Okun's Law: Unfit for Low and Lower Middle Income Countries?*

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Abstract: We test the performance of Okun's Law in low and lower middle income countries. Our main conclusion is that this stylized fact, which is consistent in advanced countries, generally does not hold in these economies. We include a discussion of the main limitations of the standard framework and potential methods to better understand the short term relationship between GDP and labor market outcomes in this context. Additionally, we utilize the case of Morocco to exemplify how looking at the main developments in the labor markets can help researchers form an expectation of the short term interactions of growth and labor markets.

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I. Introduction

In 1962, Arthur Okun used US data to document the empirical negative relationship between cyclical unemployment and output commonly known as Okun's law. From that moment, several authors have explored the extent to which the law holds in numerous individual country cases and country groups of generally advanced economies[1]. Based on their results, it is commonly accepted that this short term relationship functions as a law in most advanced economies, however the coefficients vary across country and some of the contributors of this literature have found that the behavior of the law is different in crisis and normal times.

As part of this volume Ball et. al analyze how well this relationship applies to a set of countries that includes a sizable group of emerging economies. Their main result is that in emerging economies Okun's law holds half as well as in advanced economies. The main goal of this paper is to complement their analysis, focusing on low and lower middle income countries (LLMICs) [2].

Discussing the fit of Okun's Law in LLMICs is a particularly challenging subject for several reasons. Other than being subject to the normal questioning of the Okun's law literature, that ranges from specification issues to stability of the coefficients, this analysis has to address two additional edges: the lack of long and comparable data for this set of countries, and the fact that labor markets operate in a different way in LLMICs. The first of these issues is partially addressed by using data form the World Economic Outlook, but there is still a lot of space to improve the data availability for in these countries. To account for the second issue, we include a discussion about the theoretical problems that arise when trying to apply, what we are going to

[1] For a meta-analysis on Okun's Law Roger et al Perman, Gaetan Stephan and Christopher Tavéra
[2] Our sample includes all countries classifies by the World bank as Low Income or Lower Middle Income countries for at least 80% of the years with available data.

call, the standard framework in countries with different labor markets and growth dynamics. After that analysis we conclude that in LLMICs the best approach to understand the interaction of labor markets and GDP growth is to analyze closely the economic history of each economy and to try to make sense of the trends in a narrative approach.

The motivation of this paper can be divided in two parts. On one side LLMICs have different economic environments than advanced economies and even than emerging economies. The difference in the logic of their labor markets makes it relevant to explore whether or not Okun's Law applies in these contexts. Second, LLMICs represent a large and fast growing population, so a better understanding of the relationship between labor market variables and the business cycle is useful to comprehend the general panorama of the global labor market and its future developments.

With this in mind, the goal of this paper is threefold. First we test if the standard Okun's Law framework fits the behavior of LLMICs' labor markets. Second we explore some of the theoretical and empirical problems of using the standard framework in those nonstandard contexts. Finally, we discuss some alternative approaches to analyze the short-term relationship between the labor market and business cycle in these economies, opening the discussion to alternative ways to analyze the labor markets dynamics of these countries.

The main result of the standard methodology is that on average the Okun's Law does not fit the data for LLMICs. Specifically, the average coefficient is -0.14 with just half of the countries having a significant result. In terms of the fit, the average adjusted R squared is 0.15. For both statistics this is below the average for advanced and even for developing economies found by Ball, Furceri, Leigh, and Loungani (2016).

What remains of the paper is organized as follows. Section 2 includes a literature review of Okun's law focused on what has been written about the countries in our sample. Section 3 describes the standard framework used in advanced economies and the main challenges of analyzing this relationship in LLMICs. Section 4 includes the results for the standard framework. Section 5 includes a description of the Moroccan case as a first attempt to improve the understanding of the interaction between labor markets and the business cycle in a complex environment. Section 6 concludes.

II. Literature Review

Okun's law has been a widely studied subject in advanced economies. Ball, Leigh, and Loungani (2016) show that Okun's law has held up well for a set of 20 advanced economies. And in a follow up paper, included in this volume, Ball et.al. (2016) find that the fit of the law in developing economies is half as good as for advanced economies. The goal of this section is first, to summarize the existing literature for LLMICs and second, to discuss the Nigerian case, a country where five independent papers have studied Okun's law with heterogeneous results.

II.I. Previous literature for LLMICs

Except for the case of Nigeria, which we're going to discuss in the following subsection, and one paper for Trinidad and Tobago, papers that study Okun's law in LLMICs include a subset of countries, that includes emerging economies in most of the cases.(Kandil, et al., 2014) cover the Caribbean, including in their analysis two countries of our sample, Belize and Trinidad and Tobago, (Ibragimov, Karimov, & Permyakova, 2013) include, from our sample, Ukraine and Moldova and (Lal, Muhammad, Jalil, & Hussain, 2010) study Pakistan, India, Bangladesh and Sri Lanka.

The first two papers find that the coefficients are significant but small, when compared to the results for advanced economies. Whereas the third paper concludes that there is no short term relationship between output gap and unemployment gap. A constant in these studies is that they apply the techniques dictated by the literature that has been developed by research in advanced economies. And in general the results are not satisfactory to the light of the standard framework.

II.II. Heterogeneous results for the same country, the case of Nigeria.

The case of Nigeria is of particular interest as it is a country with no unemployment data in our sample[3] and yet five papers have studied the fit of Okun's law. These are quotes of the papers where the authors stated their conclusions:

> *The empirical evidence shows that there is positive coefficient in the Regression, implying that Okun's law interpretation is not applicable to Nigeria.* (Bankole & Fatai, 2013).

> *However, Okun's coefficient estimates carry positive signs in both models and are in fact contrary to unemployment–output relationship even though unemployment rate determines the real output growth in Nigeria but not vice versa from the causality analysis* (Babaloa, Saka, & Adenuga, 2013)

> *This is a confirmation that the statistical relationship presented by Okun's law exists in the Nigerian situation.* (Sodipe & Oluwatobi, 2012)

> *However, the Okun's coefficient is found to be insignificant both at the ―first difference‖ and ―output-gap versions of the model. This simply means that the Okun's law is grossly invalid in Nigerian economy. (Arewa & Nwakanma, 2012)*

> *Empirical findings show that there is both the short and the long run relationship between unemployment rate and output growth in Nigeria. Hence, there is need to incorporate fiscal measures and increase the attraction of foreign direct investment (FDI) to reduce the high rate of unemployment in the country. […] This paper found out that Okun's law is not valid in Nigeria.* (Akeju & Olanipekun, 2014)

[3] We contacted the WEO team and the answers about this missing data is that the country doesn't have that series available in the official source before 2010. We contacted the statistics office of Nigeria but didn't get a reply.

We include these extracts to show that the standard framework is extensively used in Nigeria. The researchers are trying to test the fit of the same law, accepted by consensus to be an empirical fact for advanced economies, in a different context. They used techniques inspired by the previous literature to correctly identify the coefficients and to estimate the potential output and the natural rate of unemployment. But in the end, the results were not in line with the literature consensus. Our explanation for this is that the logic of Nigerian labor markets greatly differs from that of the average advanced economy.

A relevant question is if a deeper analysis of the particularities of the growth history of a country, and recognition that the dynamics of the labor markets follow an alternative logic, can help to improve the understanding of the connection between real production and labor markets. This is the question that motivates the upcoming sections.

