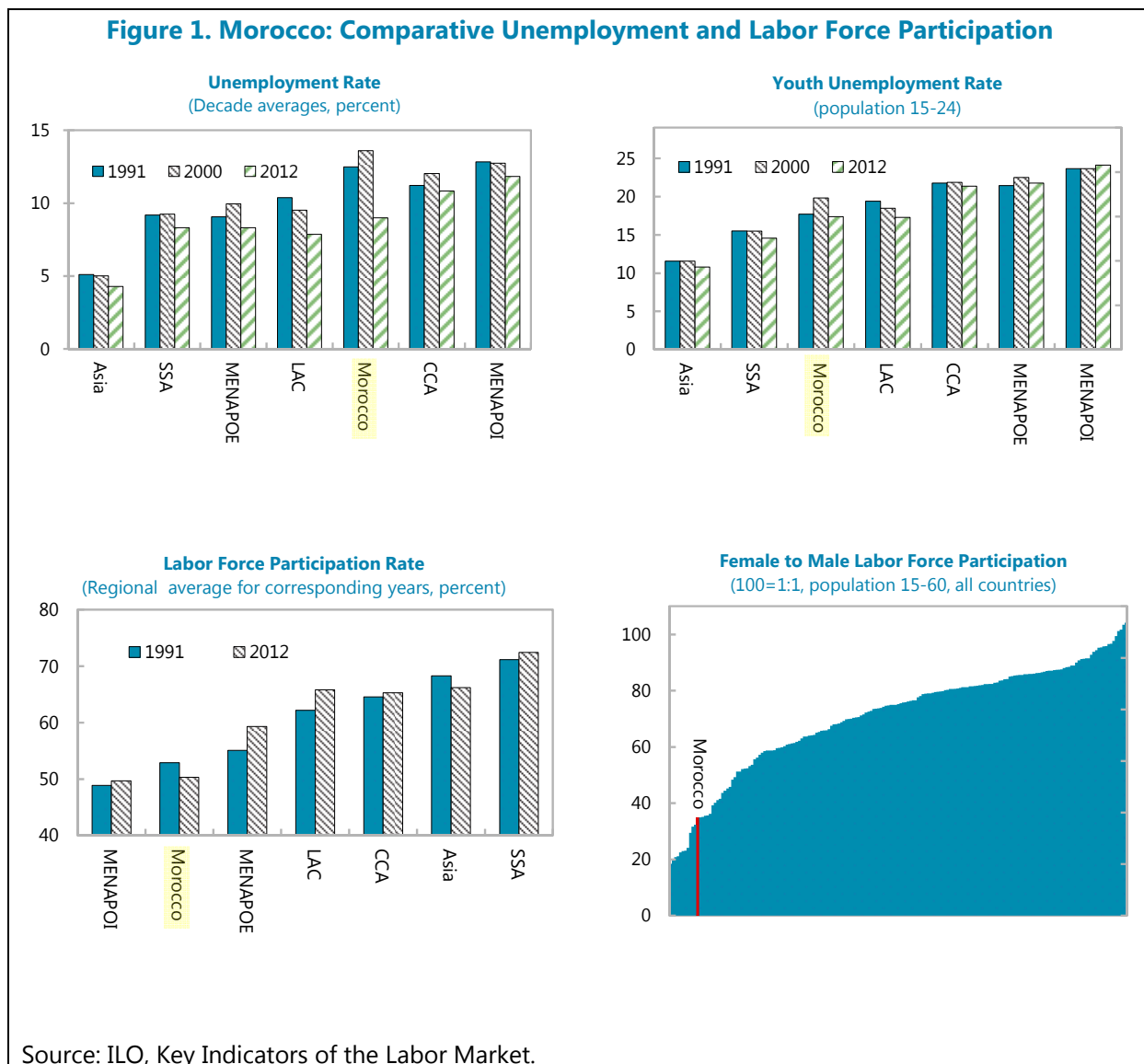
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[1] Prepared by Gregory Auclair and Dominique Fayad.

[2] Abdeslam Seddiki, Minister of Labor and Social Affairs in Morocco, Interview" 'In Morocco, youth unemployment is driving up inequality," The Guardian, August 20, 2014.

B. Labor Market, Education, and Public Spending in Morocco

Labor market

5.   The unemployment rate has decreased considerably since 1990 but remains elevated, particularly among the youth. The overall unemployment fell below the oil importers countries average in the region. However, the level is still high, at 10.1 percent in Q3 2015, and major groups are still excluded from this trend. Youth unemployment remains steadily above 15 percent and female participation in the labor force remains below other emerging regions (Figure 1).

Figure 1. Morocco: Comparative Unemployment and Labor Force Participation

Source: ILO, Key Indicators of the Labor Market.

6.   The structure of employment in Morocco has not changed significantly in the past decade (Figure 3). The key characteristics are:

- **Employment is dominated by the private sector**, with a limited share of the secondary sector.

- **The urban unemployment rate remains steadily above 14 percent** and is particularly high among the highly educated population. Long-term unemployment remains a problem; more than 60 percent of the country's unemployed have been out of work for more than 12 months.

- **Youth, and particularly those in urban areas, are the most stricken by unemployment,** with the unemployment rate for that group at 21.4 percent in Q3 2015, against 20.1 percent in 2014. Moreover, the unemployment figures may underestimate the size of youth unemployment in Morocco as it is characterized by a high level of discouragement, as the Diagnosis for the New National Strategy for Employment emphasizes.

- **The population with the highest level of education tends to be more unemployed** compared to people with a middle-level education and people without a high school diploma. It reached 18.1 percent in Q3 2015 compared to 4 percent for the population without a diploma. Moreover, the labor market participation rate of those who are highly educated has been decreasing.

