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Informality, Labor Market Dynamics, and Business Cycles in North Africa

Olivier Bizimana and Shant Arzoumanian

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Informality, Labor Market Dynamics, and Business Cycles in North Africa

Prepared by Olivier Bizimana and Shant Arzoumanian*

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September 2023

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ABSTRACT: Employment informality is widespread across North Africa. This paper aims to shed light on the role played by the informal sector in labor market adjustments over the business cycle. It finds that the response of labor markets to output fluctuations is more muted in countries with higher informality levels, like the North African economies. The analysis also confirms that informal employment is countercyclical and acts as a buffer during economic downturns in countries with relatively higher informality. However, contrary to what took place in past recessions, informal employment contracted sharply during the 2020 pandemic recession in high informality economies, suggesting that it did not play its traditional countercyclical role. By contrast, employment informality tends to fall modestly or increase during economic upturns, including the post-pandemic recovery. This finding presages the persistence of a large informal sector in the post-covid era in medium- and high-informality countries.

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Prepared by Olivier Bizimana and Shant Arzoumanian [1]

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I. Introduction

The informal economy represents a significant share of output and employment across North Africa. Informal activities account for about one third of GDP, on average, and informal employment accounts for nearly two thirds of total employment (see IMF, 2022)[2]. This is due to various factors, including flexibility, taxation, or regulatory impediments, that incentivize firms and workers to remain in the informal sector (Maloney 2004, Loayza, Oviedo, and Servén 2006). In addition, the informal sector constitutes the main source of income in less developed economies with large agricultural sectors and high shares of unskilled workers (World Bank, 2019).

While there is a rich literature on the determinants of informality and its impact on growth and welfare, there are fewer studies on the link between informality and the business cycle (see World Bank 2019). Some studies show that informal employment tends to rise during economic downturns, suggesting that it provides a buffer for workers who lose their formal jobs, especially in the absence of strong safety nets (Loayza and Rigolini 2011; Ohnsorge and Yu 2021). Other studies, however, mainly using indicators of output informality, find informality to behave procyclically (see, for example, Ferreira-Tiryaki 2008 and Ohnsorge and Yu 2021).

North African economies are also characterized by particularly poor labor market outcomes, with some of the highest youth unemployment rates and lowest female labor force participation rates across emerging and developing economies, reflecting labor and product market rigidities, among other factors (see Ahmed et al. 2012).

This paper explores the role of informal employment in labor market adjustments in North Africa during economic downturns and upturns. It also aims to shed light on how employment informality has adjusted during the 2020 pandemic recession and subsequent recovery.

Against this backdrop, this paper examines the following questions:

- How does informality affect the response of the labor market to output fluctuations?
- How does employment informality change during economic upswings and downswings?
- Have the 2020 covid recession and post-pandemic recovery been different?

To tackle these questions, the paper uses various empirical techniques, including regression-based estimates, correlation analysis and event studies. Using the Okun's law framework, the paper finds that the response of labor markets to business cycle fluctuations is relatively more muted in countries with relatively higher informality levels, like the North African economies. The paper further investigates potential factors that account for the cross-country variation in Okun coefficients. Even after other structural factors are controlled for, informality remains an important determinant of Okun's coefficients. The regression results find evidence that informal employment is more countercyclical in economies with a large share of employment informality (medium- and high-informality).

The event studies confirm that informal employment is countercyclical and acts as a buffer during economic downturns in countries with relatively higher informality (including North African economies). However, contrary to what took place in past recessions, informality doesn't seem to have provided much of a buffer to the 2020

[2] For further details on the characteristics of informal workers in North Africa see IMF (2022).

pandemic shock: Informal employment contracted sharply in countries with relatively higher informality, including those in North Africa, as informal labor-intensive sectors were hit harder than in the past. The results also suggest that the role of informality during economic upturns is less straightforward. Informal employment tends to fall only modestly during economic upturns in economies with relatively large informal sectors, which is consistent with an incomplete return to formal jobs of workers who are laid off or drop out of the labor force during economic downturns. Informal employment during the post-pandemic recovery appears to have followed a similar pattern in medium informality countries, like North African economies. By contrast, informal employment rebounded during the post-pandemic recovery in high informality countries.

The remainder of the paper is organized as follows. Section 2 documents key features of labor markets in five North African economies (Algeria, Egypt, Mauritania, Morocco, and Tunisia). Section 3 examines how informality affects the short-term relationship between labor market developments and output fluctuations (Okun's law) in North Africa, compared with other regions. To do this, section 4 investigates the cyclicality of informal employment using various methodologies, including correlation analysis, regression-based estimates, and event studies that distinguish between the upswing and downswing phases of the business cycle. Section 5 assesses the responses of informal employment during the Covid-19 recession and the post-pandemic recovery relative to past downturns and upturns. Finally, section 6 concludes.

II. Labor markets in North Africa: High unemployment and low cyclicality

This section presents an overview of key labor market characteristics across North Africa over the past two decades. Given the existence of a large informal sector in the region, informal employment should be expected to play an important role in labor market adjustment. A few stylized facts stand out:

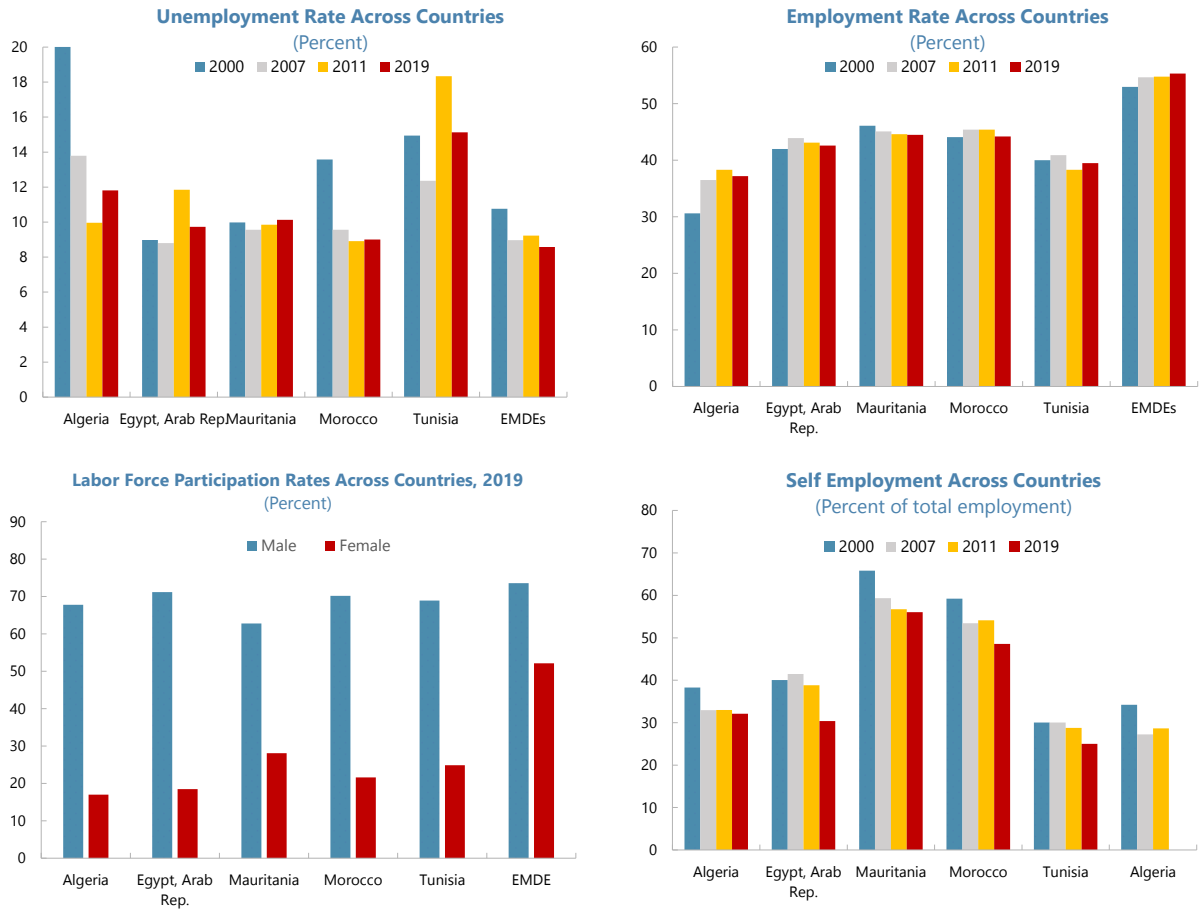
- *High and stable unemployment rates:* Unemployment rates in North Africa have been some of the highest in the world over the past two decades, averaging nearly 11 percent in 2019 (Figure 16). At the same time, the region has some of the lowest participation rates and employment-to-population ratios. The average labor force participation rate has remained broadly stable over the past decade, averaging about 45 percent in 2019. The low overall participation rate in the region is largely due to the much lower female labor force participation rate, at about 22 percent in 2019 compared with an average of about 50 percent in emerging markets and developing economies (EMDEs). Meanwhile female and youth unemployment rates have remained stubbornly high across the region, indicating elevated structural unemployment.
- *Little variability over the business cycle*: Labor market indicators in North Africa have been broadly stable over the past two decades, despite fluctuations in economic activity. As in other EMDEs, employment rates expanded slightly during the pre–global financial crisis period in all North African economies, but they remained resilient during the crisis (except in Tunisia) and were broadly steady in the prepandemic period. Consistent with that, unemployment rates fell during the precrisis period across the region and have shown little variation since, except in a few countries during the crisis (mainly Egypt and Tunisia). Labor force participation rates have been on a slight downward trend in most countries. These labor market patterns in North Africa contrast sharply with developments in advanced economies, where labor markets have exhibited high cyclicality over recent decades.