III. Standard Framework and its shortcomings

III.I Standard Framework

Following the notation of Ball et al 2016, we estimate a set of three equations at the country level using annual data.

$$u_t - u_t^* = \beta(y_t - y_t^*) + \epsilon_t \quad (1)$$

$$e_t - e_t^* = \gamma(y_t - y_t^*) + \eta_t \quad (2)$$

$$u_t - u_t^* = \delta(e_t - e^*) + \mu_t \quad (3)$$

Where u_t represents the unemployment rate at time t u_t^* its natural value, y_t the log of the real GDP, y_t^* its potential value, e_t is the log of the employment level at time t and e_t^* its potential value. The trend values are estimated using the Hodrick and Prescott filter with a smoothing parameter of 100.

An alternative way to express this relationship is the changes version. In this case ΔU_t represents the change of the unemployment rate, ΔY_t is the change of log unemployment and ΔE_t the change of log employment. This specification has the advantage that it does not require an estimate of the potential output, but has the underlying assumption that that potential output is constant.

$$\Delta U_t = \alpha + \beta\, \Delta Y_t + \omega_t \quad (4)$$

$$\Delta E_t = \alpha + \gamma \Delta Y_t + \eta_t \quad (5)$$

$$\Delta U_t = \alpha + \delta\, \Delta E_t + \mu_t, \quad (6)$$

This is the standard framework used for advances and emerging economies, but as the literature has found and the results in the next section will confirm, the fit of this equations is very poor in LLMICs.

III.II Problems with the standard approach in LLMICs

In this section we discuss two sources of complications that arise when analyzing labor markets in LLMICs: data limitations and the fact that labor markets in LLMICs work according to a different logic than the labor markets in advanced economies.

In terms of data limitations, the challenge is double: on one hand there is a deficiency in data collection -of the 91 countries classified as LLMICs according to our definition, only 18 have available data to calculate the Okun's coefficient. On the other hand, some countries that collect data do it without a comparable definition. This is a particularly relevant problem for the unemployment measurement, because the definition includes many details that can generate incomparable statistics. Given that the employment definition is less susceptible this second problem, a comparison of the coefficients estimated by equation (2) constitutes a better alternative in this context.

The second part of the problem is more complex, and arises from the disparate realities of labor markets in LLMICs and the advanced economies on which the international definition of labor market statistics is based. For example, the unemployment rate represents the share of the labor force available and seeking employment that hasn't worked in the past week. This definition makes sense in a context where the government provides some form of unemployment insurance or where the employers are entitled to severance pay after dismissal. However, these two institutions are not present in the labor markets of LLMICs. In LLMICs people cannot afford to wait to be called for a job interview. In fact, they are not likely to be salaried workers and those who are, are probably employed in the informal sector. Additionally, given the need for a livable income and the predominance of informal activities, it is relatively easy to find a job for at least an hour that would classify a person as employed. (OECD, 2009) (Dewan & Peek, 2007). This implies that we should expect very low unemployment rates in LLMICs - if they follow the international definition- and a low correlation between changes in unemployment and the business cycle. A more informative variable in this context would be average job quality.[4] When a crisis arises and "bad" jobs replace "good" jobs, so the expectation is to find a negative correlation between quality and growth.

The main take away from this section is that there is space for improvement in the data collection process. This improvement has to occur on two levels. More countries need to start collecting data on labor markets and the surveys must include questions that accurately reflect the realities of labor markets in LLMICs. Until this is achieved, the most informative result remains the employment equation.

[4] For more details about the alternative measures and a more extensive discussion about this subject consult (Dewan & Peek, 2007)

IV. Main Results

We first estimate the benchmark specifications of Okun's law. The estimations are based on 18 countries with available unemployment rate and real GDP data. Table 2 reports the estimated results across countries. With the gaps version specified as equation (1), the estimated Okun coefficients fall in the range between -0.42 and 0, and half of them are significant. With the changes version (equation 4), we still have negative coefficients for all 18 countries, while the coefficients are statistically significant for only 4 countries (Bolivia, Egypt, Nicaragua, and Philippines).

Table 1. Estimates of Okun's Law based on Unemployment Rate

	Gaps Specification			Changes Specification		
Country	Coef.	R-squared	N. of Obs.	Coef.	R-squared	N. of Obs.
Belize	-0.26***	0.30	25	-0.19	0.12	24
Bolivia	-0.26	0.17	15	-0.34*	0.21	14
Cabo Verde	-0.26***	0.22	35	-0.14	0.05	34
Egypt	-0.42***	0.69	25	-0.33***	0.37	24
El Salvador	-0.06	0.03	22	-0.09	0.04	22
Georgia	-0.02	0.00	19	-0.19	0.11	18
Honduras	-0.10*	0.09	35	-0.00	0.00	34
Indonesia	-0.02	0.01	31	-0.04	0.03	30
Kyrgyz Republic	-0.11	0.07	21	-0.12	0.10	20
Moldova	-0.05	0.04	20	-0.00	0.00	20
Mongolia	-0.10*	0.36	8	-0.20	0.44	7
Morocco	-0.02	0.01	20	-0.04	0.05	19
Nicaragua	-0.15**	0.18	35	-0.14**	0.16	34
Pakistan	-0.12*	0.10	32	-0.01	0.00	31
Philippines	-0.23***	0.25	30	-0.17**	0.15	29
Sao Tome and Principe	-0.01	0.00	35	-0.02	0.02	34
Ukraine	-0.04	0.10	20	-0.04	0.04	19
Vietnam	-0.29**	0.21	25	-0.16	0.04	24

The benchmark results show that Okun's Law does not fit in the low-income countries. However, there is considerable cross-country heterogeneity. Figure 1 displays the histogram for

the estimated Okun coefficients and associated R-squared. The results with the gaps version and changes version are shown in the left and right panel, respectively. With the gaps version, the estimated coefficients have an average value of -0.14 and a standard deviation of 0.12. The R-squared mostly falls below 0.30, with a mean value is 0.16. Estimation with the gaps version leads to similar results. The mean value of coefficients is -0.12 and standard deviation is 0.10. The average R-squared value is 0.11.

Figure 1. Histogram of Okun's Law based on Unemployment Rate

Besides the standard methodology of Okun's Law, we also estimate the short-run impact of output on total employment as an alternative way to analyze the linkage between labor market and output. Table 2 reports the estimated results for total employment across country. The estimates are based on 25 countries with available employment data. With the gap version (equation 2) we find positive coefficients for 19 countries, 16 of which are statistically

significant. With the changes version (equation 2), the estimated coefficients are positive in 20 countries, 8 of which are statistically significant.