- **Women are massively excluded from the labor force and experience large inequalities in opportunities** (Figure 2).[3] Despite measures to improve women's rights and reduce gender inequalities, women largely remain excluded from economic participation and opportunity, educational attainment, political empowerment, and health and survival.
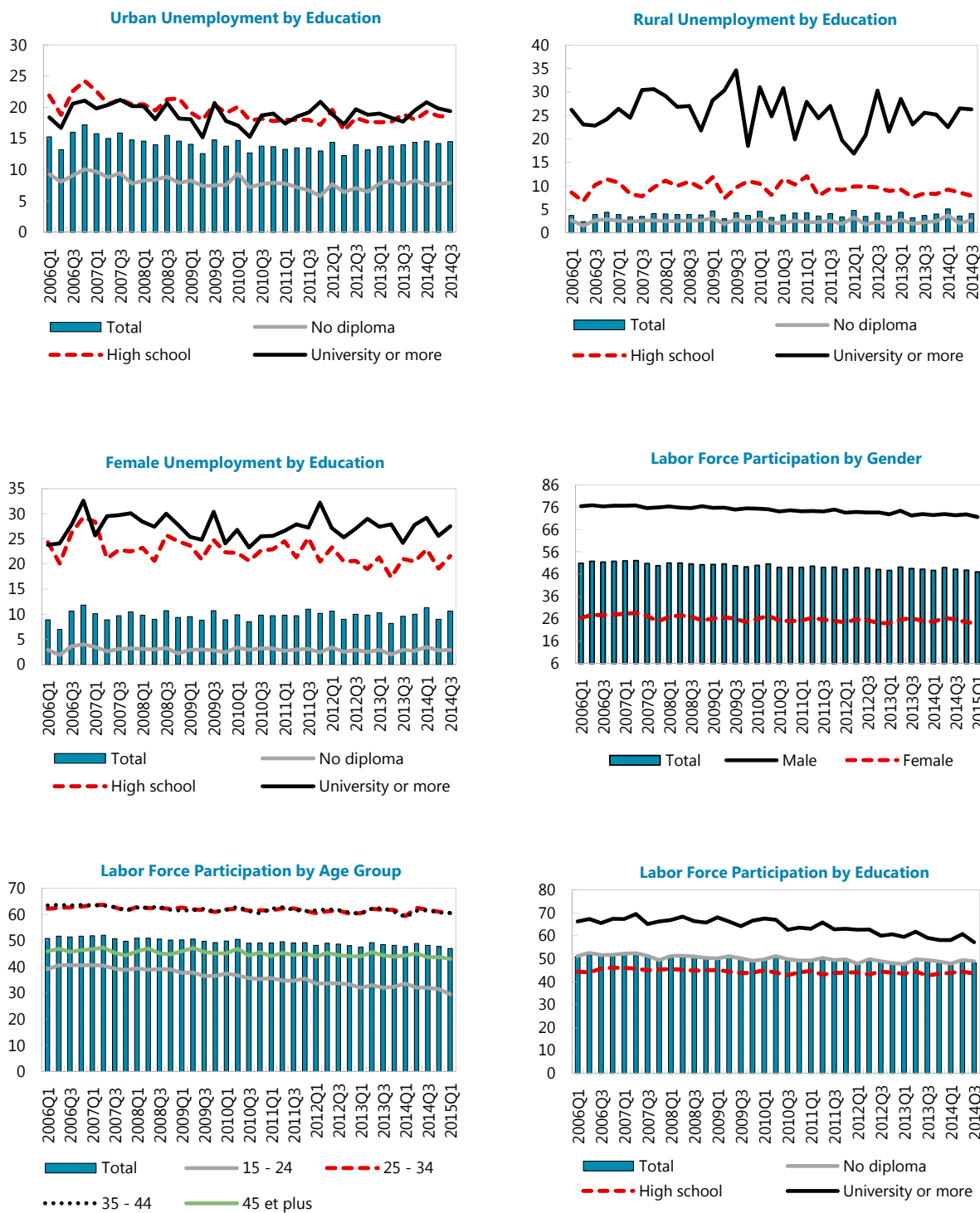
Figure 2. Morocco: Global Gender Gap Index, 2006–13

(composite index, 1=greater equality)

Source: World Economic Forum *Global Gender Gap Report (2013)*.

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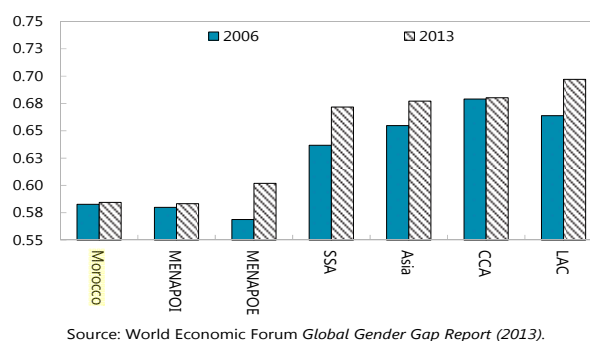
[3] The gender gap index can be interpreted as the percentage of the inequality between women and men that has been closed. The index is built on four groups of variables: economic participation and opportunity, educational attainment, political empowerment, and health and survival, among 130 countries.
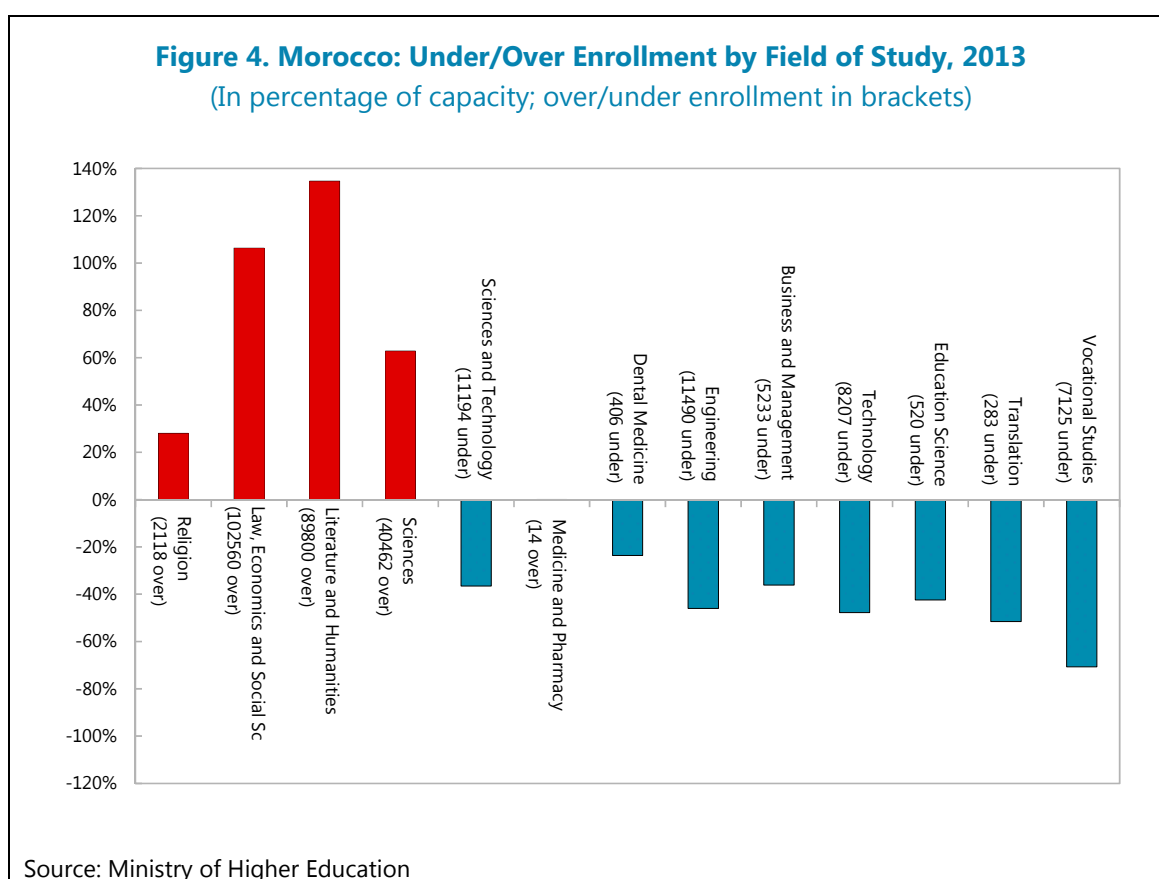
Figure 3. Morocco: Unemployment and Labor Force Participation, 2006–14