- *High employment informality rates* (see IMF, 2022). This paper uses the share of self-employed in total employment from ILO as its indicator of employment informality. While an imperfect proxy,[3] this measure presents some advantages compared with other indicators, as it has a relatively long time span and broad coverage, which allows for cross-country and time-series comparison. In addition, it tends to correlate well with other measures of informality. Despite a downward trend over the past two decades, informal employment remains relatively high in North Africa, representing about 40 percent of total employment in 2019 (Figure 1). This level is, however, lower than the average for EMDEs, in which self-employment represents on average 50 percent of total employment. Indeed, using the same group of countries considered in Section III (but ranking them based on self-employment rather than on the Schneider index and the share of workers who do not contribute to pensions), most of the North African economies are in the medium-informality group when the distribution of this indicator of employment informality is considered, with the exception only of Mauritania (which is in the high-informality group) (see Annex 3).[4]

[3] Self-employment accounts for the majority of informal employment, but not all self-employed workers are in informal employment. According to the ILO, self-employed workers are those with jobs in which the remuneration is directly dependent upon the profits derived from the goods and services produced. They include employers, own-account workers, contributing family workers, and members of producers' cooperatives. While the last two categories are always presumed to be informal by the ILO, employers and own-account workers may not necessarily be informal (as they may work in the formal sector). In addition, the various measures for employment informality (informal employment, noncontributors to pension schemes, and self-employment) tend to be positively correlated with each other (see IMF, 2022).

[4] The sample of countries is split into three groups based on the size of informal employment, proxied by self-employment (Annex Table 3.1). The low-informality group (top 1/3rd percentile) includes mainly advanced economies and some EMDEs (informal employment accounts on average for about 10 percent of total employment in this group). The medium-informality group (middle 1/3rd percentile) is mainly composed of EMDEs, with informal employment averaging about 35 percent of total employment. The high-informality group (bottom 1/3rd percentile) is mainly composed of low-income countries; informal employment in this group accounts on average for more than 70 percent of total employment.

Figure 1. Key Labor Market Characteristics across North Africa



Sources: ILOSTAT; International Labour Organization modeled estimates; and IMF staff calculations.
Note: EMDEs = emerging market and developing economies.

III. Informal Employment and Okun's law

A. The Okun's Law Relationship

This subsection examines how the elasticity of unemployment to output fluctuations, a relation captured by the Okun's law coefficient, is affected by informality. Okun's law postulates that there is an inverse relationship between cyclical fluctuations in output and the unemployment rate, which can be represented by the following equation:

$$u_t - u_t^* = \beta^g(y_t - y_t^*) + \varepsilon_t, \qquad (1)$$

in which u_t and y_t are the unemployment rate and (the logarithm of) output, respectively, while u_t^* and y_t^* are the trend components of the unemployment rate and output.[5] The Okun's coefficient (β^g) is expected to be negative, so that a positive (negative) change in output is associated with a lower (higher) unemployment rate.[6] While equation (1) is referred to as the "gap" specification, another version of Okun's law is expressed as a relationship between changes in the unemployment rate and the growth rate of output:

$$u_t - u_{t-1} = \alpha + \beta^c(y_t - y_{t-1}) + \omega_t. \qquad (2)$$

The ratio α/β^c measures the rate of output growth consistent with a stable unemployment rate, that is, how fast output would need to grow to maintain a given level of unemployment (the "unemployment threshold"). Equation (2) is referred to as the "change" specification. The two versions are equivalent if potential growth and the natural rate of unemployment are constant (see Ball, Leigh, and Loungani 2017). As this assumption is unlikely to hold empirically, the gap version appears preferable and is used as benchmark specification.

To examine how informality affects the elasticity of unemployment to economic activity, panel regressions are conducted separately for different groups of countries. As a large informal sector may absorb workers who lose their formal jobs during economic downturns, the adjustment to business cycles in economies with high informality is likely to occur more through wages, working hours, or both in the informal sector, rather than through a reduction in the number of employed (see Maloney 2004). This helps to dampen the rise in unemployment during recessions.

B. Estimation Results

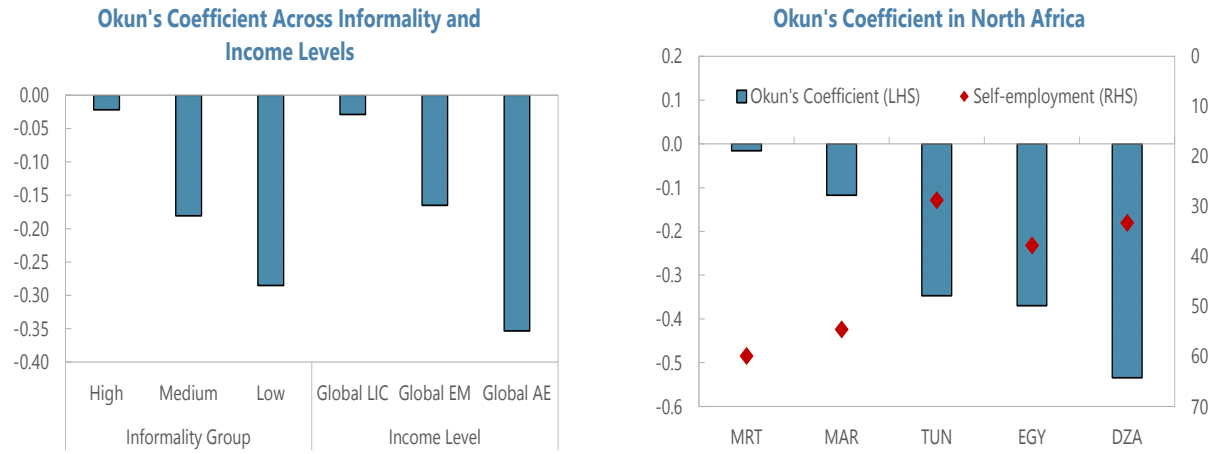
To test whether a higher share of informal employment reduces the response of labor markets to economic activity, separate panel regressions are run for high-, medium-, and low-informality groups and for advanced economies, EMDEs, and low-income countries (LICs). The results show that the Okun's coefficients are statistically significant and with the expected signs (negative) for most of the country groups and are lower (unemployment responds less to output fluctuations) in countries with high informality compared with countries

[5] The trend is computed using a standard Hodrick-Prescott filter with a smoothing parameter of 100. Using a smoothing parameter value of 6.25 yields qualitatively similar results (see Ravn and Uhlig 2002). To address the end-point problem associated with the Hodrick-Prescott filter, the GDP and unemployment rate series were extended to 2023 using the IMF's October 2019 *World Economic Outlook* projections.

[6] The error term ε_t captures factors that shift the cyclical unemployment-output relationship, such as unusual movements in productivity or in labor force participation.

with low informality (Figure 2 and Table A.3.).[7] Consistent with this result, the Okun's coefficient in advanced economies is about 3 and 30 times larger than that in emerging markets and LICs, respectively.[8]

Figure 2. Okun's Law Coefficients from Panel Regressions



Source: IMF estimates; and ILOSTAT; International Labour Organization modeled estimates
Note: The bars show the estimated Okun's coefficients from the gap specification. Data labels on the horizontal axis in the right panel use International Organization for Standardization (ISO) country codes. AE = advanced economies; EM = emerging markets; LIC = low-income countries.

The findings from the global panel estimates hold for North African economies. Those with relatively higher shares of informal employment (Mauritania and Morocco) have relatively smaller Okun's coefficients (in absolute value) compared with the other countries (see Table A.6.). While the labor market in Mauritania barely responds to output, a 1 percentage point increase in output above its trend corresponds to a 0.1 percentage point reduction in cyclical unemployment in Morocco (broadly in line with the average in medium- and high-informality countries). In contrast, labor markets in Algeria, Egypt, and Tunisia are much more responsive to output than the average of the medium-informality group and EMDEs: on average, a 1 percentage point deviation of output above its trend is associated with a 0.4–0.5 percentage point decline in the cyclical unemployment in these three countries (which is broadly comparable with the average for advanced economies).

C. Potential Determinants of Okun's Coefficients

Differences in labor market responsiveness to output may reflect not only different levels of informality, but also other structural characteristics. This subsection looks at the following other potential determinants of Okun's coefficients across countries:[9]

- *Economic structure*: The sectoral composition of employment could influence the way labor markets respond to the business cycle. For example, unemployment could be more sensitive to output in economies with higher shares of employment-intensive service sectors. By contrast, in economies with relatively higher

[7] Ahn and others (2019) find a lower cyclical sensitivity of labor markets with high levels of informality.

[8] Ball and others (2019) find an average value of the Okun's coefficient of –0.4 for a group of advanced economies and –0.2 for developing economies.

[9] See Ball and others (2019), David and others (2019), and Farole, Ferro, and Gutierrez (2017) for recent studies on determinants of Okun's coefficients in emerging markets and developing economies.

shares of capital-intensive manufacturing sectors, unemployment could be less responsive to changes in output (at least in the short term). However, some studies have found that the negative relationship between output and unemployment is stronger in industrial-intensive economies (see, for example, Farole, Ferro, and Gutierrez 2017).