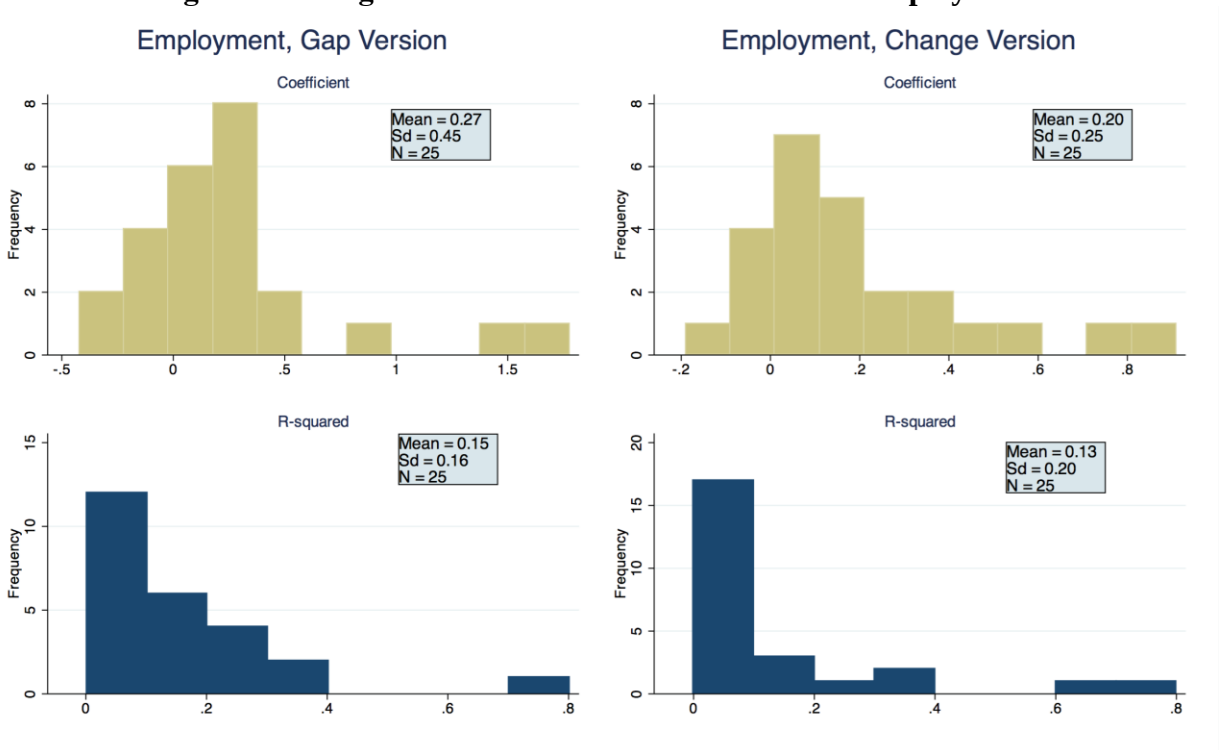
Table 2. Estimates of Okun's Law based on Total Employment

	Gaps Specification			Changes Specification		
Country	Coef.	R-squared	N. of Obs.	Coef.	R-squared	N. of Obs.
Belize	0.23*	0.14	25	0.33*	0.14	24
Bolivia	1.62**	0.20	26	0.20	0.00	25
Cabo Verde	0.08	0.04	35	0.15	0.07	34
Cote d'Ivoire	0.30*	0.09	35	0.07	0.00	34
Egypt	0.81***	0.72	25	0.86***	0.68	24
El Salvador	1.39*	0.16	22	0.29	0.05	22
Georgia	-0.13	0.02	21	0.09	0.01	20
Honduras	0.25*	0.09	35	-0.02	0.00	34
India	0.31***	0.18	35	-0.01	0.00	34
Indonesia	-0.05	0.02	27	-0.03	0.00	26
Kenya	0.48**	0.17	35	0.43*	0.11	34
Kyrgyz Republic	0.06	0.01	21	0.05	0.03	20
Moldova	-0.05	0.01	20	0.17	0.06	20
Mongolia	0.11*	0.08	35	0.13**	0.13	34
Morocco	-0.42**	0.22	19	-0.19	0.04	18
Nicaragua	0.52**	0.11	35	0.33	0.04	34
Pakistan	0.28	0.05	27	0.55	0.09	26
Philippines	0.31**	0.19	30	0.09	0.01	29
Sao Tome and Principe	-0.31	0.06	35	-0.02	0.00	34
Tajikistan	0.3***	0.38	20	0.8***	0.72	20
Tanzania	0.36**	0.26	20	0.24*	0.20	19
Turkmenistan	0.09***	0.38	16	0.17**	0.34	16
Ukraine	0.05	0.03	24	0.11	0.09	23
Uzbekistan	0.12**	0.21	24	0.11***	0.38	23
Vietnam	-0.04	0.00	26	0.10	0.02	25

This alternate estimation performs better, but the results are also heterogeneous. Figure 3 shows the histogram for the estimated coefficients and associated R-squared. With the gap version, the estimated coefficients have a mean value of 0.27 and standard deviation of 0.45. The R-squared

mostly falls below 0.4, with an average value of 0.15. Estimation with the change version leads to a lower mean value of coefficients of 0.20 with standard deviation of 0.25, and average R-squared value of 0.13.

Figure 2. Histogram of Okun's Law based on Total Employment



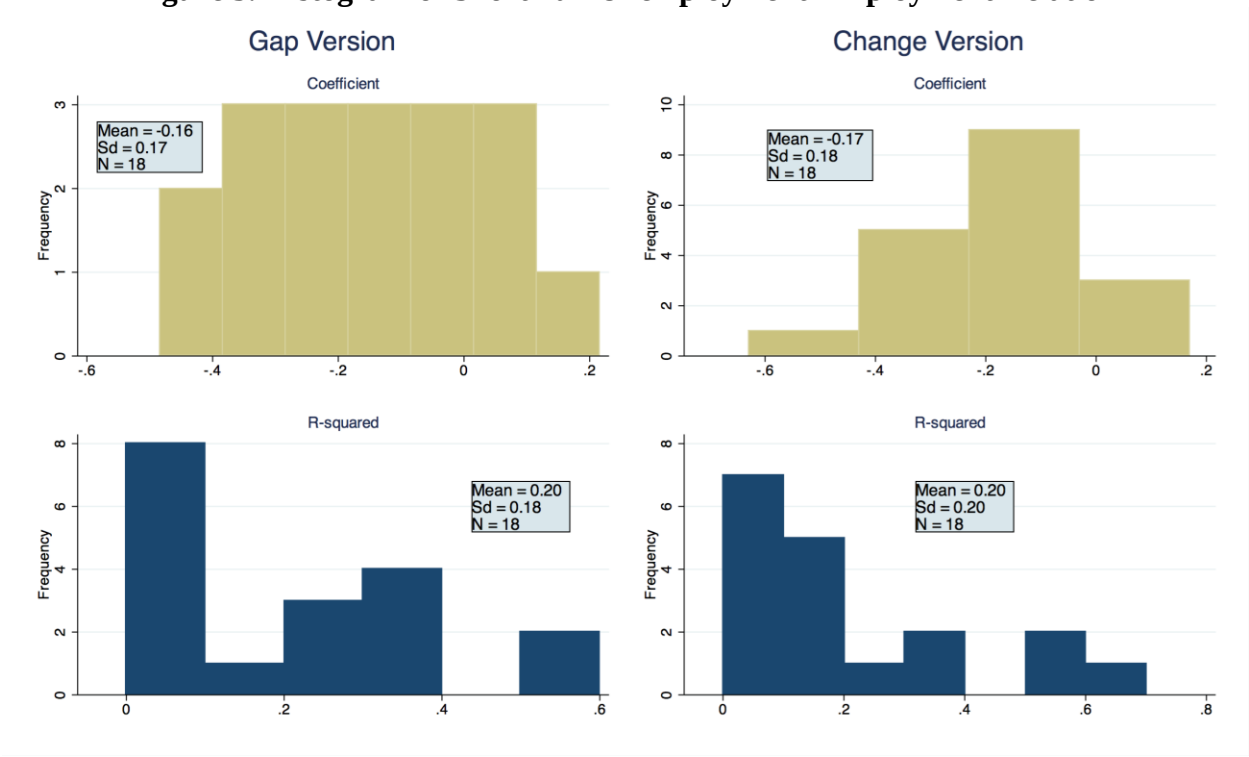
To understand the relationship of the two above equations, we estimate the short-run relationship between unemployment rate and total employment following both the gap version and change version specified as equation (3) and equation (6), respectively. The estimates are based on a total of 18 countries with available unemployment and employment data. Table 3 reports the estimated results across countries. With the gap version, we find positive coefficients for 12 countries, 10 of which are significant. With the change version, the estimated coefficients are negative for 16 countries, 10 of which are significant.