Urban Unemployment by Education

Total — No diploma
----- High school — University or more

Rural Unemployment by Education

Total — No diploma
----- High school — University or more

Female Unemployment by Education

Total — No diploma
----- High school — University or more

Labor Force Participation by Gender

Total — Male ----- Female

Labor Force Participation by Age Group

Total — 15 - 24 ----- 25 - 34
······· 35 - 44 — 45 et plus

Labor Force Participation by Education

Total — No diploma
----- High school — University or more
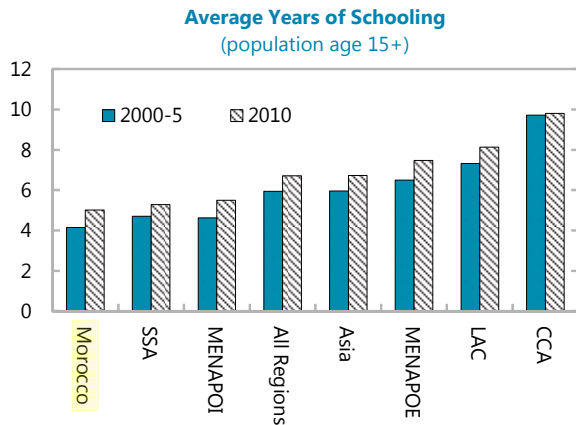
Source: Haut-Commissariat au Plan du Maroc.

Education

7.   Although the enrollment in education has improved, it remains below regional average and other developing regions, and the quality of education is lagging behind other countries as revealed by the scores of Moroccan students in sciences and mathematics. The results of Moroccan students remained below other countries and worsen, as shown by the PILRS reading and literacy test, and the TIMSS test, mathematics and sciences, in 2001 and 2011 (Figure 5). Moreover, from 2000 to 2012, 248 thousands of students dropped-off from school on average every year and 72 percent left school without qualification.[4] As a result, the majority of Moroccan student choose to follow studies in social sciences at the expense of technical sciences, engineering and business where the number of registration exceed universities' capacity, as shown by capacities in Moroccan universities (Figure 4). This reflects the need to strengthen the general level of early education in order to prepare Moroccan pupils for university studies conducive to jobs.
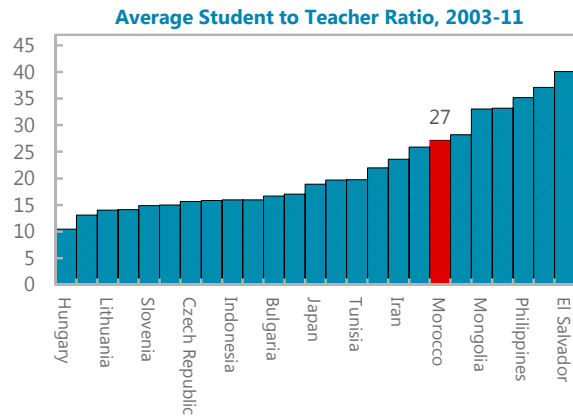

Figure 4. Morocco: Under/Over Enrollment by Field of Study, 2013
(In percentage of capacity; over/under enrollment in brackets)