- *Labor and product market rigidities*: Excessively protective labor market codes could discourage businesses from hiring new employees during economic upturns and prevent them from laying off workers during downturns and therefore dampen the responsiveness of labor markets to business cycles (see, for example, Ahmed, Guillaume, and Furceri 2012). Product market distortions that create barriers to entry for new firms and restrict competition in key sectors could also affect labor demand and productivity growth and hence the responsiveness of unemployment to economic activity (see, for example, Crivelli, Furceri, and Toujas-Bernaté 2012).
- *Large public sector employment and high wage premiums*: The public sector is a large and more stable source of employment in many countries, especially in North Africa (see Ahmed, Guillaume, and Furceri 2012). Additionally, higher public sector wage premiums can divert labor from the private sector. Hence, employment is expected to be less responsive to economic activity in countries in which the public sector accounts for a large share of the workforce.
- *Quality of institutions*: The empirical literature has shown that better institutions are associated with higher investment and growth (see, for example, IMF 2003). Hence, one should expect better quality of institutions, measured, for example, by indicators of legal systems, to be associated with stronger employment outcomes and more responsiveness of labor markets to output fluctuations (see, for example, Farole, Ferro, and Gutierrez 2017).

We first examine the relationship between the country-specific estimated coefficients and the average values of the potential determinants–including informal employment–over the sample period. The bivariate scatter plots (Figure 3) depict a negative relationship between the Okun coefficients and informal employment (top left panel), especially for countries of the medium and high informality groups. The relationship between the estimated Okun coefficients and the other factors is less clear.

We then estimate the determinants of Okun coefficients using the following specification[10]:

$$\hat{\beta}_i = \alpha + \sum_{j=1}^{k} \delta_j X_{j,i} + \xi_i \qquad (3)$$

Where $X_{j,i}$ is a vector of explanatory variables that include all the potential determinants presented in the scatter plots. [11]

The results of the panel estimation of the determinants of the Okun coefficients are presented in Table 1. Since Okun's coefficient (which is negative) is assigned a positive value in the regression, a negative number means that increases in the right-hand side variables contribute to weakening Okun's coefficient or making it smaller in

[10] Equation (3) is estimated with ordinary least square (OLS). For robustness check, we also apply a weighted least squares (WLS) procedure in which the observations are weighted by the inverse of the standard error of the dependent variable. The weighted least squares estimation yields broadly the same results as the OLS (available from the authors upon request).

[11] The regression also controls for the level of real GDP per capita, as the global panel regressions have shown that the Okun's coefficient decreases (in absolute value) with the level of income—that is, it is larger for advanced economies than for EMDEs and for LICs.

absolute value. As expected, the Okun coefficients are negatively corelated with labor market informality–that is a larger degree of employment informality contributes to weakening Okun's coefficient. Even after other structural factors are controlled for, informality remains an important determinant of Okun's coefficients. Conducting regressions in which all variables are introduced one by one in a stepwise fashion shows that labor informality and the indicator of the quality of institutions have the expected sign and remain statistically significant, while the labor market institution variable does not seem to matter for the Okun's coefficient (Table 1).[12] The regression with employment informality has also the highest *R*-squared value.[13]

Table 1. Determinants of Okun's Coefficient—Gap Specification: Global Sample

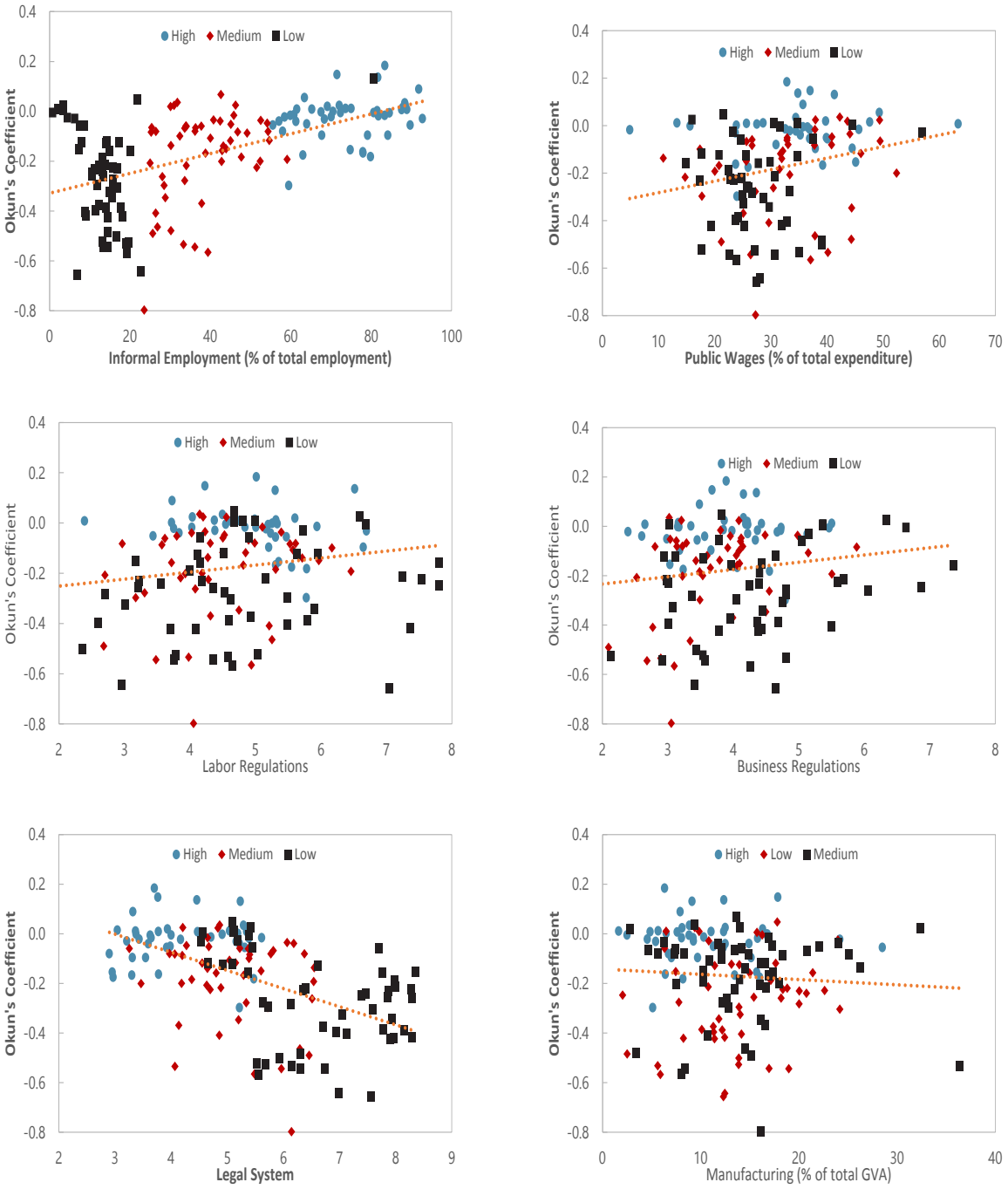
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Labor market informality	-0.00387***								-0.00309***
	(0.000489)								(0.000882)
Labor market regulations		-0.0273*							-0.000553
		(0.0164)							(0.0165)
Product market regulations			-0.0293*						-0.0647***
			(0.0153)						(0.0186)
GDP per capita				0.00327***					-0.00264**
				(0.00108)					(0.00104)
Legal system					0.0728***				0.0760***
					(0.00939)				(0.0138)
Manufacturing, share of GDP						0.00336			-0.000749
						(0.00286)			(0.00344)
Agriculture, share of GDP							-0.00933***		
							(0.00114)		
Public wage bill, % total expenditures								-0.00507***	-0.000698
								(0.00168)	(0.00139)
Constant	0.328***	0.305***	0.292***	0.107***	-0.216***	0.124***	0.282***	0.339***	0.232*
	(0.0312)	(0.0821)	(0.0674)	(0.0207)	(0.0480)	(0.0432)	(0.0246)	(0.0587)	(0.128)
Observations	150	136	136	149	140	146	150	128	116
R-squared	0.265	0.023	0.021	0.100	0.258	0.010	0.267	0.055	0.438

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

[12] This result is in line with previous studies that find a relatively small role of labor market institution variables in explaining employment outcomes (see, for example, Farole, Ferro, and Gutierrez 2017 and Ball, Leigh, and Loungani 2017). However, these results could also be affected by the presence of some collinearity among the various variables, and among these variables and informality, as shown in Section III.

[13] For robustness purposes, interaction terms between output and each of the structural factors are also included, yielding broadly consistent results (see Annex Table A.4)

Figure 3. Factors That Influence Okun's Coefficient



Sources: Frazier Institute/World Economic Forum; ILOSTAT; IMF, *World Economic Outlook*; International Labour Organization modeled estimates; World Bank, *World Development Indicators*; and IMF staff calculations.
Note: The scatter plots show the bivariate relationship between the coefficients from the estimation of the gap specification (2) for individual countries and each of the potential determinants. Larger values for labor market (hiring and firing regulations subindicator), product market (administrative requirements subindicator), and legal system (protection of property rights subindicator) indicate better outcomes (that is, fewer regulations and better legal system).