Table 3. Estimates of Short-run Unemployment-Employment Relation

	Gaps Specification			Changes Specification		
Country	Coef.	R-squared	N. of Obs.	Coef.	R-squared	N. of Obs.
Belize	-0.36***	0.34	24	-0.48***	0.40	25
Bolivia	-0.01	0.00	14	-0.10	0.09	15
Cabo Verde	0.15	0.02	34	0.02	0.00	35
Egypt	-0.27***	0.27	24	-0.40***	0.58	25
El Salvador	-0.14*	0.13	22	0.02	0.04	22
Georgia	-0.39***	0.64	18	-0.29***	0.52	19
Honduras	-0.16**	0.15	34	-0.24***	0.34	35
Indonesia	-0.31***	0.33	26	-0.37***	0.35	27
Kyrgyz Republic	-0.16	0.02	20	-0.22	0.07	21
Moldova	-0.29***	0.53	20	-0.32***	0.30	20
Mongolia	-0.63*	0.52	7	-0.03	0.00	8
Morocco	-0.09	0.10	18	-0.01	0.00	19
Nicaragua	-0.09**	0.17	34	-0.07*	0.09	35
Pakistan	-0.08	0.09	26	-0.17***	0.28	27
Philippines	-0.19*	0.11	29	-0.23**	0.13	30
Sao Tome and Principe	0.02	0.01	34	0.12***	0.21	35
Ukraine	-0.11	0.08	19	-0.16**	0.23	20
Vietnam	-0.05	0.00	24	0.04	0.00	25

Figure 3 shows the histogram for the estimated coefficients and associated R-squared. With the gaps version, the estimated coefficients have a mean value of -0.16 and standard deviation of 0.17. The R-squared mostly falls below 0.4, with an average value of 0.20. Estimation with the gaps version leads to similar results. The low coefficients (in absolute value) and R-squared indicates that employment has a very limited correlation with the unemployment rate in LLMICs. This can either be caused by an increasing employment which raises the labor force, or by countries collecting data with different standards. In either case, total employment can be a better indicator than unemployment to investigate the relationship between labor market and output fulgurations in low-income countries.

Figure 3. Histogram of Short-run Unemployment-Employment Relation



To summarize, Okun's Law does not hold well in the low-income countries. The average value of the coefficients from the gaps and change version estimation are -0.14 and -0.12, respectively. With total employment as an alternative approach, the estimated linkage between labor market and output is stronger. The average value of coefficients from the gaps and changes version estimation are 0.27 and 0.20, respectively. For both approaches there is considerable cross-country heterogeneity.

V. Determinants of the Okun Coefficients

In this section we investigate the factors that might alter the relationship between economic growth and labor market in low-income countries. The dependent variables are the four sets of coefficients we estimated based on unemployment rate and total employment for each country.

The six explanatory variables we consider are those suggested in previous studies. These variables fall into two broad categories: institutional variables and economic variables. For each independent variable, we take average across time for each country. The estimated coefficient based on unemployment rate is expected to be negative; hence a lower negative value indicates a higher responsive labor market. In contrast, a higher positive coefficient based on total employment indicates a higher responsive labor market.

Table 4. Determinants of Okun Coefficients

Category	Variables	Data Source
Institutional	Employment protection	Fraser Institute – Economic Freedom of the World
	Business regulation	Fraser Institute – Economic Freedom of the World
Economic	Average unemployment rate	IMF – WEO
	Average real GDP per capita	IMF – WEO
	Skill mismatch	IMF – Staff Calculations
	Service share in GDP	IMF – WEO

Business and labor market regulations: Ahmed, Guillaume, and Furceri (2012) argue that greater business and labor market regulations slow the hiring and firing process, and therefore reduce the responsiveness of labor market to output shocks. We retrieve data on business and labor market regulations from the Economic Freedom of the World Index by the Fraser Institute. Figure 4 plots the coefficients against the business regulation index. There is a consistent pattern in that higher level of business regulation is associated with weaker responses of labor market. As shown in figure 5, the results for labor market regulation are mixed. With the coefficients based on unemployment rate, we can see an upper trend. This indicates that countries with a more flexible labor market tend to have more responsive labor markets. However, the relationship does not hold with the coefficients based on total employment.