Source: Ministry of Higher Education

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[4] Conseil Supérieur de l'Éducation, de la Formation et de la Recherche Scientifique, « La Mise en Œuvre de la Charte Nationale d'Education et de Formation 2000-2013, Acquis, Déficits et Défit », December 2014.
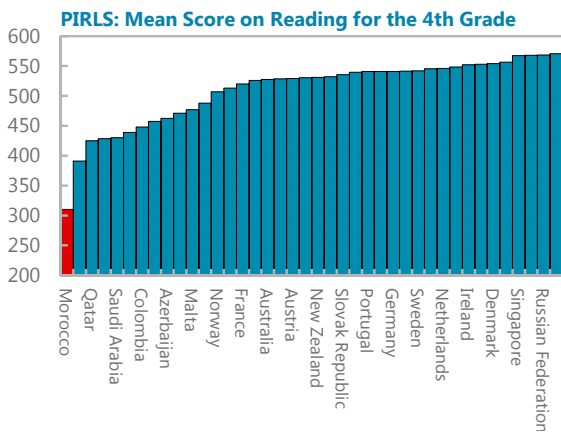
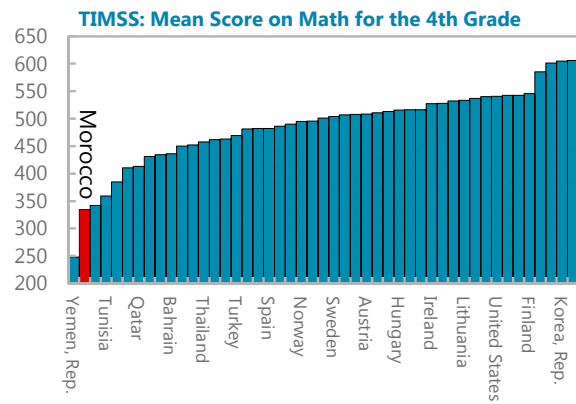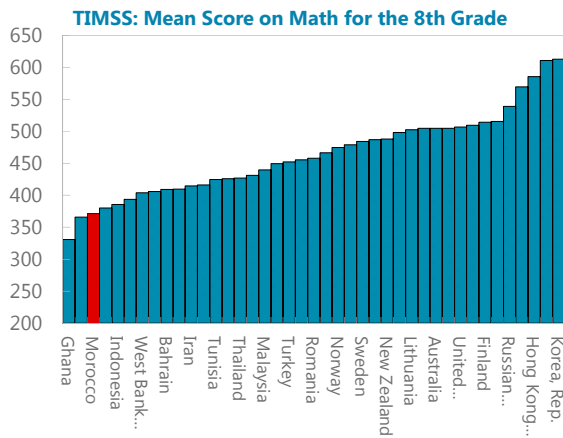# Figure 5. Morocco: Comparative School Indicators and Test Outcomes

Average Years of Schooling
(population age 15+)

Source: Barro-Lee Dataset.

Average Student to Teacher Ratio, 2003-11

Sources: UNESCO; and IMF staff estimates.

PIRLS: Mean Score on Reading for the 4th Grade

Source: 2011 PIRLS

TIMSS: Mean Score on Math for the 4th Grade

Source: 2011 TIMSS

TIMSS: Mean Score on Math for the 8th Grade

Source: 2011 TIMSS

TIMSS: Mean Score on Science for the 8th Grade
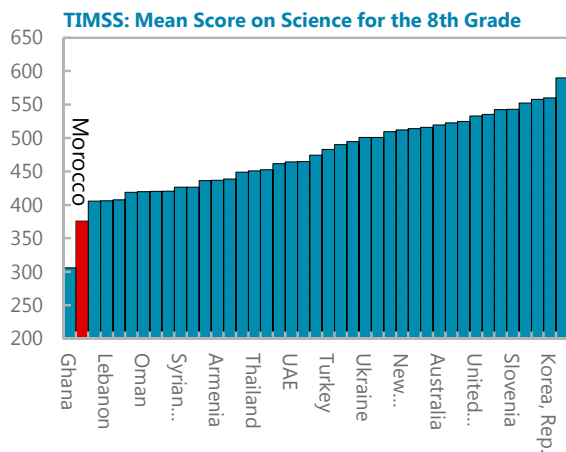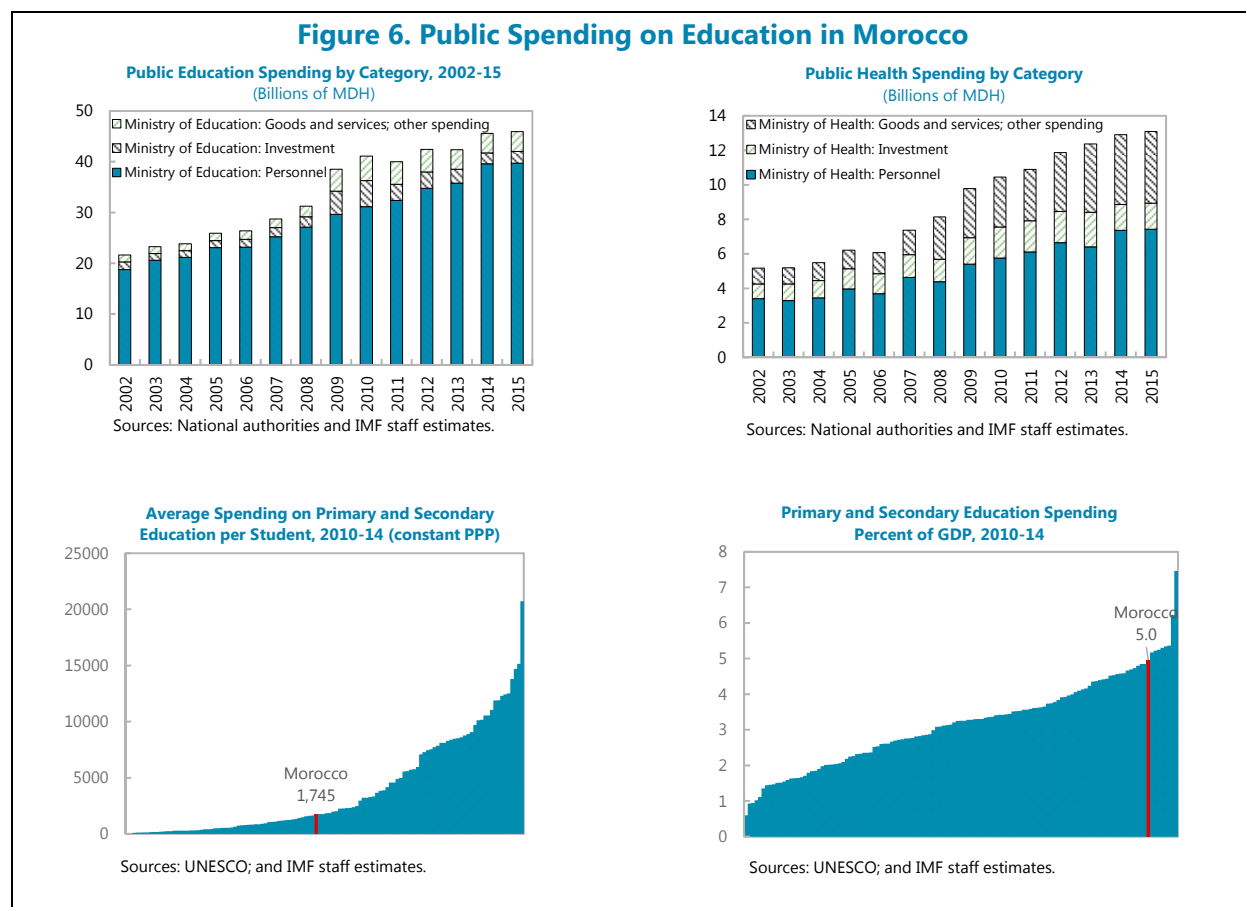
Source: 2011 TIMSS