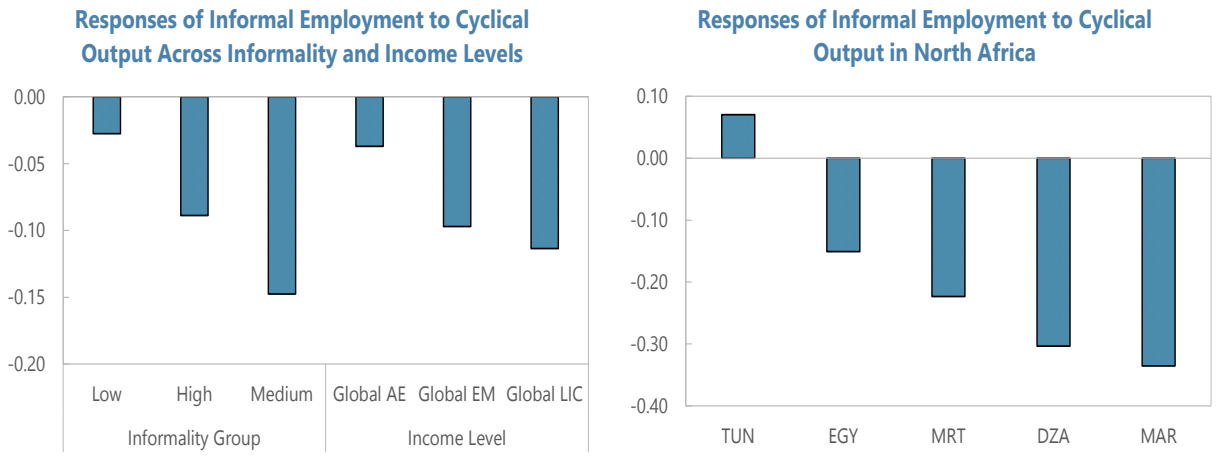
IV. Informal Employment and the Business Cycle

A. Countercyclicality of employment informality

Informal employment appears to behave more countercyclically in economies with higher informality, including in North Africa, indicating that it acts as a safety net during economic downturns. Simple correlation analysis shows that the correlation between informal employment and cyclical output (the difference between GDP growth and its trend) is negative (–0.3) and statistically significant in countries with medium and high levels of informality (compared with –0.1 for low-informality countries) (see Annex 4 for details). Within North Africa, informal employment appears to be countercyclical in countries with relatively more informality (Algeria, Mauritania, and Morocco). In Mauritania and Morocco, the share of informal employment is high enough to make overall employment countercyclical, something that is observed in general only for countries in the high-informality group.

Formal regression analysis confirms that informal employment is more countercyclical in medium- and high-informality countries. The cyclical component of informal employment (the deviation from its trend) is regressed on cyclical output (Table A.5). The elasticity of informal employment to cyclical output is quantitively larger (in absolute value) in the medium- and high-informality groups (Figure 19). Country-by-country regressions show that the countercyclicality of informal employment is also observable in North Africa, particularly in countries with higher shares of informality (Mauritania and Morocco), consistent with the correlation analysis.

Figure 4. Response of Employment Informality to Cyclical Output



Source: IMF estimates

Note: The bars show the estimated coefficients of informality with respect to output. Data labels on the horizontal axis in the right panel use International Organization for Standardization (ISO) country codes. AE = advanced economies; EM = emerging markets; LIC = low-income countries.

B. Event Studies of Informal Employment

An event study analysis is used to look at how informal employment changes during the upswing and downswing phases of the business cycle. Real GDP growth is examined for all the countries in the sample between 1991 and 2019, with the events identified as years in which GDP growth fell below or exceeded a country's average level of growth by a particular threshold (1.5 standard deviations in advanced economies and 1 standard deviation in emerging markets and LICs).[14] Downswings (upswings) are defined as any country-year observations with GDP growth lower (higher) than 1.5 standard deviations in advanced economies and 1 standard deviation in emerging markets and LICs in all years of the sample. Average growth rates over downswings (upswings) are calculated by first averaging for a given country over all downswing (upswing) years, then taking simple averages of these across country groupings. How labor market indicators (unemployment, labor force participation, and employment rates) behaved during these events on average in the high- and medium-informality groups is then examined, along with whether there are notable (statistically significant) differences between these two groups and the low-informality group.

The event studies confirm that informal employment is countercyclical in countries with relatively higher informality, and hence provides a buffer for household incomes during economic downturns (Figure 5). In addition, changes in informal employment in the high- and medium-informality groups during economic downswings differ statistically significantly from those in the low informality groups (table 2).

Specifically, the results suggest that, in countries with relatively higher levels of informality, the increase in informal employment during downswings does not seem to be fully reversed during upswings:

- *During economic downturns, informal employment acts as a buffer in countries with relatively higher informality* (Figure 5). Informal employment tends to rise during downturns in medium- and high-informality groups (including North African economies), offsetting the contraction in formal employment and thus dampening the fall in total employment (which actually increases during recessions in high-informality countries). Informal employment growth exceeded its long run trend by about 0.6 percentage points in the medium- and high-informality groups during downturns. The rise in unemployment is also more limited in these countries, compared with low-informality ones.

- *During economic upturns, informal employment could slow the recovery of the formal labor market.*[15] If the increase in informal employment during downturns reflects the transition to informality of workers who have lost their formal jobs, one would also expect to observe a reverse of that phenomenon during the expansionary phase of the business cycle—that is, an equivalent fall in informal employment that boosts the rise in formal jobs. However, in high- and medium-informality countries, including North African economies, informal employment tends to fall only modestly below its long run trend (by about 0.3 and 0.1 percentage points, respectively) during economic recoveries (less than it increases during downswings). This is consistent with the recovery's creating new job opportunities in the informal sectors of these countries, but also with an incomplete return to formal jobs of those who lose them during economic downturns. While more work is needed to shed light on these transition dynamics, one could not rule out the risk of a hysteresis

[14] This approach allows for varying trend growth rates among different countries. In particular, the value of the cutoff is based on different standard deviations by country income group, as business cycles are more volatile in emerging market economies than in advanced economies (Aguiar and Gopinath 2007). The algorithm of Harding and Pagan (2002) is also used as a robustness check, yielding similar results (available from the authors upon request).

[15] The slow or incomplete recovery in formal employment could also be explained by hysteresis effects due, for example, to high labor and product market rigidities that could limit job creation.

phenomenon associated with informality—that is, while individuals who lose their formal job may find refuge in informality during recessions, it may be difficult for them to transition back to formality during the recovery owing to loss of human and social capital (networking) potentially associated with informality.

Overall, the event study findings are consistent with earlier studies which found that informal employment is countercyclical in emerging market economies, and negatively correlated to formal employment (World bank, 2021).

As a robustness check, alternative cutoffs are explored using different methodologies: the commonly used algorithm of Harding and Pagan (2002), which identifies business cycle turning points. The minimal duration of a cycle is set at five years[16]. Peaks (troughs) are identified in years when output growth is higher (lower) than the subsequent and the preceding years. If there are additional peaks (troughs) within five years around a peak, the one with the deepest slowdown or contraction/expansion is picked. Overall, the results are robust to alternative specifications[17].

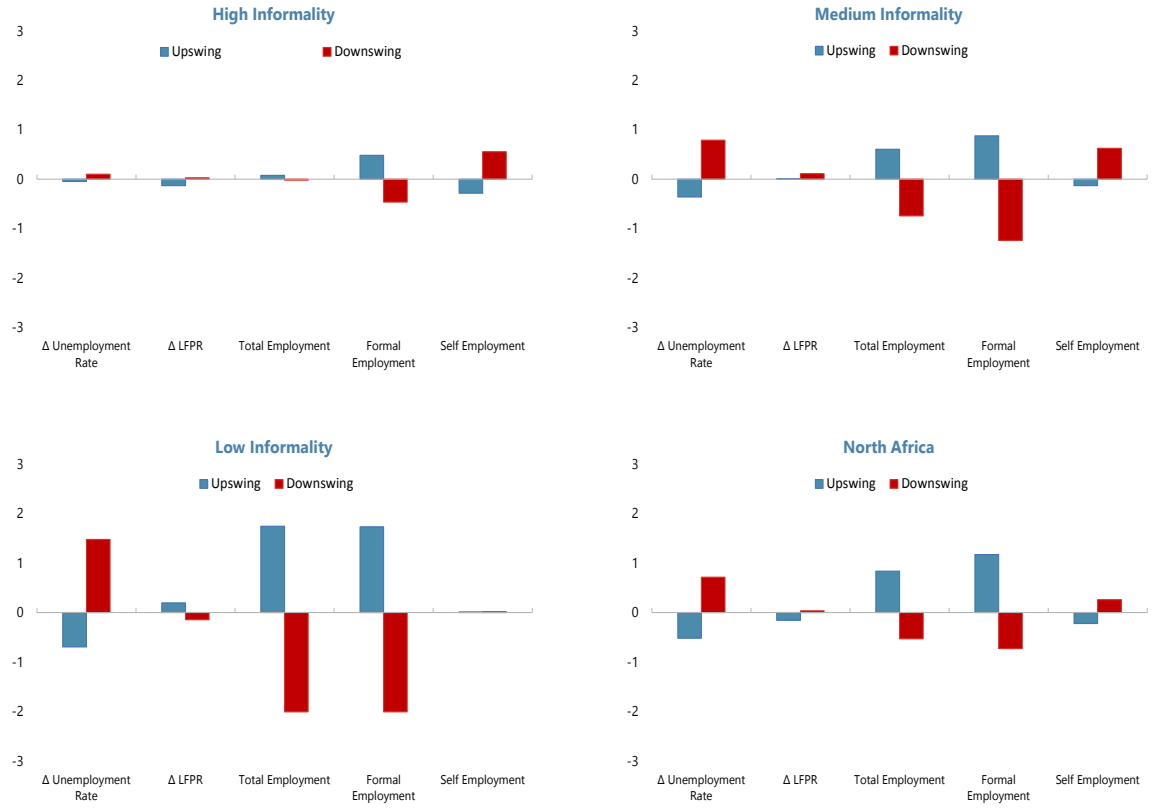
The dynamics of sectoral employment provides further insight into the dynamics of employment and the potential role of informality during upswings and downswings (Figure 6). Employment in most sectors seems to behave in a procyclical manner, with the notable exception of agriculture (and non-market services which are not expected to respond to business cycles).