Figure 4. Okun Coefficients and Business Regulation

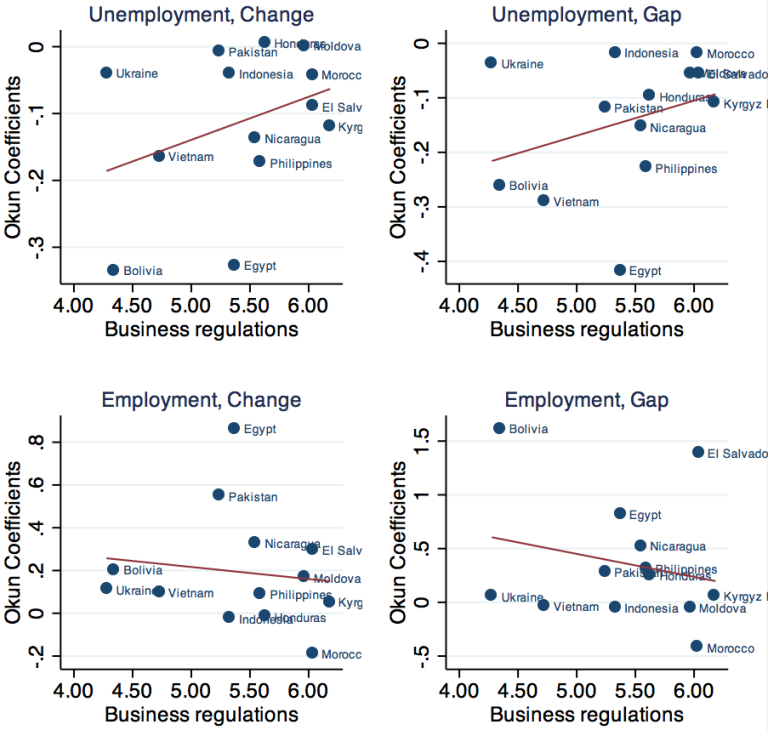
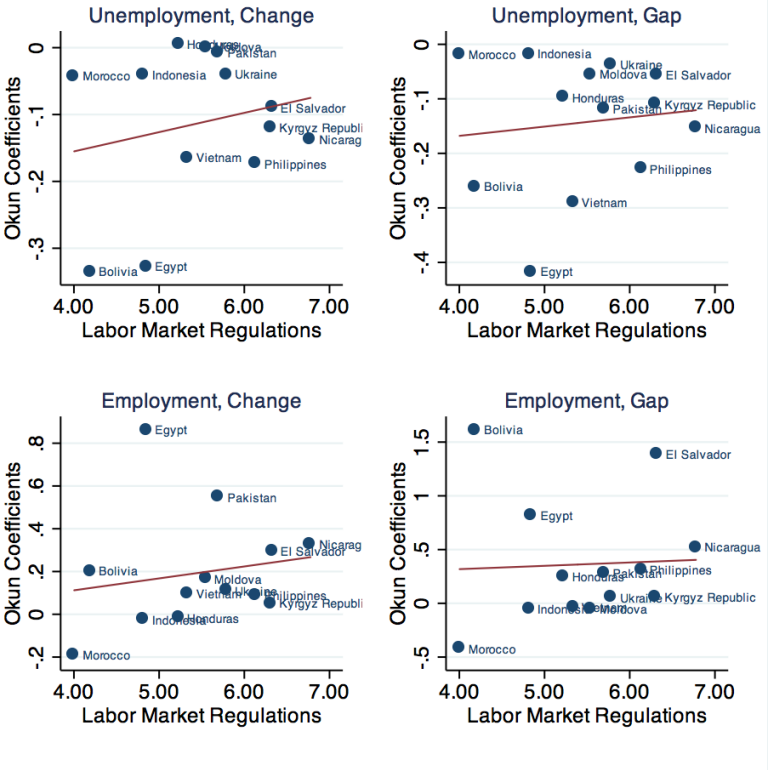
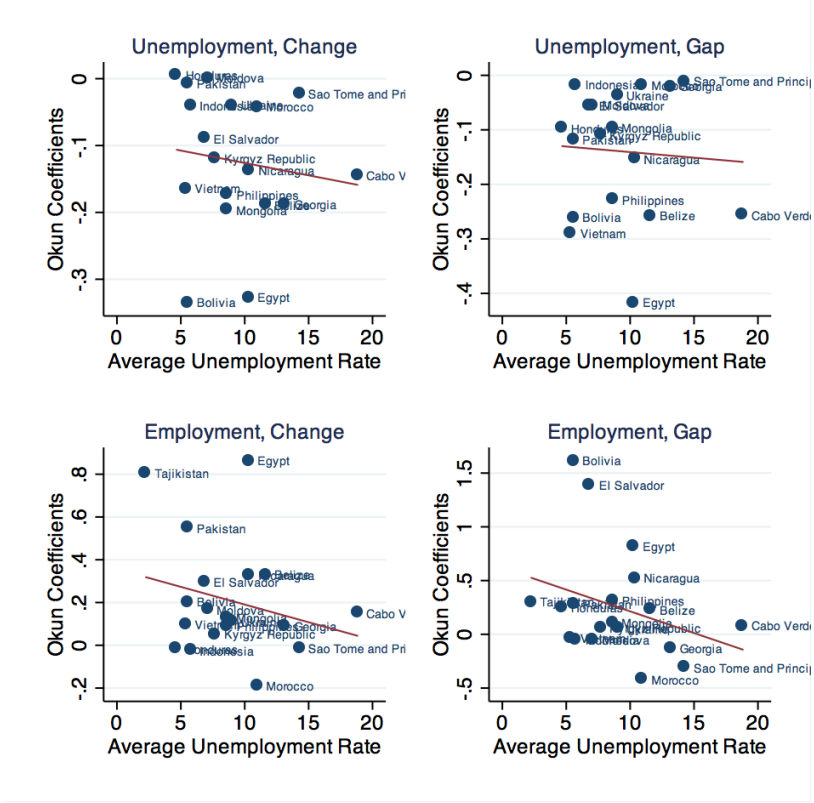


Figure 5. Okun Coefficients and Labor Market Regulation



Average unemployment Rate: Ball, Leigh, and Loungani (2016) and Ball, Furceri, Leigh, and Loungani (2016) find a negative relationship between the Okun coefficients and the average unemployment rate in advanced and emerging economies countries. As figure 6 shows, the results are mixed in LLMICs. We find a similar pattern for the unemployment coefficient, i.e. in countries where the average unemployment is higher the labor market tends to be more responsive to output. This relationship does not hold with the coefficients based on total employment.

Figure 6. Okun Coefficients and Average Unemployment Rate



Real GDP per capita: Ball, Furceri, Leigh, and Loungani (2016) suggest that per capita GDP can alter how labor market respond to output fluctuations. However, we find little association in low-income countries (figure 7).

Figure 7. Okun Coefficients and Real GDP per Capita

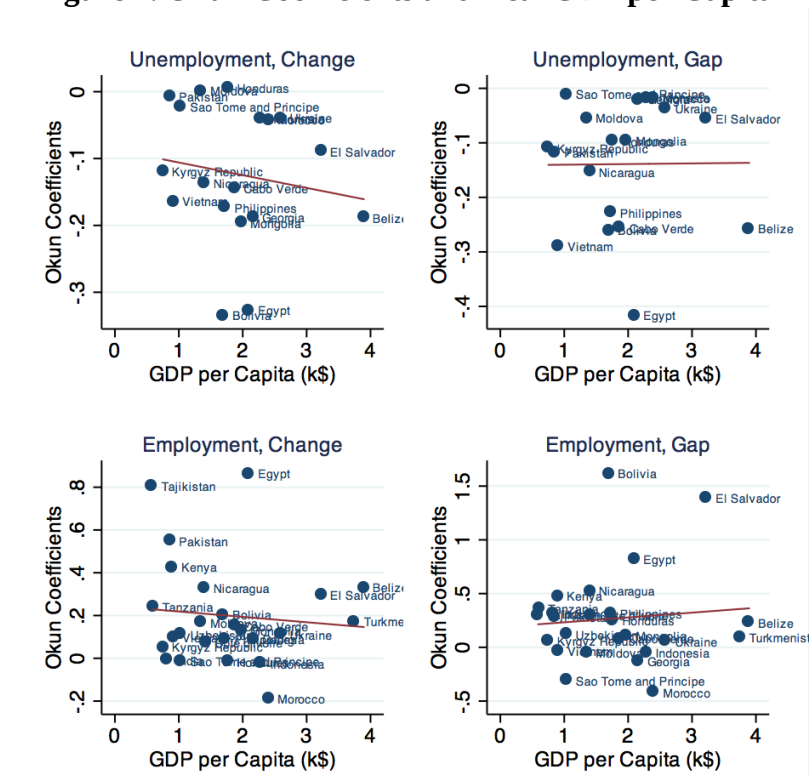
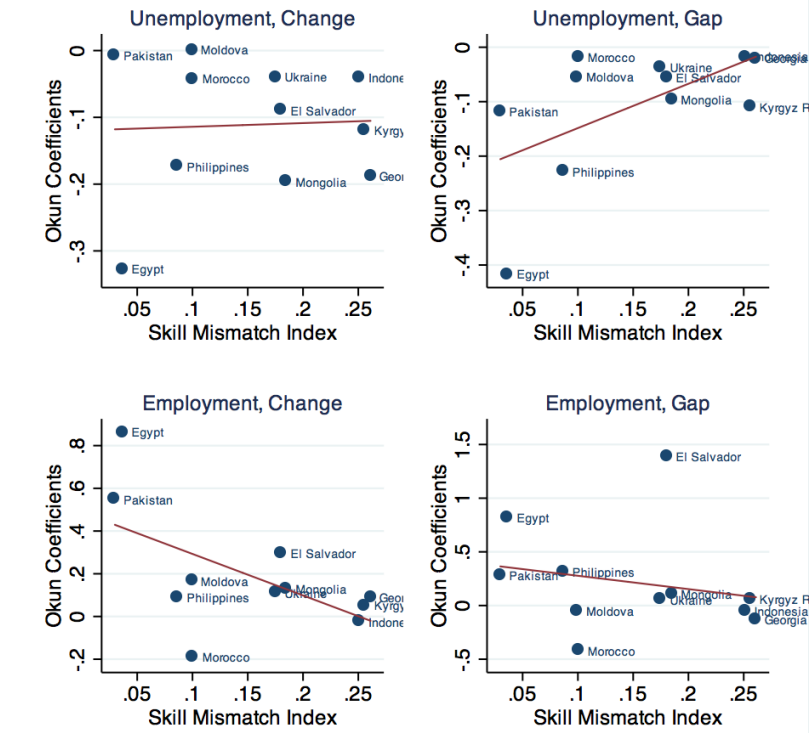