8.   Cross-country comparisons can be distorted by high absenteeism rates in some countries and mean scores may be overestimated. Morocco registers the second highest level of student absenteeism among the countries in the TIMSS panel suggesting that the Moroccan scores could be even lower (Figure 8).

9.   Multiple causes of youth unemployment are identified in the literature.[5] In particular, insufficient decent-job creation in the private sector, and the inadequate skills supply by the education system are major hindrances to youth accessing the labor market.

Public Spending in Education

10.   Public spending on education has increased steadily since 2005 and is now among the highest in percentage of GDP (Figure 6). However, the public spending in primary and secondary education per student is relatively low, as the youth represents a large share of the Moroccan population. Although, regional disparities in school infrastructure and education services are important, the regional budget allocation in pre-graduate education has remained stable across regions since 2006.

Figure 6. Public Spending on Education in Morocco

Public Education Spending by Category, 2002-15
(Billions of MDH)

Ministry of Education: Goods and services; other spending
Ministry of Education: Investment
Ministry of Education: Personnel

Sources: National authorities and IMF staff estimates.

Public Health Spending by Category
(Billions of MDH)

Ministry of Health: Goods and services; other spending
Ministry of Health: Investment
Ministry of Health: Personnel

Sources: National authorities and IMF staff estimates.

Average Spending on Primary and Secondary Education per Student, 2010-14 (constant PPP)

Morocco
1,745

Sources: UNESCO; and IMF staff estimates.

Primary and Secondary Education Spending Percent of GDP, 2010-14

Morocco
5.0

Sources: UNESCO; and IMF staff estimates.

11.   Although, government spending per primary student increased in Morocco from 2001 to 2011, the average score of Moroccan students worsened over this period. The relationship

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[5] AfDB, Diagnostic de Croissance au Maroc, Agénor OCP.

between public spending and scores at TIMSS and PIRLS for 4th Grade students in 2001 and 2011 shows that public spending in education per student increased in most countries and many countries improved the efficiency of public spending in this area. Indeed, the dispersion of public spending per student decreased and more countries scored above 400 in 2011. However, Morocco's average score fell to about 300 over this time period, despite an increase in public spending per student.

C.   Efficiency Frontier Approach

12.   The stylized facts for Morocco show that enrollment rate increased in the past year but the score of Moroccan students worsen. The literature on efficiency of public spending in education applies an input/output approach using non-parametric and parametric techniques by taking public expenditures in education as input and gross enrollment rate in primary and secondary schools as output.[6] Consequently, the contribution of this study is to assess the efficiency of public spending in education using indicators of students' performance (PIRLS and TIMSS) in order to assess the efficiency in terms of the quality of the outcome rather than a quantitative objective.

13.   The literature is not conclusive on the relationship between public spending in education, level of development and enrollment rate. Herrera and Pang (2005) use public expenditures as an input and gross primary enrollment and completion rates as outputs and find a positive relationship between expenditure and the level of economic development. Gupta and Verhoeven (2001) use a Free Disposal Hull (FDH) technique to assess the education sector's performance by taking expenditure in purchasing power parity (PPP) terms as an input and gross enrollment rates in primary and secondary schools as outputs. The authors note that adding GDP per capita lowers or cancels the significance of the impact of expenditure on educational output and conclude that African countries are less efficient than countries in Asia and in the Western Hemisphere. Gupta and others (2007) use a Data Envelop Analysis (DEA) to evaluate the efficiency of education and health expenditure. By taking public expenditure on education in PPP terms as an input and primary net enrollment and youth literacy rates as output, they find no clear relationship between income per capita and the efficiency of education spending. The performance of poor countries varies widely, depending on the output indicator. Jayasuriya and Wodon (2003) use a SFA to estimate health and education efficiency frontiers using the primary enrollment rate as the output variable and real GDP per capita, adult illiteracy, and education expenditure per capita (private and public) as input variables. The findings show that neither education expenditure nor regional differences have a statistically significant impact on net primary enrollment.

14.   The two main methodologies used in the literature to assess the efficiency of public spending on education have advantages and drawbacks and we favor the Stochastic Frontier Analysis (SFA). The SFA has the advantage to estimate the inefficiency term but imposes constraints

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[6] Gupta and Verhoeven (2001), Herrera and Pang (2005), Gupta and other (2007), Jayasuriya and Wodon (2003).

on the production function. The non-parametric methods do not isolate the error term which becomes part of the inefficiency and are extremely sensitive to the presence of outliers.[7] We chose the parametric approach by estimating a SFA for the reasons above and to keep constancy with the assessment of the Fiscal Affairs Department.[8] We use, as control variables:[9]

- The Gini index to control for countries' income inequalities as lower revenues are an obstacle to school attainment (opportunity cost),

- The population density to control for regional disparity in accessing education infrastructures that is higher in urban areas,

- The number of books at home to control for socio-economic determinants, it is used as a proxy for adult literacy and parents' education level.

15.   The results of the frontier analysis, based on a stochastic frontier analysis, confirm that the inefficiency of public spending in education is large in Morocco. Morocco ranks third in terms of inefficiency gap, starting from the fifth worst level in education quality. This suggests large potential efficiency gains that we determine in the next section (Figure 7).

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[7] Griogli 2014.