- *During economic downturns, agricultural employment in the high and medium informality groups behaved countercyclically, as one would expect given that many informal workers are employed in the sector.*
- *During economic upturns, agricultural employment is partially countercyclical in the high and medium informality groups.* Agricultural employment tends to fall only slightly below its long run trend during economic upswings, suggesting that many formal workers who were absorbed into informal work in agriculture during downturns do not return to formal jobs during the recoveries–which is consistent with the informalization of previously formal employment observed at the aggregate level. Moreover, the changes in agricultural employment in the high- and medium-informality groups during economic downswings and upswings differ statistically significantly from those in the low informality groups (table 3).

[16] The approach differs, however, from the standard version, as GDP growth is used, instead of the level of aggregate activity. Since the data are annual, phases are set to have a minimum length of one year. The results are available upon request.

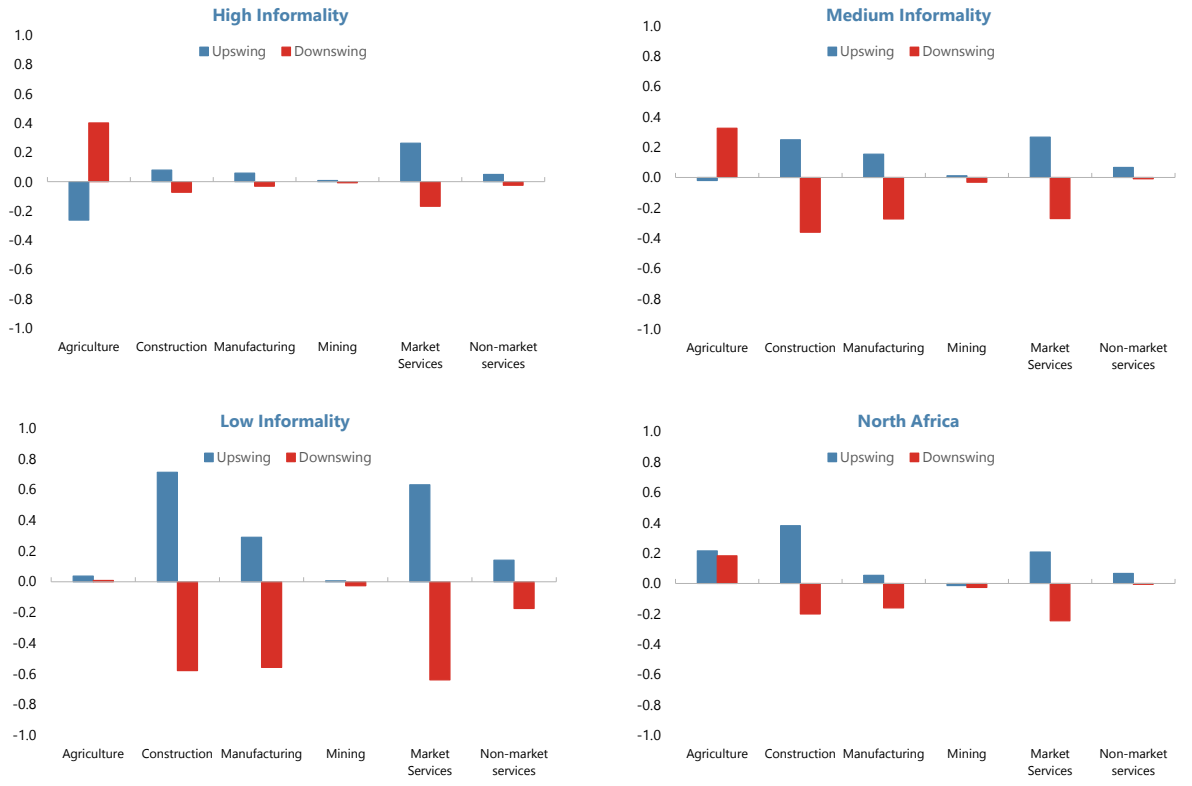
[17] The computation of the cutoff values requires a certain amount of subjectivity. Therefore, for completeness the event studies are subjected to a sensitivity analysis. The results are available upon request.

Figure 5. The Labor Market during Downswings and Upswings



Sources: ILOSTAT database; International Labour Organization modeled estimates; and IMF staff calculations.
Note: Data in the event studies are for 1990–2019. Downswings and upswings are computed using all years and countries for which GDP data are available. Informal employment is proxied by self-employment. Formal employment is measured as total employment excluding self-employment. The statistics for employment correspond to the demeaned growth and the contributions to growth by status (formal and informal employment). Δ = change (in); LFPR = Labor force participation rate.

Figure 6. Sectoral Employment during Downswings and Upswings



Sources: ILOSTAT database; International Labour Organization modeled estimates; and IMF staff calculations.
Note: Data in the event studies are for 1990–2019. Downswings and upswings are computed using all years and countries for which GDP data are available. The statistics for employment correspond to the demeaned growth and the contributions to growth by sector.

Table 2: Labor Market Responses over the Business Cycle

	Total Employment Growth		Formal Employment Growth		Self Employment Growth		Unemployment Rate Change		LFPR Change	
	Downswing	Upswing	Downswing	Upswing	Downswing	Upswing	Downswing	Upswing	Downswing	Upswing
High	0.09***	0.19***	-0.47***	0.48***	0.55***	-0.28**	0.1***	-0.04***	0.03**	-0.13***
Medium	-0.62***	0.74***	-1.24***	0.88***	0.63***	-0.13	0.79***	-0.36**	0.11***	0.01***
Low	-1.96***	1.72***	-1.97***	1.7***	0.01	0.02	1.42***	-0.67***	-0.14**	0.24***

Source: IMF staff calculations.

Note: The cyclical event is defined as a year in which GDP growth falls below or exceeds a country's average level of growth by a particular threshold (1.5 standard deviations in advanced economies, and 1 standard deviation in emerging market and developing economies). Downswings (upswings) are defined as any country-year observation with GDP growth less (higher) than the specified cutoff in all years of our sample. Formal employment is proxied by total employment excluding self-employment. Informal employment is proxied by self-employment. All statistics correspond to the demeaned employment growth, formal employment growth, and self-employment growth. Asterisks refer to the significant differences in means between high and medium informality groups and the low informality group, respectively. The asterisks for the low informality group represent numbers that significantly differ from zero. *, **, *** denote significance at the 10 percent, 5 percent and 1 percent levels, respectively.

Table 3: Sectoral Employment Responses over the Business Cycle

	Agriculture		Services		Industry	
	Downswing	Upswing	Downswing	Upswing	Downswing	Upswing
High	0.4***	-0.26***	-0.19***	0.31**	-0.12***	0.14***
Medium	0.33**	-0.02	-0.28***	0.34**	-0.66***	0.42***
Low	0.03	0.03	-0.82***	0.73***	-1.15***	0.99***

Source: IMF staff calculations.

Note: The cyclical event is defined as a year in which GDP growth falls below or exceeds a country's average level of growth by a particular threshold (1.5 standard deviations in advanced economies, and 1 standard deviation in emerging market and developing economies). Downswings (upswings) are defined as any country-year observation with GDP growth less (higher) than the specified cutoff in all years of our sample. All statistics correspond to the demeaned employment growth by sectors. Asterisks refer to the significant differences in means between high and medium informality groups and the low informality group, respectively. The asterisks for the low informality group represent numbers that significantly differ from zero. *, **, *** denote significance at the 10 percent, 5 percent and 1 percent levels, respectively.

V. Is the pandemic recession different?

The pandemic recession. Contrary to what took place in past recessions, informality doesn't seem to have provided a buffer to the pandemic shock in North Africa. In 2020, informal employment contracted sharply in countries with relatively higher informality, including those in North Africa (Figure 7). This unusual response of informality reflects the extraordinary nature of the shock, as well as the drastic measures taken to contain the spread of the coronavirus.[1] Lockdowns and social-distancing measures led many formal and informal businesses to shut down. As a result, informal workers, many of whom work in highly contact-intensive service sectors (accommodation and food services, entertainment, wholesale, and retail trade), were negatively affected. In addition, informal workers tend to be employed in small companies that were unable to withstand a long period of inactivity and were forced to close because they had less access to sufficient support measures. This is illustrated by the contraction in market services employment —which includes trade, transportation, accommodation, and food: where informality is widespread, as it was resilient during past downturns (Figure 7).

The post-pandemic recovery. Given that lockdown measures severely affected employment in sectors with a high degree of informality (high-contact services), and that informal jobs are subject to minimal hiring and setup costs (Alfaro, Becerra, and Eslava 2020), one would expect post-pandemic labor markets to be characterized by a faster-than-usual rebound of informal employment. However, there has been a stark difference in the job recovery across countries with varying degrees of informality in labor markets.

Contrary to past upswings, informal employment in the high informality countries rebounded strongly in 2021, as containment measures were lifted, and economies reopened (Figure 8). This rebound partly reflects a transition from outside the labor force into informal employment, as underscored by the strong increase in the labor force participation (Figure 8). This suggests that workers who held informal jobs before the crisis returned to informality as the recovery took place. This rebound is also partly to be expected, given that the informal sector in countries of this group accounts for more than 70 percent of total employment, and hence provides more opportunities. Formal employment followed a similar trajectory, with workers transitioning from outside the labor force into formality. The sectoral decomposition suggests that the increase in informal jobs was most likely attributable to the services sector, and, to a lesser extent, agriculture.