Figure 8. Okun Coefficients and Skill Mismatch



Skill mismatch: Estevao and Tsounta (2011) suggest that the responsiveness of labor markets could depend on the skill mismatch. Ball, Furceri, Leigh, and Loungani (2016) find evidence that in emerging economies that is the. When testing this variable in our sample we find a similar correlation for LLMICs.

Service share in GDP: Crivelli, Furceri, and Toujas-Bernaté, (2012) document that labor market and output fluctuations are more correlated in countries with higher share of services in GDP. We found similar association with the coefficients based on the unemployment coefficient and mixed results for employment (figure 9).

Figure 9. Okun Coefficients and Service Share in GDP

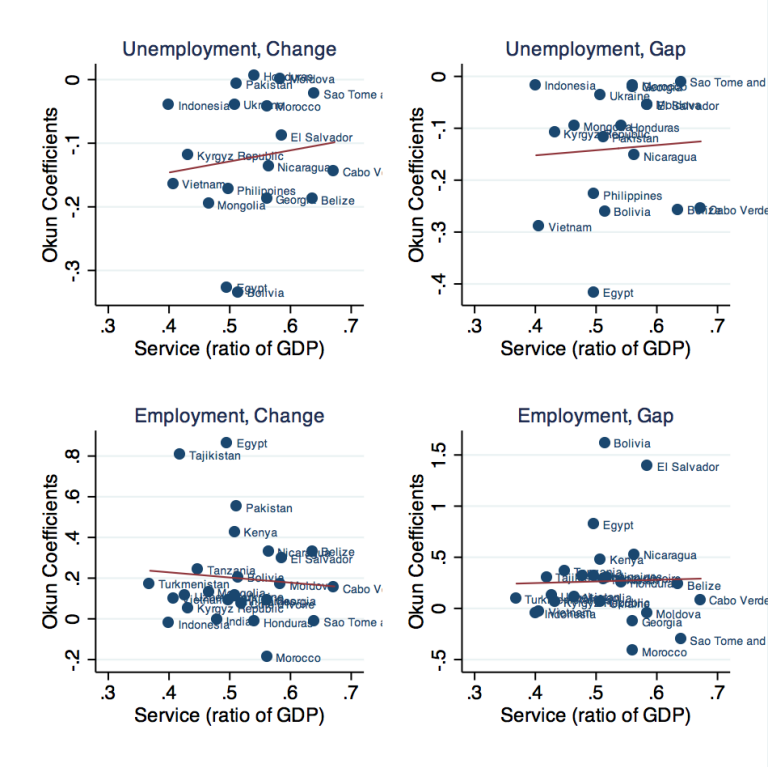


Table 8 reports the regression results of coefficients against each potential explanatory variable separately. We have very limited success in explaining the heterogeneity across LLMICs. Only the effect of the skill mismatch index is statistically significant[5].

Table 8. Determinants of Okun Coefficients. Univariate regressions

		Unemployment Gap	Unemployment Change	Employment Gap	Employment Change
Business regulation	Coef.	0.06	0.06	-0.21	-0.06
	Std	(0.05)	(0.06)	(0.36)	(0.08)
	Obs	13	13.00	13	13
	R-sq	0.11	0.12	0.05	0.02
Labor market regulation	Coef.	0.02	0.03	0.03	0.06
	Std	(0.04)	(0.04)	(0.28)	(0.09)
	Obs	13	13	13	13
	R-sq	0.01	0.04	0.00	0.03
Average unemployment rate	Coef.	-0.01	-0.01	-0.04	-0.02
	Std	(0.01)	(0.01)	(0.03)	(0.02)
	Obs	18	18.00	19	19
	R-sq	0.00	0.02	0.09	0.06
Average per capital RGDP	Coef.	0.01	-0.0190	0.05	-0.03
	Std	(0.03)	(0.0194)	(0.10)	(0.05)
	Obs	18	18	25	25
	R-sq	0.00	0.02	0.01	0.01
Skill Mismatch	Coef.	0.81*	0.06	-1.24	-1.94*
	Std	(0.45)	(0.47)	(1.21)	(0.95)
	Obs	11	11	11	11
	R-sq	0.33	0.00	0.05	0.33
Service Share in GDP	Coef.	0.10	0.17	0.16	-0.25
	Std	(0.40)	(0.24)	(0.98)	(0.53)
	Obs	18	18	25	25
	R-sq	0.00	0.02	0.00	0.01

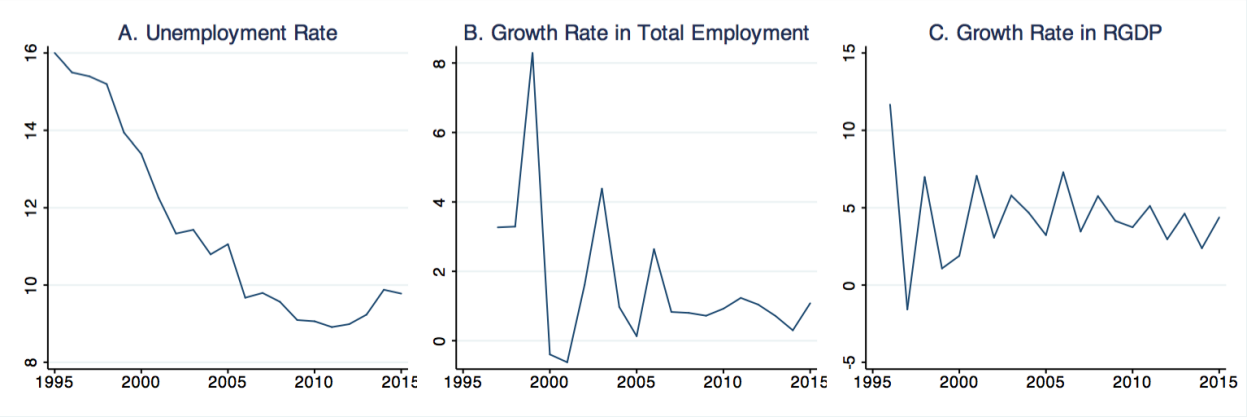
In LLMICs Okun's law does not work as it does in advanced economies and the heterogeneity of the short term relationship between output and unemployment cannot be explained by the traditional variables explore by the literature.

[5] And note that the number of countries is less in this case so it can be induced by the fact that countries that collect the data needed to estimate the Skill mismatch index are different from the rest of the sample and closer to advanced economies.