[8] Grigoli, F., and Kapsoli, J.

[9] We apply the SFA on a panel of 44 countries. We assume a normal/half normal distribution of errors. The dependant variable is the 8th grade TIMSS scores averaged across math and sciences available for 2003, 2006, 2011. The explanatory variable is the logarithm of educational expenditure in primary and secondary education per student (USD PPP basis), average for the 4 preceding years. Above 8000 USD PPP of public spending per student, countries face decreasing marginal returns, therefore, we drop these countries from the sample in order to estimate the maximum efficiency gains Morocco can achieve by closing the gap with the frontier. We apply a SFA on the 8th grade TIMSS scores averaged across math and sciences and the public expenditures in primary and secondary education per student (USD PPP basis), average for the 4 preceding years in order to take the lagged effects of public spending on education into account.

Figure 7. Morocco: Comparative Inefficiency Term for TIMSS Scores

Sources: Calculated from TIMSS scores for math and science; IMF staff estimates.

Sources: IMF staff estimates.
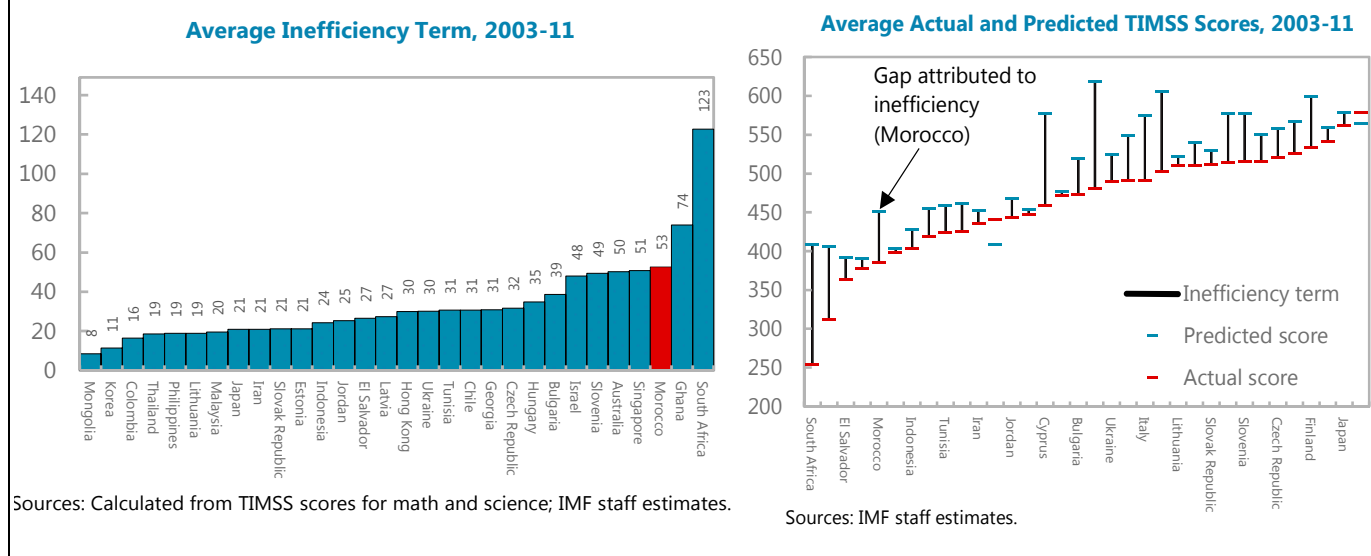
D. Gap Analysis

16.   **In order to identify the determinants of the inefficiency, we regress the inefficiency gap on a set of fiscal, institutional, and educational variables.** We estimate the determinants of the gap using pooled OLS with fixed effects on univariate and multivariate regressions. The fiscal variables are governance efficiency, ethics and corruption, wastefulness of public spending, and diversion of public funds. As institutional variables, we use an indicator of decentralization (the ratio of central budget over total budget), the capital to current expenditure ratio, the wage to current expenditure ratio, and the teacher wage to average wage ratio. Finally, our indicators relative to education are the number of students in private schools, teachers' education level, the number of teachers trained, the student to teacher ratio, a student absenteeism index, a teacher absenteeism index, and an index of student intimidation as an indicator of the school climate.

17.   **The results show that the main determinants of the efficiency gap are indicators of: ethics and corruption indicator, diversion of public funds,[10] teacher training, and teacher wages relative to the average wage in the economy** (Table 1). It is also relevant to look at potential improvements in many areas where Morocco is lagging behind other countries, which cannot be revealed by a panel analysis (Figure 8). It appears that teacher training and teacher education are relatively low, teachers' and students' absenteeism are among the highest in the sample, and the school climate can be improved to provide a favorable learning environment.

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[10] Diversion of public funds is an indicator from the World Economic Forum that assesses how common is the reallocation of public funds to companies, individuals, or groups due to corruption.

Table 1. Gap Analysis Results

	1	2	3	4	5	6	7	8	9
Wastefulness of public spending	-10.80								-16.55**
Government efficiency	0.79								
Ethics and corruption	-21.73**	-26.10**	-26.96**	-26.11**	-25.54**	-25.72	-31.42***	-32.86***	
Diversion of public funds	-17.17**								
Decentralization	1.70	0.97							
Capital to current exp. ratio	-35.71		-12.94	-20.58					
Wage to current exp. ratio	-2.79*				-2.67*	-1.76			-2.21
Teacher wage to avg. wage ratio	13.21						19.84	12.37	
Students in private schools (%)	0.72			0.85			1.68		
Teacher education level	16.72***					16.77			
Teacher trained	-27.04**								
Student teacher ratio	-0.25								.029
Student absenteeism	-5.52							-6.65	
Student intimidation	3.42								
Number of countries	29	28	24	24	25	25	18	18	21
Observations	55	52	40	40	49	48	35	35	37

18. **The results of gap analysis show the efficiency of Moroccan public spending in education would increase if fiscal reforms were to be undertaken.** For the same amount of public spending per student, the test score would improve by 53 points if: (i) the quality of budget management improves, through better allocation of public spending and lower diversion of public funds: (ii) teachers' incentives are enhanced by improving budget management and the overall level of teacher education; and (iii) institutional and governance quality improves.