In the medium informality countries (including North African economies), the recovery in informal jobs lost during the pandemic recession was weak. Informal employment fell slightly below its long run trend during the post-pandemic recovery, broadly in line with previous economic upturns. By contrast, formal employment and the labor force participation rate rebounded sharply, suggesting that some displaced workers who returned to the labor force re-entered the formal sector. This can be explained by the fact that formal firms in the medium informality group may have weather the crisis better than informal ones, presumably because the former benefitted from government policy support measures introduced in response to the pandemic (including tax reliefs, credit guarantees, loan payment facilities, etc.). In North Africa, however, formal job recovery has been very sluggish, pointing to risks of labor market hysteresis, possibly reflecting labor and product market rigidities.[2]

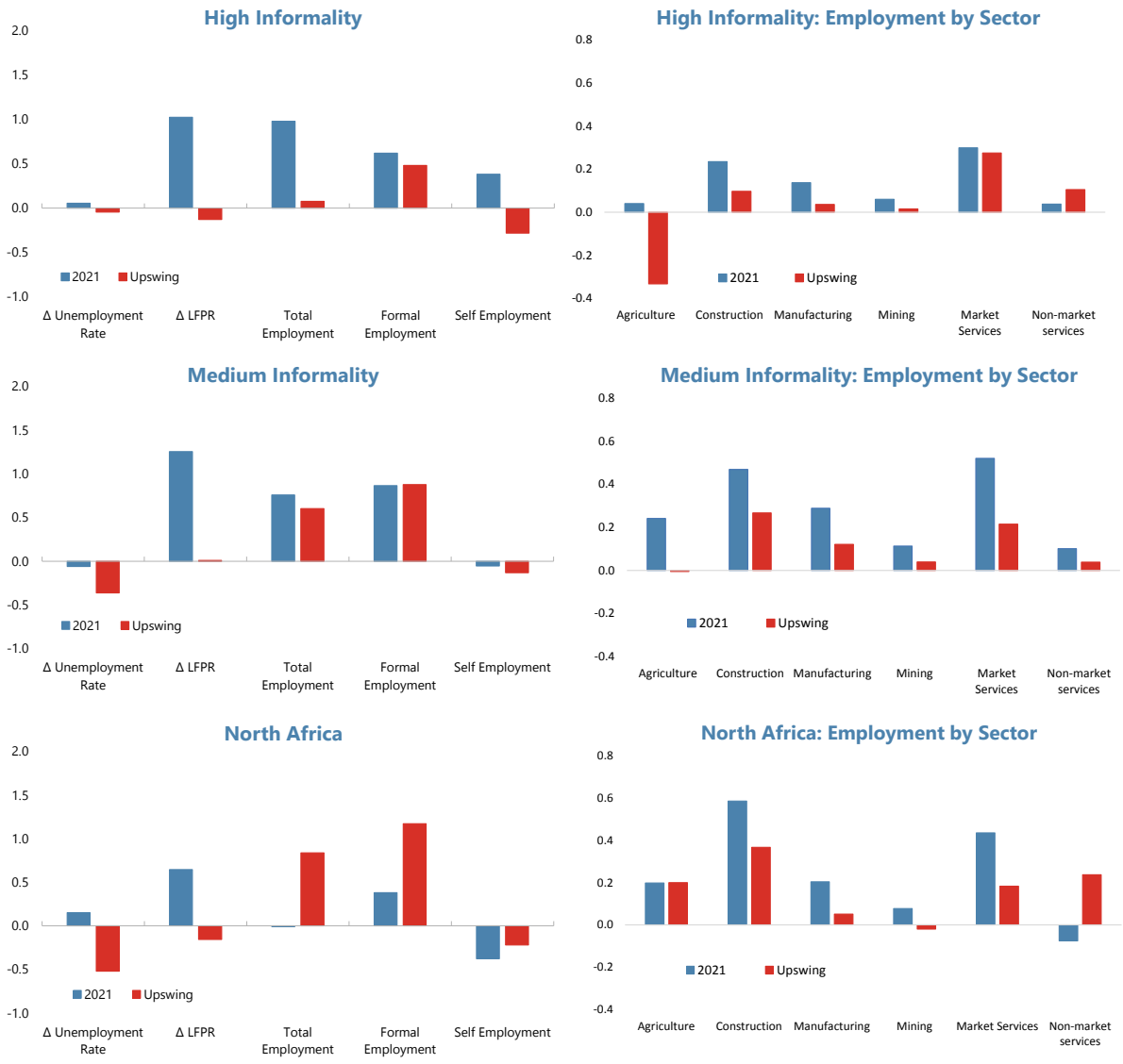
[1] In Morocco, this also partly reflects the impact of the drought that cut agricultural production by about one-third in 2020.

[2] See Ahmed and others (2012) on discussion on the effects of labor and product market institutions as well as other rigidities on MENA's labor market.

Figure 7. The Labor Market during Downswings and the COVID-19 Recession

Sources: ILOSTAT database; International Labour Organization modeled estimates; and IMF staff calculations.
Note: Data in the event studies are for 1990–2019. Downswings are computed using all years and countries for which GDP data are available. Informal employment is proxied by self-employment. Formal employment is measured as total employment excluding self-employment. The statistics for employment correspond to the demeaned growth and the contributions to growth by status (formal and informal employment) and by sector, respectively. The data for 2020 are from ILO (2021). Δ = change (in); LFPR = Labor force participation rate.

Figure 8. The Labor Market during Upswings and the Post-Pandemic Recovery



Sources: ILOSTAT database; International Labour Organization modeled estimates; and IMF staff calculations.
Note: Data in the event studies are for 1990–2019. Upswings are computed using all years and countries for which GDP data are available. Informal employment is proxied by self-employment. Formal employment is measured as total employment excluding self-employment. The statistics for employment correspond to the demeaned growth and the contributions to growth by status (formal and informal employment) and by sector, respectively. The data for 2021 are from ILO (2022). Δ = change (in); LFPR = Labor force participation rate.

VI. Conclusion

Informal employment is widespread across North Africa and plays an important role in labor market adjustments. According to the literature, the informal sector acts as a buffer during economic downturns in emerging and developing economies. as workers who are laid off and exit formal labor markets enter the informal sector instead of falling into unemployment or dropping out of the labor force. However, the role of informality during economic upturns is less straightforward and underexamined. This paper sheds light on the role played by informality in labor market adjustments, both during economic downturns and upturns, across countries with varying degrees of informality, including in North African economies.

Using the Okun's law framework, the paper finds that labor markets are less responsive to output fluctuations in countries with a relatively higher share of informal employment, like the North African economies, compared to countries with lower levels of informal employment. Okun's coefficients are relatively smaller (in absolute value) in economies with relatively larger informal employment. This paper further investigates some of the potential factors that account for the cross-country variation in Okun coefficients. The results show that even after other structural factors are controlled for, informality remains an important determinant of Okun's coefficients.

The event studies confirm that informal employment is countercyclical and provides a buffer for household incomes during economic downturns in countries with relatively higher shares of informality. However, contrary to what took place in past recessions, informal employment contracted sharply during the 2020 pandemic recession in countries with relatively higher informality, including those in North Africa. This suggests that informal employment did not play its traditional role of absorbing displaced workers from the formal sector, as the shock disproportionally affected sectors where informality is widespread.

The behavior of informal employment in economic upturns is less straightforward. Employment informality tends to fall only modestly during economic upturns, which is consistent with an incomplete return to formal jobs of workers who are laid off or drop out of the labor force during economic downturns. This could reflect the fact that workers can find themselves trapped in informal jobs during the recovery period, with limited opportunities to join more productive (formal) firms, because of loss of human and social capital.

During the post-pandemic recovery, there has been a stark difference in the job recovery depending on the degree of informality in labor markets. Informal employment in high informality countries rebounded strongly in 2021, as workers who dropped out of the labor force during the pandemic recession returned to the informal sector. By contrast, in medium informality countries (including North African economies), informal employment fell slightly during the post-pandemic recovery, broadly in line with previous economic upturns, while formal employment rebounded. This can be explained by the fact that formal firms in the medium informality countries may have weathered the crisis better than informal ones, presumably because the former benefitted from government's policy support measures introduced in response to the pandemic.

Overall, the analysis in this paper presages the persistence of a large informal sector in the post-covid era in medium- and high-informality countries (including North African economies), especially given the lingering effects of the pandemic and the economic fallout of Russia's war in Ukraine that continue to create a drag on labor market recovery. This could halt or reverse the downward trend in informality observed over the past two decades. The possibility of a still large informal sector in North Africa points to the importance of measures to reach out to informal workers and encourage formalization. The pandemic crisis has offered some lessons on

how social safety nets can be extended to informal workers, in which several countries (such as Egypt, Morocco, and Tunisia) introduced targeted cash transfer programs, leveraging financial innovation and digitalization. In the medium to long term, encouraging formalization should be the priority. Doing so will involve implementing a package of tailored policy measures, including reducing the burden from cumbersome government regulations and distortionary taxation, strengthening the quality of governance, removing unnecessary rigidities in labor market codes, invigorating private sector activity, and facilitating access to financial services (see IMF, 2022).