VI. A Closer Look to the Morocco Case

In the previous section, we found no significant relationship between labor markets and output fluctuations. In this section we take a closer look at the evolution of labor markets. As shown in figure 10A, unemployment rate in Morocco decreased from 16 percent in 1995 to below 10 percent in 2006, and stayed relatively stable between 9 and 10 percent after 2006. However, we do not find a matching pattern in the growth rate and total employment (figure 10B). Take the year 2000 and 2001 for example, unemployment rate shows rapid decreases, while total employment also decreases. The mismatch between unemployment and employment indicates a complex labor market. In what follows we are going to explore three trends that affected the Moroccan economy during the period of analysis, looking for some hints to understand the complexity of the environment of its labor market.

Figure 10. A Closer Look to the Morocco Case



Decreased participation rate and improved education level: The labor market is characterized with a downward trend participation rate. Table 9 compares the average participation rate between 1999-2002 and 2011-2014. The participation decreased by 7 percent over the 15 years. This reduction is due to progression of the education that particularly affected the participation of young people aged 15 to 24 years (decreases by 25%). In contrast with the declining

participation rate, the education level of the labor supply has relatively improved. The percentage of working people with a higher education degree increased from 31.3 percent in 2000 to 41.4 percent in 2014.

Table 9. Participation Rate in Morocco

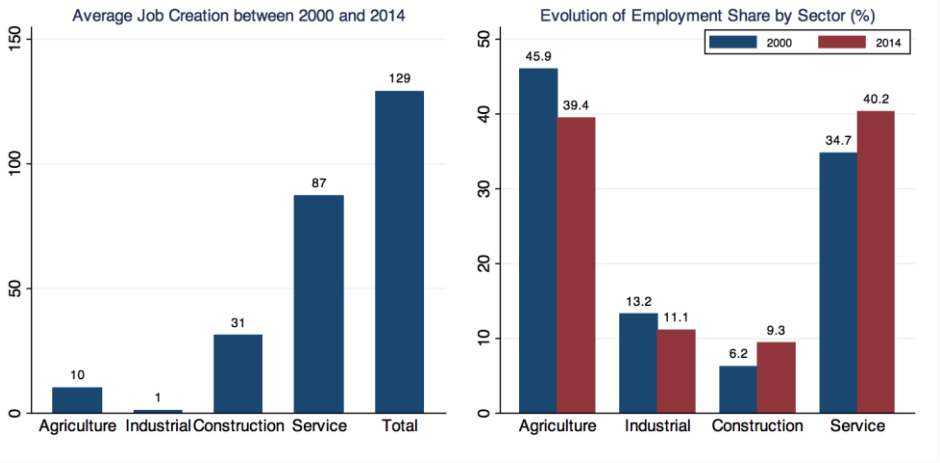
	Average (%): 1999-2002	Average (%): 2011-2014	Change (%)
National	52.2	48.6	-7%
Without diploma	51.2	49.0	-4%
With diploma	54.2	48.0	-11%
Male	78.1	73.4	-6%
Female	27.1	25.2	-7%
15 to 24 yr	44.2	33.4	-25%
25 to 34 yr	63.0	61.4	-3%
35 to 44 yr	62.9	61.4	-2%
44 yr & over	44.3	44.5	0%
Rural	60.4	57.5	-5%
Urbain	46.4	42.7	-8%

Source: Haut-commissariat au plan, Morocco, 2016

Progression of service sector: During the past fifteen years, total employment increased by 129 thousand jobs per year on average. As shown in the Left panel of figure 11, service sector accounts for 87 thousand jobs creation per year (67% of total). Among the rest of the job creation, construction sector contributes 31 thousand jobs (24%); agriculture, forest and fishing contribute 10 thousand jobs (8%); and the industrial sector (including handicrafts) creates 1 thousand jobs (1%). Following the progression of the services, the employment structure has changed between 2000 and 2014. The share of service sector increases from 34.7% in 2000 to 40.2 percent in 2014 (right panel of figure 11).

This sectoral shift begins to close the gap between Morocco and Advanced economies. Increasing the relevance of the standard Okun framework in this case.

Figure 11. Evolution of Employment Share by Sector (%)



Source: Haut-commissariat au Plan, Morocco, 2016

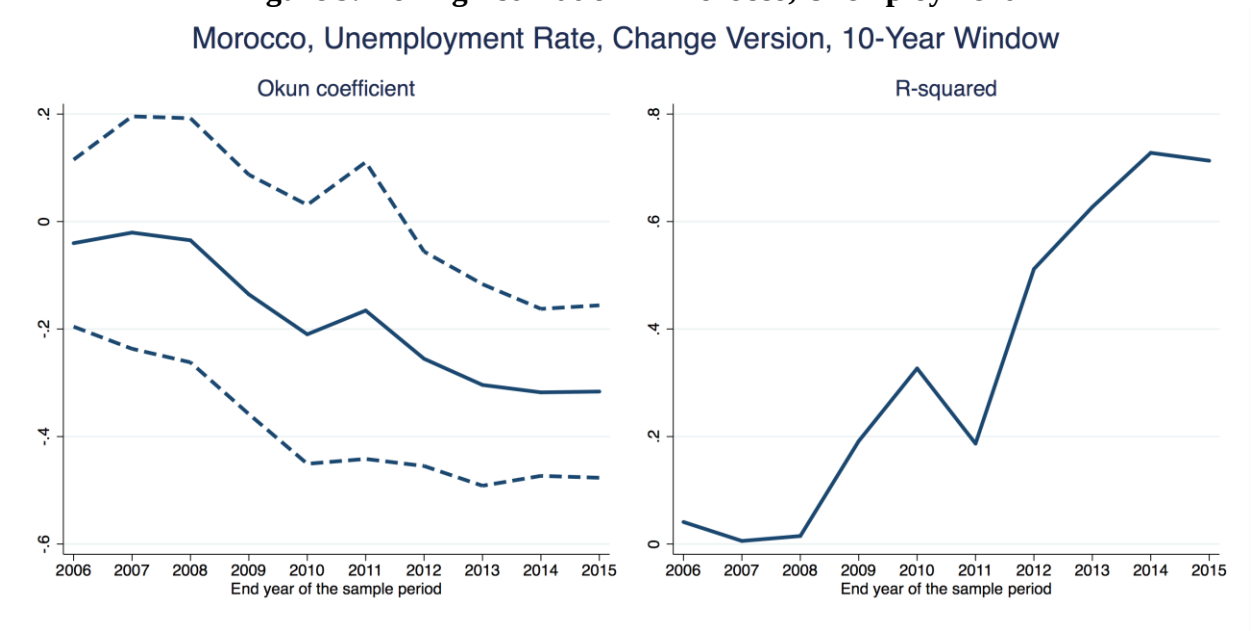
Importance in informal sector: Another feature of employment in Morocco is the importance of informal activities in providing non-agricultural employment. In 2013, employment in the informal sector was around 2.4 million people representing 36.3% of overall non-agricultural employment. The informal sphere is essentially composed by small business and microenterprise. According to a survey conducted by the Haut-commissariat au Plan, 233 thousand independent employers recruited 420 thousand employees and distributed 11.4 billion Dirham of wages in 2013. This amount of wages accounts for almost 4 percent of the national compensation and 11% of the overall added value of the informal sector.

Limited by the data availability, we are not able to directly examine the impact of labor market evolution the relationship between output and labor market. As an alternative approach, we perform a rolling windows exercise Figure 9 displays the dynamic of Okun coefficient based on a 10-year rolling window.[6] The solid line in the left panel is shows estimated Okun coefficients, and the dash lines shows the 95 percent confidence interval. The right panel shows the

[6] We also used different width of the window, and the results are robust. Results with 12-year rolling window are shown in figure A1 and A2.