19. **These improvements in public spending efficiency can be achieved through several specific measures:**

- **Better defining responsibilities between the central government and sub-national authorities**. The decentralization process may increase the efficiency of public spending unless it is poorly designed and/or not completely achieved. Beyond the transfer of responsibilities, sub-national authorities should manage financial and human resources. This would increase the efficiency in the allocation of public spending resources as educational needs may differ between geographical areas. Moreover, the transfer of competencies should be supported by incentive-based policies.

- **Improving budget management by increasing the degree of managerial autonomy which, consequently, would also improve the quality of allocating resources through**: (i) more flexible job status; (ii) a wage-setting process; (iii) budget allocation; and (iv) teaching methods. Also, at the school level, it would enhance greater decision-making autonomy assessment policies that monitor student performance and allow for benchmarking between schools.

- **These measures would also help to reassert teachers' values**, enhancing their motivation, and restoring a favorable learning environment conducive to improving the overall performances of their students.

These conclusions are consistent with the authorities' diagnosis on the education system. The evaluation highlights three main areas of improvement where a better efficiency of public can play a key role: (i) increase the financial autonomy of regional academies such that human resources can be better managed, (ii) improve governance, teachers' training and authority at school, (iii) increase teachers' incentives to take initiatives and responsibilities in the educational output quality.

E. Conclusion

20.   This paper shows that more efficient public spending could help boost the quality of education, and thereby, contribute to a reduction in youth unemployment in Morocco. The different ways to address youth unemployment include: (i) policies for enhancing economic growth: (ii) a restructuring of the education system to improve basic skills; (iii) vocational training; and (iv) the development and implementation of youth entrepreneurship programs. This paper shows that improving basic skills through more efficient public spending is a crucial piece of this effort. Although public spending on education has increased substantially over the past decade, the quality of education in Morocco (as measured by students' scores at international tests) is lagging behind many emerging countries, and skill mismatches are widely recognized as a key factor behind the high level of unemployment.[11] The results of Moroccan students are lower than in other countries spending equivalent amounts of public resources on education, raising an efficiency issue. A broad reform of the national education system to strengthen the general level of education is ongoing, but that needs to be done in tandem with overhauls to make the public education sector more efficient. This combination would help to give students the necessary background and skills they need to go on to further study and, ultimately, to attain successful and productive roles in the Moroccan job market.
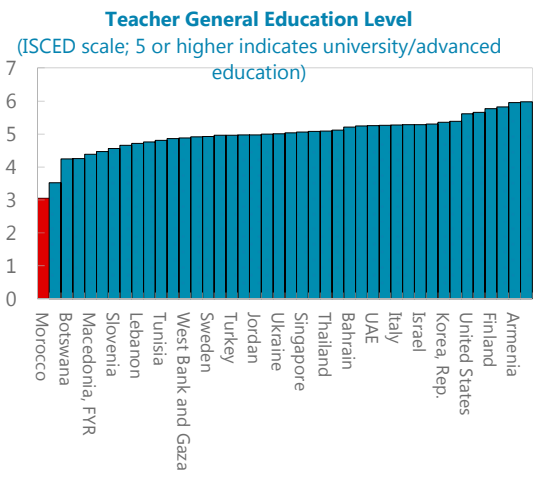
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[11] IBRD (2014), Revue des Dépenses Publiques, Tome II: Secteur de l'Education. AfDB (2014), Diagnostic de Croissance du Maroc. Sutherland, D., Price, R., and Gonand, F. (2009), Improving Public Spending Efficiency in Primary and Secondary Education, OECD.

Figure 8. Morocco: Comparative Outcomes from the 2011 TIMSS Background Questionnaires
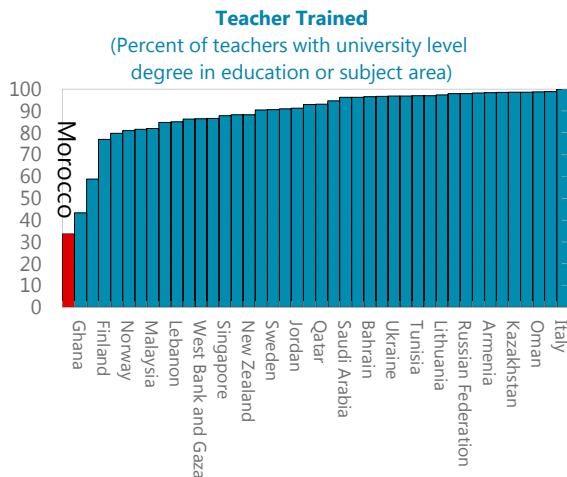
Teacher Trained
(Percent of teachers with university level degree in education or subject area)

Sources: 2011 TIMSS teacher background questionnaire.

**Teacher General Education Level**
(ISCED scale; 5 or higher indicates university/advanced education)

Sources: 2011 TIMSS teacher background questionnaire.

Staff Compensation per Teacher to Average Wages, 2011
(Wages in education vs. average wages)
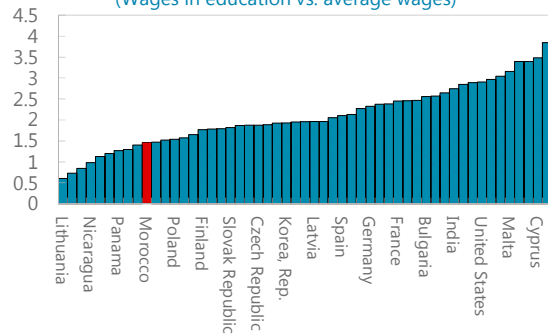
Sources: UNESCO; ILO Global Wage Report; HCP; and IMF staff estimtes.
Note: Morocco calculated based on 2009 data. Wages in education calculated as total compensation of education employees divided by the number of teachers.