Annex I. Data Sources

The primary data source for this chapter are the IMF's World Economic Outlook database, the ILO's ILOSTAT and modelled estimates, the World Bank's *World Development Indicators* and the Fraser Institute's Economic Freedom of the World. The database comprises 155 countries, including advanced, emerging market economies, and developing and low-income countries. The country sample is dictated by data availability–the number of countries with continuous annual data for real GDP, the unemployment rate and self-employment. The time period is 1991-2019. Available data for 2020 and 2021 is added for the analysis of the Covid shock.

Table A.1. Data sources

Indicator	Source
Real GDP	IMF, World Economic Outlook database
GDP per capita, PPP (constant 2017 international $)	IMF, World Economic Outlook database
Share of agriculture value added in GDP	World Development Indicators database
Share of manufacturing value added in GDP	World Development Indicators database
Public wages (% of total expenditure)	World Development Indicators database
Population, total (UN estimates and projections)	ILOSTAT, International Labour Organization modeled estimates
Population ages 15+, total (UN estimates and projections)	ILOSTAT, International Labour Organization modeled estimates
Population ages 15-64, total (UN estimates and projections)	ILOSTAT, International Labour Organization modeled estimates
Population, male (UN estimates and projections)	ILOSTAT, International Labour Organization modeled estimates
Population ages 15+, male (UN estimates and projections)	ILOSTAT, International Labour Organization modeled estimates
Population ages 15+, female (UN estimates and projections)	ILOSTAT, International Labour Organization modeled estimates
Labor force, total (modeled ILO estimates)	ILOSTAT, International Labour Organization modeled estimates
Labor force, male (modeled ILO estimates)	ILOSTAT, International Labour Organization modeled estimates
Labor force, female (modeled ILO estimates)	ILOSTAT, International Labour Organization modeled estimates
Labor force participation rate, total (modeled ILO estimates)	ILOSTAT, International Labour Organization modeled estimates
Labor force participation rate, male (modeled ILO estimates)	ILOSTAT, International Labour Organization modeled estimates
Labor force participation rate, female (modeled ILO estimates)	ILOSTAT, International Labour Organization modeled estimates
Employment, total (modeled ILO estimate)	ILOSTAT, International Labour Organization modeled estimates
Employment, male (modeled ILO estimate)	ILOSTAT, International Labour Organization modeled estimates
Employment, female (modeled ILO estimate)	ILOSTAT, International Labour Organization modeled estimates
Employment rate, total (modeled ILO estimate)	ILOSTAT, International Labour Organization modeled estimates
Employment rate, male (modeled ILO estimate)	ILOSTAT, International Labour Organization modeled estimates
Employment rate, female (modeled ILO estimate)	ILOSTAT, International Labour Organization modeled estimates
Self-employed, male (% of male employment) (modeled ILO estimate)	ILOSTAT, International Labour Organization modeled estimates
Self-employed, female (% of female employment) (modeled ILO estimate)	ILOSTAT, International Labour Organization modeled estimates
Self-employed, total (% of total employment) (modeled ILO estimate)	ILOSTAT, International Labour Organization modeled estimates
Hiring and firing regulations	World Economic Forum, Global Competitiveness Report
Administrative requirements	World Economic Forum, Global Competitiveness Report
Protection of property rights	World Economic Forum, Global Competitiveness Report

Sources: IMF staff compilation.

Annex II. List of Countries by Informality Grouping

Table A.2. List of Countries by Informality Grouping

Low Informality	Informal employment (% of total)	Medium Informality	Informal employment (% of total)	High Informality	Informal employment (% of total)
United States	6.3	Italy	22.9	Bolivia	68.5
United Kingdom	15.1	Greece	33.5	Haiti	73.6
Austria	12.0	Turkey	32.0	Peru	55.2
Belgium	14.0	Argentina	25.5	Afghanistan	82.3
Denmark	8.1	Brazil	32.8	Bangladesh	59.9
France	11.6	Chile	27.1	Bhutan	72.4
Germany	9.9	Colombia	51.4	Myanmar	65.6
Luxembourg	8.6	Costa Rica	25.1	Cambodia	48.4
Netherlands	16.7	Dominican Republic	43.4	India	76.5
Norway	6.5	Ecuador	49.9	Indonesia	51.9
Sweden	9.7	El Salvador	38.8	Nepal	78.0
Switzerland	14.8	Guatemala	39.8	Pakistan	57.0
Canada	15.3	Honduras	51.4	Thailand	51.5
Japan	10.3	Mexico	31.6	Vietnam	56.1
Finland	13.2	Nicaragua	42.8	Angola	78.4
Iceland	12.2	Panama	37.4	Burundi	85.6
Ireland	15.0	Paraguay	43.1	Cameroon	74.9
Malta	14.4	Uruguay	28.2	Central African Republic	93.3
Portugal	16.6	Guyana	34.5	Chad	92.6
Spain	16.0	Belize	33.6	Comoros	58.5
Australia	16.5	Jamaica	39.3	Benin	88.7
New Zealand	18.4	St. Lucia	26.6	Equatorial Guinea	86.0
South Africa	15.6	St. Vincent and the Grenadines	26.1	Eritrea	86.3
Bahamas, The	15.1	Iraq	22.6	Ethiopia	84.7
Barbados	17.2	Lebanon	36.8	Gambia, The	72.6
Puerto Rico	16.6	**Egypt**	**31.2**	Ghana	73.2
Suriname	14.4	Sri Lanka	42.2	Guinea-Bissau	81.7
Trinidad and Tobago	24.5	Malaysia	27.6	Guinea	92.1
Bahrain	2.7	Maldives	23.2	Kenya	50.3
Cyprus	13.3	Philippines	36.5	Lesotho	47.4
Israel	12.4	Djibouti	35.2	Liberia	78.4
Jordan	13.8	**Algeria**	**32.0**	Madagascar	88.2
Kuwait	1.8	Botswana	24.2	Malawi	61.9
Oman	3.7	Cabo Verde	31.9	Mali	81.0
Qatar	0.4	Gabon	32.8	**Mauritania**	**57.1**
Saudi Arabia	4.6	Libya	38.5	Mozambique	84.2
United Arab Emirates	4.0	**Morocco**	**49.4**	Niger	95.1
Brunei Darussalam	7.6	Namibia	37.5	Nigeria	80.4
Singapore	14.0	**Tunisia**	**25.4**	Zimbabwe	67.3
Mauritius	19.8	Fiji	42.9	Rwanda	67.1
Belarus	4.2	Samoa	32.7	Senegal	64.4
Bulgaria	11.6	Tonga	47.8	Sierra Leone	90.5
Ukraine	15.8	Armenia	35.6	Somalia	91.7
Czech Republic	16.9	Georgia	49.2	Sudan	54.3
Slovak Republic	14.8	Kazakhstan	23.9	South Sudan	92.2
Estonia	10.7	Kyrgyz Republic	34.0	Tanzania	84.3
Latvia	11.5	Moldova	33.3	Togo	77.0
Hungary	10.4	Tajikistan	30.6	Uganda	77.8
Lithuania	11.7	China	45.7	Burkina Faso	86.1
Croatia	12.1	Uzbekistan	35.2	Zambia	75.1
Slovenia	15.2	Serbia	28.3	Solomon Islands	63.8
		Mongolia	48.9	Vanuatu	68.5
		Bosnia and Herzegovina	21.4	Papua New Guinea	75.7
		Poland	20.3	Azerbaijan	68.2
		Romania	25.2	Albania	55.5
Average	**12.1**		**34.5**		**73.3**

Sources: ILOSTAT, International Labour Organization modeled estimates; and IMF staff calculations.
Note: Self-employment is used as a proxy indicator of informal employment.

Annex III. Econometric Results

Table A.3. Regressions of Okun's law - gap specification

VARIABLES	(1) Global sample	(2) Low	(3) Medium	(4) High	(5) AE	(6) EM	(7) LIC
Cyclical GDP	-0.124***	-0.221***	-0.147***	-0.0123	-0.384***	-0.104***	-0.0124
	(0.0207)	(0.0429)	(0.0313)	(0.00767)	(0.0319)	(0.0192)	(0.00900)
Observations	2,989	1,040	1,031	918	700	1,411	878
R-squared	0.167	0.335	0.186	0.007	0.621	0.128	0.006
Number of ifs_code	150	52	52	46	35	71	44
FE	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Determinants of Okun's coefficients: Global panel estimation with interaction term

Equation (1) is modified by adding the interaction between various potential determinants ($\mathcal{D}_i$) of labor market responsiveness (one at a time) and cyclical output:[3]

$$u_t - u_t^* = \beta_1^g (y_t - y_t^*) + \beta_2^g \mathcal{D}_i (y_t - y_t^*) + \varepsilon_t. \qquad \text{(A.1)}$$

β_2^g captures the impact of the interaction term of each of the possible determinants of the magnitude of the Okun's coefficient. Given that the Okun's coefficient is negative, a negative (positive) coefficient associated the interaction term would imply that the underlying factor amplifies (dampens) the impact of cyclical output on the unemployment gap.