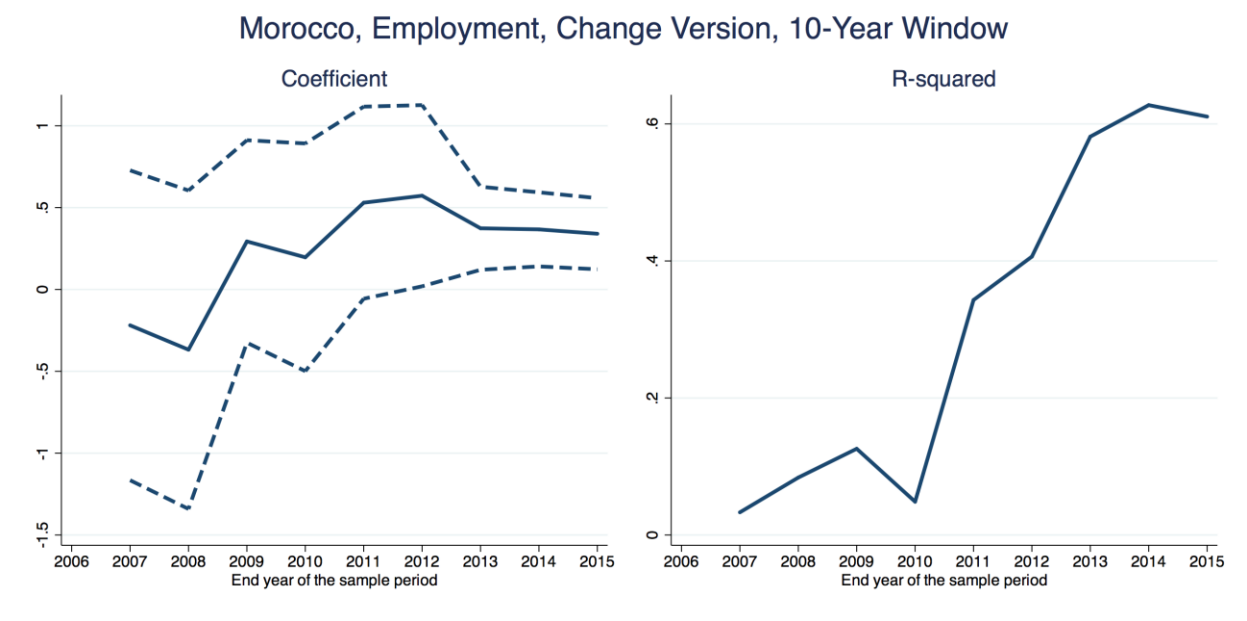
corresponding R-squared. The value on the horizontal axis shows the end year of each rolling window. Take the first rolling window of 1996 – 2006 for example, the estimated Okun's coefficient is -0.03 and it is not statistically significant, and the R-squared is 0.03. As the rolling window moves alone, there is a clear trend that the Okun coefficient becomes more negative and statistically significant. Meanwhile, the R-squared increases from around zero to above 0.7. This indicates the Okun's Law became more and more fit for Morocco.

Figure 9. Rolling Estimation in Morocco, Unemployment



We apply the same analysis to total employment and total labor force in Morocco. Figure 10 shows the dynamic of the relationship between growth in total employment and growth in real GDP. There is a similar pattern, the relationship between employment and output becomes stronger across time: as the window evolves, the coefficient becomes greater and more significant. The R-squared increases from around zero to above 0.6.

Figure 10. Rolling Estimation in Morocco, Unemployment



If we assume that the three trends that we described at the beginning of the section are the main changes in the labor markets dynamics. Then this results indicate that the increase in the importance of the informal market was more than compensated with the sectoral shift and the tightness of the supply generated by the decrease in labor market participation.

VI. Conclusion

The main objective of this paper is to test if the Okun's Law – short-run relationship between output and labor market – holds in low-income countries. We find evidence that the standard Okun's Law does not hold well in the low-income countries. With total employment as an alternative approach, the estimated linkage between labor market and output is stronger. For both approaches there is considerable cross-country heterogeneity. We investigate the potential factors that could alter the linkage between output and labor market, but have limited success in explaining this heterogeneity.

We take a closer look at the country case of Morocco. During the past 15 years, the Moroccan labor market features a decreased participation rate and improved education level. Meanwhile, the service sector progresses quickly and accounts for the largest share in total employment. The informal sector plays an important role in the Moroccan labor market. Limited by the data availability, we could not directly investigate how these evolutions alter the responsiveness of labor market to output growth. As an alternative approach, we estimate the Okun's Law with rolling window regression. We find that the linkage between labor market and output becomes stronger across time.

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Figure A1. Rolling Estimation in Morocco, Unemployment

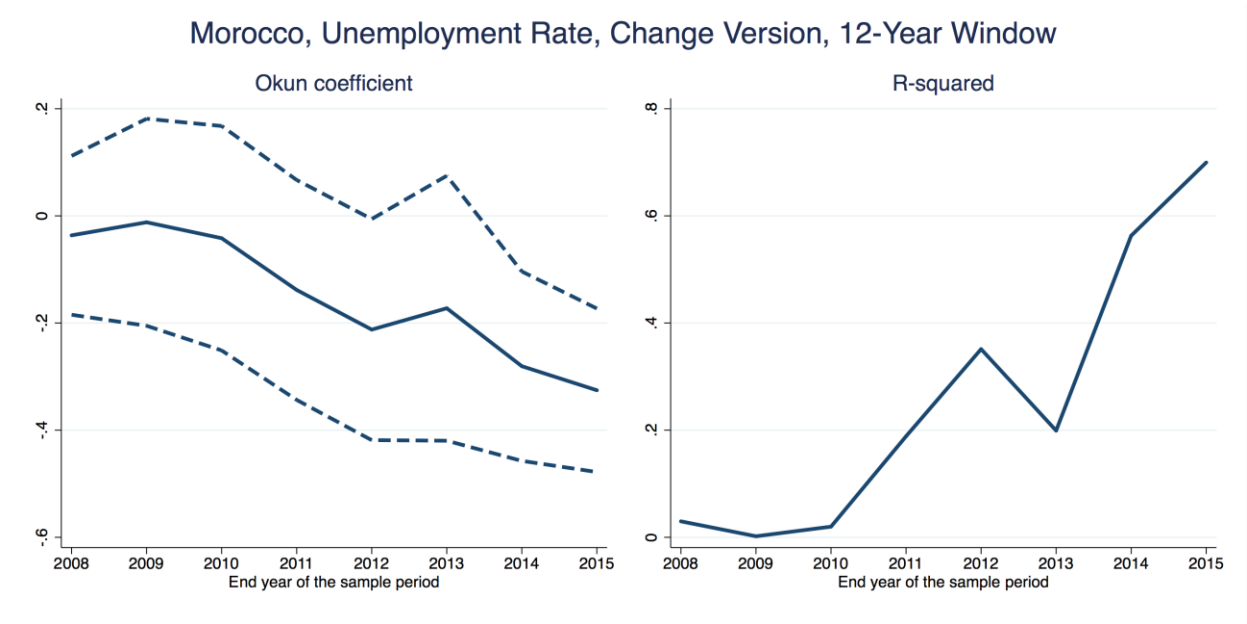

Figure A2. Rolling Estimation in Morocco, Employment