Diversion of Public Funds, 2015
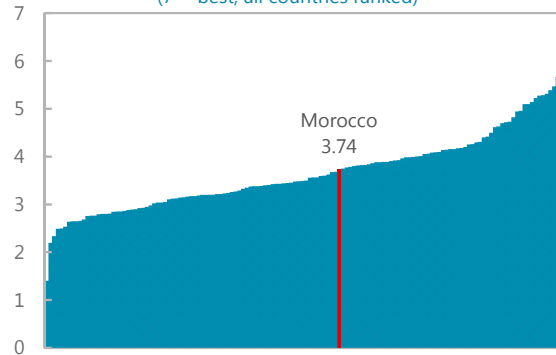(7 = best, all countries ranked)

Morocco
3.93
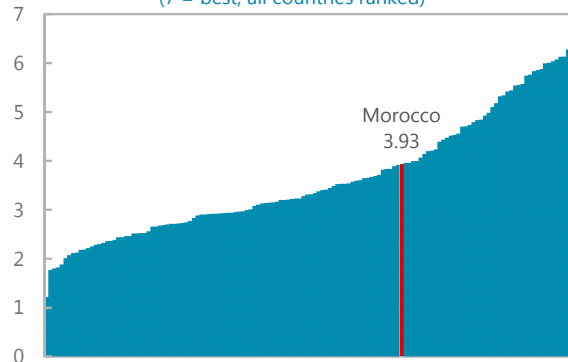
Source: 2015 World Economic Forum

Wastefulness of Government Spending, 2015
(7 = best, all countries ranked)
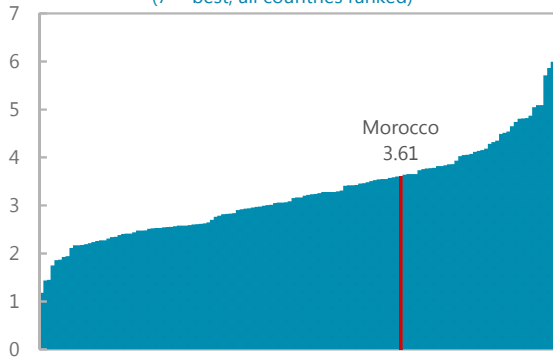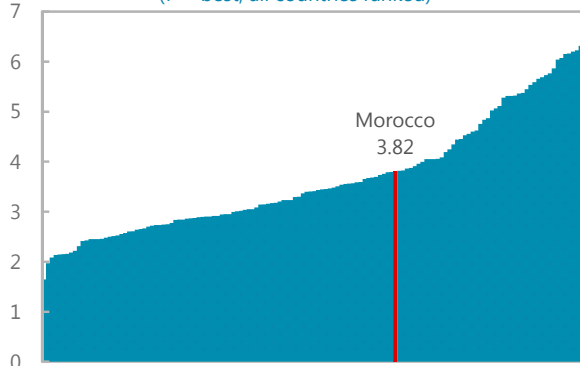

Morocco
3.61

Source: 2015 World Economic Forum

Government Efficiency, 2015
(7 = best, all countries ranked)

Morocco
3.74

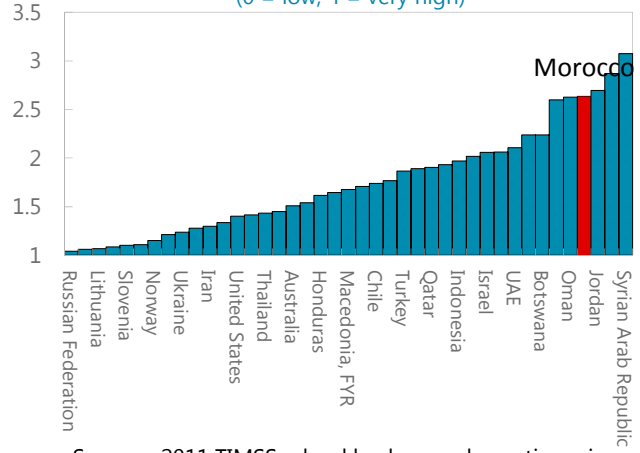Source: 2015 World Economic Forum

Figure 8. Morocco: Comparative Outcomes from the 2011 TIMSS Background Questionnaires (concluded)

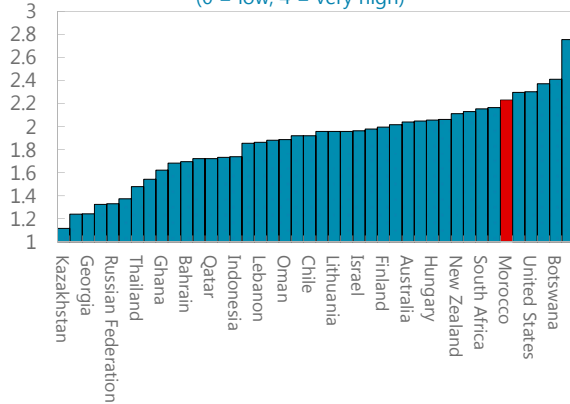**Ethics and Corruption, 2015**
(7 = best, all countries ranked)

Morocco
3.82

Sources: 2015 World Economic Forum Global

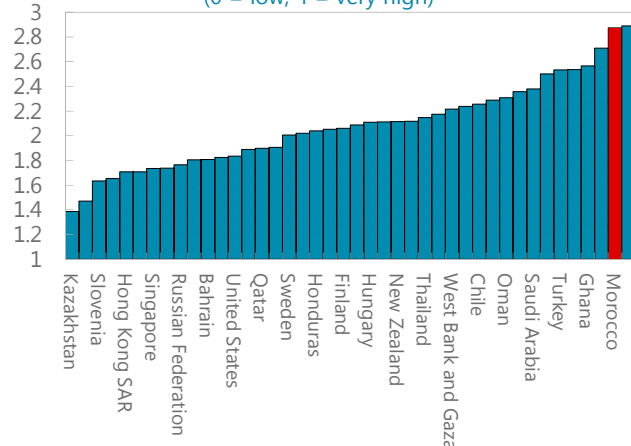**Teacher Absence**
(0 = low; 4 = very high)

Morocco

Sources: 2011 TIMSS school background questionnaire.

Intimidation Among Students
(0 = low; 4 = very high)

Sources: 2011 TIMSS school background questionnaire.

Student Absence
(0 = low; 4 = very high)

Sources: 2011 TIMSS school background questionnaire.

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