Table A.4. Panel Regression—Gap Specification: Global Sample with Interaction Terms

VARIABLES	(1) Benchmark	(2) Informality	(3) Labor market regulations	(4) Business regulations	(5) GDP per capita	(6) Institutions	(7) Manufacturing share	(8) Public Wages
Cyclical GDP	-0.124***	-0.246***	-0.185**	-0.176**	-0.0907***	0.246***	-0.0829**	-0.234***
	(0.0207)	(0.0449)	(0.0911)	(0.0697)	(0.0258)	(0.0492)	(0.0419)	(0.0644)
Interaction term		0.00289***	0.000515	-0.00201	-0.00172	-0.0761***	-0.00475	0.00322*
		(0.000688)	(0.0172)	(0.0158)	(0.00135)	(0.0102)	(0.00296)	(0.00174)
Observations	2,989	2,989	2,209	2,177	2,978	2,652	2,648	2,499
R-squared	0.167	0.238	0.265	0.271	0.182	0.313	0.202	0.186
Number of ifs_code	150	150	136	136	149	140	146	128

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

[3] See, for example, An and others (2017); Dixon, Lim, and van Ours (2017); and Banerji, Lin, and Saksonovs (2015).

Countercyclicality of informality

The econometric analysis is carried out on a panel of data consisting of the informality groupings and individual countries. The estimated baseline specification is as follows:

$$L_t^I - L_t^{I*} = \alpha + \gamma(y_t - y_t^*) + \mu_t, \qquad \text{(A.2)}$$

in which L_t^I is labor informality—proxied by the share of self-employment in total employment; y_t is the logarithm of output measured with real GDP; L_t^I and y_t^* are the trend of labor informality and the logarithm of real GDP smoothed with the Hodrick-Prescott filter, and $(y_t - y_t^*)$ is the cyclical output.

Table A.5. Informality Response to Output Fluctuations

VARIABLES	(1) Global sample	(2) Low	(3) Medium	(4) High	(5) AE	(6) EM	(7) LIC
Cyclical GDP	-0.0667***	-0.0259***	-0.117***	-0.0638***	-0.0399***	-0.0703***	-0.0758***
	(0.00814)	(0.00622)	(0.0170)	(0.0146)	(0.0117)	(0.0115)	(0.0174)
Constant	0.0103***	-0.00807***	0.0436***	-0.00934***	-0.0218***	0.0159***	0.0252***
	(0.000390)	(0.000836)	(0.000869)	(0.000781)	(0.00127)	(0.000175)	(0.000904)
Observations	2,989	1,040	1,031	918	700	1,411	878
R-squared	0.084	0.030	0.133	0.101	0.060	0.084	0.101
Number of ifs_code	150	52	52	46	35	71	44
FE	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A.6: Okun's law coefficients: unemployment - gap specification

Country	β	Adj-R2	Country	β	Adj-R2
Low Informality					
United States	-0.656***	0.685	Belarus	-0.026	0.021
United Kingdom	-0.386***	0.668	Bulgaria	-0.522***	0.586
Austria	-0.188***	0.321	Russian Federation	-0.123***	0.375
Belgium	-0.326***	0.211	Ukraine	-0.125***	0.712
Denmark	-0.418***	0.721	Czech Republic	-0.229***	0.519
France	-0.396***	0.47	Slovak Republic	-0.544***	0.766
Germany	-0.231***	0.194	Estonia	-0.405***	0.74
Luxembourg	-0.059	0.056	Latvia	-0.374***	0.749
Netherlands	-0.424***	0.606	Montenegro	-0.568***	0.723
Norway	-0.153*	0.145	Hungary	-0.220***	0.318
Sweden	-0.256***	0.243	Lithuania	-0.543***	0.815
Switzerland	-0.224***	0.452	Croatia	-0.527***	0.682
Canada	-0.343***	0.59	Slovenia	-0.283***	0.729
Japan	-0.240***	0.723			
Finland	-0.259***	0.711			
Iceland	-0.214***	0.512			
Ireland	-0.304***	0.785			
Malta	-0.128***	0.542			
Portugal	-0.644***	0.708			
Spain	-0.920***	0.747			
Australia	-0.421***	0.249			
New Zealand	-0.388***	0.718			
South Africa	-0.502***	0.285			
Bahamas	-0.484***	0.306			
Barbados	-0.276***	0.465			
Trinidad and Tobago	0.047*	0.182			
Bahrain	0.005	0.019			
Cyprus	-0.532***	0.803			
Israel	-0.296***	0.428			
Jordan	-0.119	0.122			
Kuwait	0.01	0.018			
Oman	0.009	0.02			
Qatar	-0.005	0.014			
Saudi Arabia	-0.029	0.049			
United Arab Emirates	0.025	0.07			
Brunei Darussalam	-0.056	0.077			
China, P.R.: Hong Kong	-0.248***	0.681			
Singapore	-0.158***	0.512			
Mauritius	-0.158	0.115			

Table A.6 (Continued)

Country	β	Adj-R^2	Country	β	Adj-R^2
Medium Informality					
Italy	-0.471***	0.546	Samoa	-0.042	0.069
Greece	-0.516***	0.78	Armenia	-0.150***	0.441
Turkey	-0.150***	0.306	Georgia	-0.018	0.019
Argentina	-0.153***	0.222	Kazakhstan	-0.199***	0.728
Brazil	-0.238***	0.54	Kyrgyz Republic	-0.055***	0.155
Chile	-0.243***	0.342	Moldova	-0.062***	0.171
Colombia	-0.365***	0.288	Tajikistan	-0.106***	0.711
Costa Rica	-0.359***	0.318	China, P.R.: Mainland	-0.016	0.055
Dominican Republic	-0.061*	0.094	Uzbekistan	-0.102*	0.097
Ecuador	-0.063*	0.12	Mongolia	-0.044*	0.097
Guatemala	-0.011	0.002	Bosnia and Herzegovina	-0.035	0.03
Honduras	-0.169***	0.179	Poland	-0.342***	0.233
Mexico	-0.284***	0.627	Romania	-0.035*	0.098
Nicaragua	-0.117***	0.296			
Panama	-0.042	0.077			
Paraguay	-0.033	0.027			
Uruguay	-0.268***	0.708			
Venezuela	-0.066***	0.16			
Belize	-0.122***	0.36			
Jamaica	-0.406***	0.361			
St. Lucia	-0.351***	0.225			
Iran	0.027	0.025			
Lebanon	-0.02	0.058			
Syria	-0.067	0.074			
Egypt	-0.297***	0.358			
Sri Lanka	-0.084***	0.272			
Korea	-0.346***	0.764			
Malaysia	-0.064***	0.372			
Maldives	0.007	0.001			
Philippines	-0.025	0.036			
Algeria	-0.384*	0.119			
Botswana	-0.222***	0.186			
Cabo Verde	-0.023***	0.175			
Lesotho	-0.032	0.019			
Morocco	-0.053	0.082			
Eswatini	0.047	0.022			
Tunisia	-0.264***	0.157			
Fiji	-0.022***	0.163			

Table A.6 (Continued)

Country	β	Adj-R^2	Country	β	Adj-R^2
High Informality					
Bolivia	-0.0200	0.02	Togo	-0.0030	0.003
Haiti	-0.0700	0.085	Uganda	0.105***	0.205
Peru	-0.0010	0	Zambia	-0.0120	0.001
Afghanistan	0.025***	0.503	Solomon Islands	-0.0030	0.028
Bangladesh	-0.1700	0.092	Azerbaijan	-0.037***	0.36
Bhutan	0.0250	0.03	Albania	-0.0180	0.014
Myanmar	-0.0010	0			
Cambodia	0.0190	0.08			
India	-0.0100	0.013			
Indonesia	-0.0200	0.03			
Nepal	0.0030	0.001			
Pakistan	-0.0360	0.051			
Thailand	-0.082***	0.528			
Vietnam	0.0230	0.015			
Angola	-0.0080	0.002			
Cameroon	0.0000	0			
Comoros	0.0300	0.043			
Congo, Republic of	-0.070*	0.118			
Benin	-0.0510	0.057			
Eritrea	0.006*	0.106			
Ethiopia	0.0080	0.045			
Gambia	0.0080	0.038			
Ghana	0.125***	0.137			
Guinea	-0.026***	0.275			
Côte d'Ivoire	-0.100***	0.298			
Kenya	-0.0130	0.053			
Liberia	-0.0050	0.056			
Madagascar	0.0180	0.009			
Malawi	0.0030	0.013			
Mali	0.163***	0.203			
Mauritania	-0.013***	0.237			
Niger	0.0340	0.044			
Nigeria	-0.076***	0.225			
Zimbabwe	0.0090	0.081			
São Tomé and Príncipe	-0.108*	0.116			
Senegal	0.0780	0.041			
Sudan	-0.076***	0.28			
Tanzania	0.0130	0.006			

*** p<0.01, ** p<0.05, * p<0.1

Annex IV. Correlation Analysis

Table A.7: Correlation Between Output and Employment – Country Groupings

Low Informality

Variables	Informal Employment	Formal Employment	Total Employment	GDP Growth	GDP Gap
Informal Employment	1.000				
Formal Employment	-0.170	1.000			
Total Employment	-0.054	0.230	1.000		
GDP Growth	-0.082	0.153	0.499	1.000	
GDP Gap	-0.074	0.130	0.215	0.353	1.000

Medium Informality

Variables	Informal Employment	Formal Employment	Total Employment	GDP Growth	GDP Gap
Informal Employment	1.000				
Formal Employment	-0.310	1.000			
Total Employment	0.071	0.317	1.000		
GDP Growth	-0.257	0.183	0.247	1.000	
GDP Gap	-0.141	0.076	0.094	0.298	1.000

High Informality

Variables	Informal Employment	Formal Employment	Total Employment	GDP Growth	GDP Gap
Informal Employment	1.000				
Formal Employment	-0.232	1.000			
Total Employment	0.092	-0.155	1.000		
GDP Growth	-0.265	0.108	0.095	1.000	
GDP Gap	-0.187	0.023	0.066	0.384	1.000

Sources: IMF staff calculations.

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